NATIONAL DISASTER MANAGEMENT AUTHORITY (NDMA)
THE ISLAMIC REPUBLIC OF PAKISTAN

THE PROJECT
FOR
NATIONAL DISASTER MANAGEMENT PLAN
IN
THE ISLAMIC REPUBLIC OF PAKISTAN

FINAL REPORT

INSTRUCTOR'S GUIDELINE ON COMMUNITY BASED DISASTER RISK MANAGEMENT

MARCH 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.
CTI ENGINEERING INTERNATIONAL
OYO INTERNATIONAL CORPORATION

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PREFACE

The National Disaster Management Plan (NDMP) is a milestone in the history of the Disaster Management System (DRM) in Pakistan. The rapid change in global climate has given rise to many disasters that pose a severe threat to human life, property and infrastructure. Disasters like floods, earthquakes, tsunamis, droughts, sediment disasters, avalanches, GLOFs, and cyclones with storm surges are some prominent manifestations of climate change phenomenon. Pakistan, which is ranked in the top ten countries that are the most vulnerable to climate change effects, started planning to safeguard and secure the life, land and property of its people in particular the poor, the vulnerable and the marginalized. However, recurring disasters since 2005 have provided the required stimuli for accelerating the efforts towards capacity building of the responsible agencies, which include federal, provincial, district governments, community organizations, NGOs and individuals.

Prior to 2005, the West Pakistan National Calamities Act of 1958 was the available legal remedy that regulated the maintenance and restoration of order in areas affected by calamities and relief against such calamities. An Emergency Relief Cell within the Cabinet Division has been serving since 1971 as an institutional disaster relief support at the national level. Similar institutional arrangements existed at the provincial level in the form of relief commissioners. However, that regime provided a reactive approach towards emergency response only.

The United Nations International Strategy for Disaster Reduction (UNISDR) introduced the paradigm shift from a reactive to a proactive approach in the form of the Hyogo Framework of Action (2005-2015) signed by 168 countries including Pakistan. To fulfill the global obligations as well as cope with the challenges emerged in the aftermath of October 2005 earthquake, the Government of Pakistan promulgated the National Disaster Management Ordinance in 2007 to introduce a comprehensive National Disaster Management System in the country. The Ordinance became the Act called the National Disaster Management Act in December 2010. The Act establishes three tiers for the disaster management system: i.e., national, provincial and district levels.

Under the Act, the National Disaster Management Commission (NDMC) was established at the national level, and has the responsibility for laying down policies and guidelines for disaster risk management and approval of the National Plan. The National Disaster Management Authority (NDMA) was subsequently established in 2007 in line with the Act, and serves as the implementing, coordinating and monitoring body for disaster risk management at the national level. Along with the Ordinance (now Act), the National Disaster Risk Management Framework (NDRMF) was prepared by the NDMA in March 2007. The NDRMF served as an overall guideline for disaster risk management at national, provincial and district levels. In March 2010, the NDMA formulated the National Disaster Response Plan (NDRP) identifying specific roles and responsibilities of the relevant stakeholders in emergency response including Standard Operation Procedures (SOPs).

Concurrently, NDMA, in collaboration with national and international partners, had been in the process of strengthening the DRM system in the country. In order to support this new approach in Pakistan, the Japan International Cooperation Agency (JICA) dispatched a series of missions from the year 2008 to 2009 based on the request from the Government of Pakistan. It studied the whole legal and administrative system of DRM in Pakistan and held meetings with all stakeholders to identify the needs and requirements to enhance the capacity of the national DRM system. Based on thorough bilateral consultations, a project document on formulation of a National Disaster Management Plan (NDMP) for Pakistan was conceived for implementation through Japanese Grant-in-Aid. A PC-II was prepared accordingly and was approved by the Planning Commission in the meeting of Central Development Working Party held on 19-11-2009. For implementation through Grant-in-Aid, the scope of work for the project was discussed, agreed and signed between the Government of Pakistan and JICA on 11-12-2009 and the project Inception Report was prepared in April 2010. The Plan, aimed at enhancing the capacity of the country to prepare for and respond to disasters by defining the measures to be considered necessary for disaster management and risk reduction in line with the provision of the National Disaster Management Act (Chapter II, Section 10), was finalized in June 2012.

The overall NDMP is a comprehensive plan, having a total investment cost of USD 1040.9 million (PKR 92.02 Bn with 1 USD = PKR 88.4), consisting of the "Main Plan" document along with three supporting volumes besides the Executive Summary, which identifies macro level hazards and risk assessment, development of the multi hazard early warning system to reduce the vulnerability to disasters by enhancing and strengthening the early warning capacity, identification of the roles and responsibilities of the stakeholders, including federal, provincial and district governments, community organizations, NGOs, businesses, and individuals who are involved in the disaster management. The Community Based Disaster Risk Management (CBDRM) approach, in view of its universal reorganization and importance in DRM planning, has been given due place in the Plan. Based on pilot activities tested in different hazard contexts and social settings, best practices and guidelines have been documented in the Plan to serve as models for future CBDRM activities in Pakistan. The Plan also provides strategic direction for systematic human resource development in the field of disaster management and the operational plan for the National Institute of Disaster Management (NIDM).

The components of NDMP published in one main document with three supporting volumes, besides the Executive Summary, are entitled:

- National Disaster Management Plan — Main Plan
- Human Resource Development Plan on Disaster Management — Vol. I
- Multi-Hazard Early Warning System Plan — Vol. II
- Instructors' Guidelines on Community Based Disaster Risk Management — Vol. III

Instructors' Guidelines on Community Based Disaster Risk Management (Volume III)

The CBDRM Guidelines consist of three parts. Part-I is the introduction, Part-II is the proposed methodology and Part-III consists of CBDRM activities, findings and lessons learnt.

PART I INTRODUCTION

1. Necessity of CBDRM

Great Hanshin Awaji Earthquake of 1995 was the first milestone, proving the effectiveness of community participation. Statistics show that 72% of the people were either self-evacuated or were rescued from the debris by their neighbors. This indicates the importance of community, and a community-based disaster management committee immediately after a disaster. The greater the devastation and vastness of the disaster impacts the less the chances are of public assistance. Secondly, the community participation and involvement has become a universal process. Under such circumstances, the necessity for Community Based Disaster Risk Management (CBDRM) is being stressed and recognized widely. In the JICA project the CBDRM approach has been applied in view of its universal reorganization and importance.

2. Objectives of CBDRM

The objectives of the Community Based Disaster Risk Management (CBDRM) activities are:

1) To establish a system for reflecting lessons learned from the CBDRM activities to the disaster risk management plans; and
2) To create best practices to be used as models for other CBDRM activities.

PART II Methodology

1. Unit of Community

In JICA Activities regarding CBDRM, the community is defined as a unit in which constituents can feel the sense of unity. The members of the community are community leaders, school principles, teachers, Imam of the mosque, leaders of CBOs, and residents of the community.

2. CBDRM Model

The community activities have taken the following three major steps.

1) Recognizing Disaster Risk

The first step is to recognize and have a clear image of the past and possible future disasters in the community and understand the external forces that create disasters. For this, visual materials are shown. Town watching and hazard mapping exercises can help understand hazards and risks in the community. The Disaster Imagination Game helps visualize the disasters and disaster situation clearly.

2) Examining Countermeasures

While imagining disaster situations, countermeasures are discussed and examined and a Community Based Disaster Risk Management Plan is prepared. Formulation of Community Based Disaster Risk Management Committees is planned and their roles and responsibilities are decided. Plans for training and drills are developed.

3) Actions

Disaster Risk Management Plans are implemented. A Disaster Risk Management Committee is established. Preparedness and mitigation activities are implemented. Awareness raising activities and drills are conducted. By conducting activities and drills, necessary improvements are identified. Then Disaster Risk Management Plans are revised accordingly. Figure 1 shows the CBDRM Model.

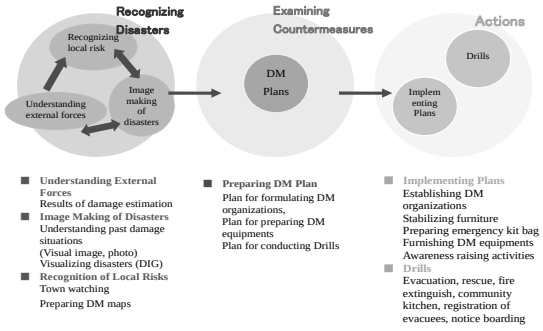

Figure 1 CBDRM Model

3. Planning Methodology

The process of developing CBDRM plans is shown in Figure 2. Pilot activities were conducted at five pilot community sites for five different disasters, namely, flood/flash floods, earthquakes, tsunamis, droughts, and cyclones. In these pilot communities, a series of activities were conducted, including vulnerability and capacity assessment, awareness raising activities, knowledge development, community based DRM plans, practical training, and drills. Community based DRM plans were prepared to link with local development plans. After the CBDRM activities, model plans for five disasters were prepared and good practices and lessons learnt were compiled. Finally, by including these experiences, a CBDRM plan in the National DRM plan was prepared.

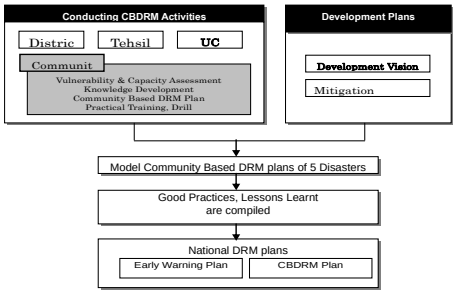

Figure 2 Planning Methodology

PART III CBDRM Activities and Lessons Learnt

1. Selected Communities

One community is selected for one target disaster. For some communities like in Rawalpindi, due to requests and necessity, a few more disasters were added. Five selected communities and their target disasters are summarized in Table 1.

Table 1 Five Selected Communities

#	Province	District	Thesile Township	Union Council	Community	Population	Target Disasters
1	Punjab	Rawalpindi	Rawalpindi	UC 45	Javed Colony	15,000	Flash Flood (Earthquake) (Fire)
2		Bhakkar	Mankera	Hyderabad 42	Dar Boola	5,000	Drought
3		Muzaffargarh	Alipur	Aliabad	Khangarh Doma	(2,000HH)	Flood
4	Sindh	Karachi City Urban Area	Saddar Town	Punjabi Club UC 3	Kharadar	616,151 (Saddar Town)	Earthquake (Tsunami)
5		Thatta	Keti Bandar	Keti Bandar	Keti Bandar	22,000	Cyclone (High Tide) (Tsunami)

2. Preparing Instructors' Guidelines

The activities start by conducting a Baseline Survey, which is the assessment of vulnerabilities and capacities of individuals and communities, followed by town watching, hazard and risk mapping, preparation of CBDRM plans, and drills. As common activities for five pilot sites, a Study, Visit and Forum were conducted separately. Details are given in Table 2.

Table 2 CBDRM Activities

Category	Activities
Selection	Preliminary Visit
	Dicussion with the Concerned
Baseline	Baseline Survey
Preparation	Strategic Meeting
	Preparation of CBDRM Guideline for Instructors
	Preparation of CBDRM Materials
	TOT
CBDRM Activities	Stakeholders' Meetings
	Disaster Awareness Raising Activities
	Town Watching
	Hazard Mapping
	CBDRM Plan
	Installing DRR Equippments
	Disastetr Scenario, Drill
End	End Survey
Common Activities	Study Visit and Forum
	Minuites of Agreement
Equippments	Installing DRR Equippments
Reports	Progress Reports, Final Report

3. Preparing Instructors' Guidelines

Before conducting the actual activities, the Draft CBDRM Instructors' Guidelines were prepared. Afterwards, ToT and the actual training sessions were conducted along with these guidelines. These guidelines have been improved incorporating field experiences and are expected to be utilized as a tool for conducting CBDRM activities in other areas of Pakistan. The characteristics of the guidelines include scientific knowledge of different disasters, past damage situations in Pakistan, and structural and non-structural countermeasures for each different disaster and highlight CBDRM planning by introducing the Disaster Imagination Game, known as DIG, as a planning tool.

4. Baseline and Post Completion Survey

In these CBDRM activities, baseline and post completion surveys were conducted to measure the effect of the activities. One of the examples is shown in Figure 3.

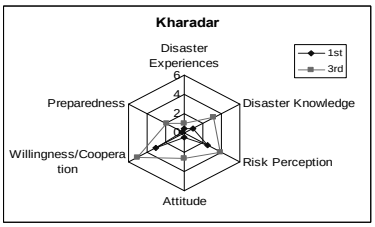

Figure 3 Baseline and Post Completion Survey Results

Characteristics of the findings are summarized below.

1) Increase in Risk Perception, Knowledge and Preparedness

After implementing CBDRM training, awareness about risk perception, preparedness and knowledge was observed. The greatest impact was found in Karachi compared to the other communities. The reason being that earlier, the risks of earthquakes were not widely disseminated to community people in Karachi.

2) Increase of Risk Perception in Urban Scenarios

Compared with the rural Areas of Bhakkar, Muzaffargarh, and Thatta, risk perception was initially quite low in the urban areas of Rawalpindi and Karachi. Now, an increase in risk perception can be observed more in the urban settings after conducting CBDRM activities.

3) Similarity among the Target Communities

There are similar tendencies in the radar charts. The risk perception and the willingness are higher than the disaster knowledge and preparedness.

5. Lessons Learnt

Key findings are listed below.

Participation

- Encouraging participation in the rural areas is not a problem, while in urban areas, it is extremely difficult.
- There should be various efforts from not only the public but also private entities to encourage the participation in urban areas. Exhibitions, seminars, workshops, symposiums and poster presentations on DRM can be organized as an attraction to increase participation in urban areas.
- Females participated very actively and took leadership of the Community Disaster Management Committee (CDMC).

Delivery of Activities

- Practical activities increase and retain the interest and attention of the participants.
- There was little scientific knowledge on disasters. Considering the low literacy rate, visual materials, visual demonstrations of experiments, town watching and mapping exercises can be used to draw the attention and interest of the participants.
- Both males and females in equal numbers participated in the drills on the last day and tested putting the knowledge gained into practice.

Mapping Exercise

- Risk and resource mapping increases the enthusiasm of participants and a large number of participants were involved.

Continuation of the DRM Activities

- Some intervention by public officials is necessary to ensure sustainability of DRM activities at the community level. To realize this, a budget for travel and technical support needs to be secured.

Intervention of Public Officials

- Discussions among public officials were effective and also gave local government officials a clear image of ground realities.
- The community and the Community Disaster Management Committee (CDMC) wish to have a permanent link with the implementing organizations, so a comprehensive community DRM plan for follow up would help retain the cohesion in the newly formed Committee and the level of collaboration between the government and local stakeholders. A budget for such activities needs to be secured at the district level.

Establishing a Mechanism for Incorporating Local Needs into Planning

- DRM plans were effectively discussed among the community and local government officials for implementation. However, establishment of a mechanism for incorporating village DRM needs into local government development plans it requires more time and effort.

Implementing Mitigation Measures

- Participants at the drought site in Bhakkar were keen to learn about drought and its

impacts and asked a lot of questions to the drought impact assessment expert. They were also interested in changing crop patterns and methods of cultivation.

The time frame and the cost for implementation of interventions, over the next ten years (2012-2022) under the overall NDMP (Main Plan to Vol.-III) have been shown in Table 3 (a) whereas Priority Actions/Programs under CBDRM (Vol.-III) including Cost are shown in Table 3. (b).

Table 3 (a) Priority Actions/Programs for the Next Ten Years (2012-2022)

Strategy	app. Cost (million USD)	Time Frame									
		Phase 1				Phase 2			Phase 3		
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
4.1 Intervention-1: Establish the Institutional and Legal System for Disaster Management											
1. Establish and function disaster management organizations at national, provincial and district levels.	2.0										
2. Formulate disaster management operation plans for relevant organizations.	0.2										
3. Implement periodic meetings among the disaster management organizations to monitor the situations.	0.1										
4. Implement drills and training of disaster management activities in the organizations to improve their capacities.	-										
4.2 Intervention-2: Prepare Disaster Management Plans at Various Levels											
1.Formulate and update disaster management plans at national, provincial, district and community or TMA levels.	1.0										
2.Develop hazard specific contingency plans.	1.0										
3.Develop sectoral disaster risk management operation in federal ministries, departments and authorities.	1.0										
4.3 Intervention-3: Establish national hazard and vulnerability assessment											
1.Conduct detailed multi–hazard vulnerability and risk analysis/assessments at national level	14.0										
2.Conduct detailed multi–hazard vulnerability and risk analysis/assessments at local level	5.0										
3.Conduct research and studies on impact of climate change on glaciers and ice cap	5.0										
4.4 Intervention-4: Establish multi-hazard early warning and evacuation systems											
1.Strengthen forecasting and early warning systems	168.5										
2.Prepare hazard maps at local scale in targeted locations	5.7										
3.Strengthen early warning dissemination systems	3.1										
4.Develop capacity of early warning and evacuation systems	11.2										
4.5 Intervention-5: Promotion of training, education and awareness in relation to disaster management											
1. Develop NIDM (National Institute of Disaster Management) to promote human resource development in the field of disaster management.	20.7										
2. Enhance the capacity of government agencies in charge of disaster management.	12.9										
3. Promote mainstreaming DRR through capacity enhancement of governmental officers.	2.6										
4. Develop the capacity of communities to cope with disasters.	26.2										
5. Raise people's awareness of disaster management.	1.9										
4.6 Intervention-6: Strengthen awareness program on disaster risk reduction at local level											
1. Enhance knowledge on disasters management in the general public	1.0										
2. Establish safe evacuation places in the case of disaster situation	10.0										
3. Implementi and disseminate CBDRM activities	1.0										
4. Disseminate self help and mutual help efforts in disaster management	1.0										
5. Establish disaster mitigation measures incorporated with existing development program	1.0										
4.7 Intervention7: Infrastructure development for disaster risk reduction											
1. develop schools, hospitals and other important public facilities with safe against disasters	100.0										
2. Protect imprtant coastal facilities against disasters taking into account climate change	21.0										
3. Enforce the building code in construction of buildings	10.0										
4. Implement appropriate structural measures in flood prone areas taking into account comprehensive and integrated flood management plans	565.6										
5. Enhance disaster risk management capacity in urban areas	11.0										
4.8 Intervention-8: Mainstreaming disaster risk reduction into development											
1. Establish disaster risk reduction policies in National Development Plan and National Poverty Reduction Strategy	-										
2. Set up sectoral guidelines on mainstreaming disaster risk reduction	1.0										
3. Establish criteria to assess development projects from a risk reduction perspective	0.2										
4. Improve technical capacity of federal and provincial governments to integrate risk reduction into development plans and programs	-										
4.9 Intervention-9: Establish national emergency response system											
1.Establish and strengthen warehouse or stockpiling system for storing food, medicine, relief supplies and rescue equipments.at strategic locations	10.0										
2.Enhance emergency response capacities, such as emergency operation centers, Civil Defence and urban search and rescue teams in major cities.	10.0										
3.Establish a robust communication system and efficient transport and logistics mechanism to be used during emergency situations.	6.0										
4.Develop and implement emergency response plans in relevant ministries and departments at federal, provincial and district levels	5.0										
5.Establish an National Disaster Management Fund to enable the federal government to organize emergency response effectively.	-										
4.10 Intervention-10: Capacity Development for Post Disaster Recovery											
1. Prepare guidelines for post disaster recovery programs and activities	1.0										
2. Develop capacity of stakeholders in post disaster recovery	3.0										
3. Develop system and methodology for recovery needs assessment	1.0										
Total Cost (million USD)	**1,040.90**										
Total Cost (billion PKR)	**92.02**										

1USD=88.4PKR

Table 3 (b) Priority Actions/Programs/Cost of CBDRM for the Next Ten Years (2012-2022)

Strategy	app. Cost (million USD)	Time Frame									
		Phase 1				Phase 2			Phase 3		
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
4.6 Intervention-6: Strengthen awareness program on disaster risk reduction at local level											
1. Enhance knowledge on disasters management in the general public	1.0										
2. Establish safe evacuation places in the case of disaster situation	10.0										
3. Implementi and disseminate CBDRM activities	1.0										
4. Disseminate self help and mutual help efforts in disaster management	1.0										
5. Establish disaster mitigation measures incorporated with existing development program	1.0										
Total Cost (million USD)	**14.00**										
Total Cost (billion PKR)	**1.24**										

1USD=88.4PKR

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LIST OF ABBREVIATIONS

ACCT.	Accountant
AJ & K	Azad Jammu and Kashmir
BHU	Basic Health Unit
CBDRM	Community Based Disaster Risk Management
CBDRMC	Community Based Disaster Risk Management Committee
CBOs	Community Based Organizations
CCB	Citizen Community Boards
CDMC	Community Disaster management Committee
CIDA	Canadian International Development Agency
CO	Community Organization
CRED	Centre for Research on Epideminology and Disasters
C.R.I	Control Room in Charge
CSOs	Civil Society Organizations
C.T.W.O	Computer, Telephone, Wireless Operator
DCO	District Coordination Officer
DDMA	District Disaster Management Authority
DDMU	District Disaster Management Unit*
DDO	Deputy District Officer
D.E.O	District Emergency Officer
DEOC	District Emergency Operation Centre
DG	Direction General
D.G. Khan	Dera Ghazi Khan
D.I. Khan	Dera Ismail Khan
DIG	Disaster Imagination Game
DMCs	Disaster Management Committees
DO	District Officer
D.R	Disaster Rescuer
DRAP-P	Drought Recovery Assistance Program Project
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EDO	Executive District Officer
EEC	Emergency Coordination Centre
EEFIT	Earthquake Engineering Field Investigation team
EMS	Emergency Medical Service
E.M.T	Emergency Medical Technician
EOC	Emergency Operations Centre
E.T	Electrician
FATA	Federally Administrated Tribal Areas
FFC	Federal Flood Commission
GRAP	Gender Reform Action Plan
INGOs	International Non-governmental Organizations
ISDR	International Strategy for Disaster Reduction
IWMI	International Water Management Institute
JICA	Japan International Cooperation Agency
KP	Khyber Pakhtunkhwa
LPP	Literature Panjab Program
LGO	Local Government Ordinance
LTST	Literacy through Skill Training
L.T.V	Light Transport Vehicle
MBT	Main Boundary Thrust
NCEG	National Centre of Excellence in Geology
NDMA	National Disaster Management Authority
NDMF	National Disaster Management Framework
NGDC	National Geophysical Date Centre
NGOs	Non-governmental Organizations
NLC	National Logistics Cell
NOAA	National Oceanic and Atmospheric Administration
NPO	Nonprofit Organization
PMD	Pakistan Meteorological Department
PRA	Participatory Rural Appraisal
PVC	Poly Vinyl Chloride
RDA	Rawalpindi Development Authority
RSMC	Regional Specialized Meteorological Centre
SAO	Senior Administrative Officer
S.C	Station Coordinator
S.I	Shift in Charge
SLBAP	Sustainable Livelihood in Barani Areas Project
SOP	Standard Operating Procedure
S.S.K	Senior Stock Keeper
SUPARCO	Space and Upper Atmospheric Research Corporation
TDMC	Town Disaster Management Committee
TMA	Tehsil Municipal Administration
T.M.I	Transport Maintenance Inspector
TMO	Tehsil Municipal Officer
TO	Town Officer
TOT	Training of Trainers
TRDP	Thardeep Rural Development Program
T.T	Tube well Technician
UC	Union Council
UN	United Nations
UNDP	United Nations Development Program
UNDRM	United Nations Disaster Risk Management
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNHCR	United Nations High Commission for Refugees
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
USGS	United States Geological Survey
UTC	Universal Time Coordinated
VCA	Vulnerability and Capacity Assessment
WAPDA	Water and Power Development Authority
WASA	Water and Sanitation Agency
WB	World Bank
WFP	World Food Program
WHO	World Health Organization
W.T	Wireless Technician

* In case of KP, 'DDMA' may be read as 'DDMU'.

LIST OF BASIC TERMS

Acceptable risk
The level of loss a society or community considers it can live with and for which it does not need to invest in mitigation

Biological hazard
Biological vectors, micro-organisms, toxins and bioactive substances, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Capacity
A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster.
Capacity may include physical, institutional, social or economic means as well as skilled personnel or collective attributes such as leadership and management. Capacity may also be described as capability.

Capacity building
Efforts aimed to develop human skills or societal infrastructure within a community or organization needed to reduce the level of risk. In extended understanding, capacity building also includes development of institutional, financial, political and other resources, at different levels of the society.

Climate change
The climate of a place or region is changed if over an extended period (typically decades or longer) there is a statistically significant change in measurements of either the mean temperature or variability of the climate for that region.

Coping capacity
The means by which people or organizations use available resources and abilities to face a disaster. In general, this involves managing resources, both in normal times as well as during crises or adverse conditions.

Disaster
A serious disruption of the functioning of a community or society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources. It results from the combination of hazards, conditions of vulnerability and insufficient capacity to reduce the potential negative consequences of risk.

Disaster risk management (DRM)
The comprehensive approach to reduce the adverse impacts of a disaster. DRM encompasses all actions taken before, during, and after the disasters. It includes activities on mitigation, preparedness, emergency response, recovery, rehabilitation, and reconstruction.

Disaster risk reduction/disaster reduction
The measures aimed to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

Early warning
The provision of timely and effective information, through identified institutions, to communities and individuals so that they could take action to reduce their risks and prepare for effective response.

Emergency management
The management and deployment of resources for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation

Forecast
Estimate of the occurrence of a future event (UNESCO, WMO). The term is used with different meanings in different disciplines.

Geological hazard
Natural earth processes that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. For example earthquakes, tsunamis, volcanic activity and emissions, landslides, rockslides, rock falls or avalanches, surface collapses, expansive soils and debris or mudflows.

Hazard
potentially damaging physical event or phenomenon that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Hazards can include natural (geological, hydro meteorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity, frequency and probability.

Hazard analysis
Identification, studies and monitoring of any hazard to determine its potential, origin, characteristics and behavior.

Land-Use planning
Branch of physical and socio-economic planning that determines the means and assesses the values or limitations of various options in which land is to be utilized, with the corresponding effects on different segments of the population or interests of a community taken into account in resulting decisions. Land-use planning can help to mitigate disasters and reduce risks by discouraging high-density settlements and construction of key installations in hazard-prone areas, control of population density and expansion

Mitigation
Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.

Natural hazards
Natural processes or phenomena occurring on the earth that may constitute a damaging event. Natural hazards can be classified by origin namely: geological, hydro meteorological or biological. Hazardous events can vary in magnitude or intensity, frequency, duration, area of extent, speed of onset, spatial dispersion and temporal spacing.

Preparedness
Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.

Prevention
Activities to ensure complete avoidance of the adverse impact of hazards.

Public awareness
The processes of informing the general population, increasing levels of consciousness about risks and how people can reduce their exposure to hazards. This is particularly important for public officials in fulfilling their responsibilities to save lives and property in the event of a disaster.

Recovery
Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.

Relief / response
The provision of assistance during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term, or protracted duration.

Resilience / resilient
The capacity of a community, society or organization potentially exposed to hazards to adapt, by resisting or changing in order to maintain an acceptable level of functioning. Resilience can be increased by learning from past disasters for better future protection and to improve risk reduction measures.

Retrofitting (or upgrading)
Reinforcement of existing buildings and structures to become more resistant and resilient to the forces of natural hazards.

Risk
The chances of losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between hazards and vulnerable social conditions. Risk is expressed as Risk = Hazards x Vulnerability. Some experts also include the concept of exposure to refer to the physical aspects of vulnerability.

Risk assessment/analysis
A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing vulnerability that could pose a potential threat to people, property, livelihoods and the environment.

Structural/non-structural measures
Structural measures refer to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure.

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

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

Technological hazards
Danger originating from technological or industrial accidents, infrastructure failures or certain human activities, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Some examples: industrial pollution, nuclear activities and radioactivity, toxic wastes, dam failures; transport, explosions, fires, spills.

Vulnerability
The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community or society to the impact of hazards.

Wildland fire
Any fire occurring in vegetation areas regardless of ignition sources, damages or benefits.

Introduction

Target Audience

This instructors' guidelines are designed for instructors and facilitators who work with the communities to raise awareness and build capacities in disaster risk management. The facilitators are expected to be community workers of Civil Society Organizations (CSOs), Community Based Organizations (CBOs), disaster managers and district experts, such as officials of the Fata Disaster Management Authority / Gilgit Baltistan Disaster Management Authority / State Disaster Management Authority-Azad Jammu Kashmir / Provincial Disaster Management Authorities, (F/G/S/C/PDMAs), District Disaster Management Authorities (DDMAs), Rescue 1122, and Civil Defence.

The approach of the Community Based Disaster Risk Management (CBDRM) activities is participatory, and these guidelines are written based on the participatory approach being prerequisite; thus, the facilitators are expected to have basic knowledge on the participatory approach.

How to Use the Instructor's Guidelines

These guidelines consist of eight modules in the sequence of conducting CBDRM activities. In each module, basic information on the topics and some worksheets are provided to make conducting each workshop easier.

The guidelines are expected to make it possible for the community to be able to conduct the following 4 key items.

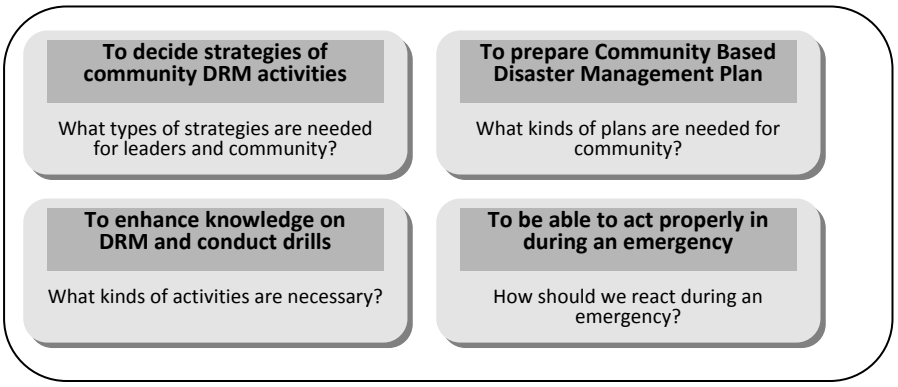


Figure 0.1 How to Use the Guidelines

Structure of these Guidelines

These guidelines consist of 8 modules, as is shown in the following figure.

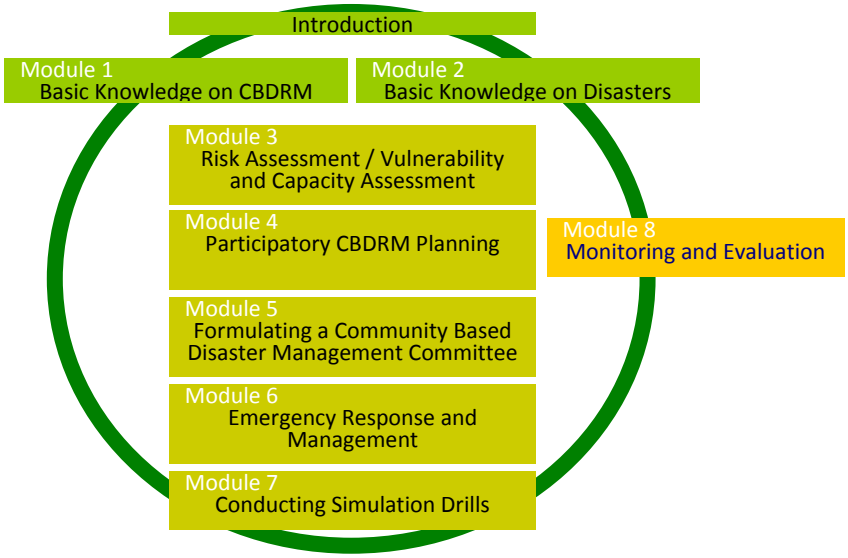


Figure 0.2 Structure of the Guideline

Target Disasters

Target disasters for the CBDRM activities in these guidelines are 1) floods, 2) flash floods, 3) earthquakes, 4) droughts and 5) cyclones.

Target Unit for CBDRM

In Pakistan, public organizations are taking leading roles regarding public administration. The general public expects public authorities to take greater responsibilities. Disaster Risk Management (DRM) is not an exception, though the history of disaster risk management organizations is relatively new and institutional arrangements at local government levels have just been set up and started to function gradually. Until recently, the DRM approach has focused more on emergency response and recovery, but is becoming more proactive and the focus is shifting to preparedness and mitigation. Along this trend, CBDRM is also highlighted and being put into practice.

The government initiatives are more focused on conducting CBDRM through public institutions, Union Councils (UC), as a unit of CBDRM. There are more than 6300 UCs in Pakistan and the CBDRM activities need to be conducted for UC on one hand, but smaller units under UCs for CBDRM activities are also needed on the other hand. In the JICA project, the target unit was these smaller units in autonomous communities under the UCs with “community” being defined as a unit in which constituents can feel a sense of unity.

Pilot Activities for Augmentation

The pilot activities are conducted to augment the CBDRM activities in other areas. As augmentation tools, these instructor's guidelines and materials for CBDRM activities have been developed. To ensure augmentation, human resources, finances, and institutions are important aspects. Through conducting pilot activities in different contexts and settings, lessons learnt are reflected and realistic and sustainable human resources, budgetary sources, and institutional arrangements to conduct CBDRM are identified to delineate CBDRM as part of the National Disaster Management Plan.

How the Guidelines are Developed

These guidelines are a product of CBDRM activities in 5 pilot communities in Pakistan as one of the components in "The Project for National Disaster Management Plan in the Islamic Republic of Pakistan," funded by the Japan International Cooperation Agency. The pilot sites and their target disasters are summarized in the following table.

The draft instructors' guidelines were prepared for the facilitators of the activities and upon completion of the field works, the feedback was reflected and the draft guidelines were revised.

Table 0.1 Pilot Community and Target Disasters

#	Province	District	Thesile Township	Union Council	Community	Population	Target Disasters
1	Punjab	Rawalpindi	Rawalpindi	UC 45	Javed Colony	15,000	Flash Flood (Earthquake) (Fire)
2		Bhakkar	Mankera	Hyderabad 42	Dar Boola	5,000	Drought
3		Muzaffargarh	Alipur	Aliabad	Khangarh Doma	(2,000HH)	Flood
4	Sindh	Karachi City Urban Area	Saddar Town	Punjabi Club UC 3	Kharadar	616,151 (Saddar Town)	Earthquake (Tsunami)
5		Thatta	Keti Bandar	Keti Bandar	Keti Bandar	22,000	Cyclone (High Tide) (Tsunami)

Conducted CBDRM Activities

To develop these instructors' guidelines, CBDRM activities were conducted from October 2010 to July 2011. The activities and the schedule of each activity are summarized in the following table.

Table 0.2 Schedule of CBDRM Activities

#	Agenda	Theme	2010			2011												2012	
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb
(1)	Selection	Preliminary Visit																	
(2)		Dicussion with the Concerned																	
(3)	Baseline	Baseline Survey																	
(4)	Preparation	Strategic Meeting															Revising		
(5)		Preparation of CBDRM Guideline for Instructors												Revision	Receiving Comments			Printing	
(6)		Preparation of CBDRM Materials																	
(7)		TOT																	
(8)	CBDRM Activities	Stakeholders' meetings																	
(9)		Disaster Awareness Raising Activities																	
(10)		Town Watching																	
(11)		Hazard Mapping	Basemap				Compiling Data												
(12)		CBDRM Plan																	
(13)		Installing DRR Equippments						1 site											
(14)		Disastetr Scenario, Drill																	
(15)	End	End Survey																	
(16)	Common Activities	Study Visit and Forum									SV	Forum							
(17)		Minutes of Agreement																	
(18)	Reports	Progress Reports, Final Report			24 Dec		10 Feb		15 May		30 June								

Lessons Learnt

Key findings on lessons learnt through conducting CBDRM are summarized below by categories.

Participation

- There should be various efforts from public and private sectors to encourage participation in urban areas. At present, UC Nazim is not functioning fully, and relying only on public channels is not adequate.
- Encouraging participation in rural areas is not a problem, while in urban areas it is very difficult to motivate the residents to participate. There was a suggestion to remunerate the participants, but in our project, we do not want to pay in the urban areas. Based on the contact information of the individuals who have answered the baseline survey, we contacted them to encourage participation, but it did little help to increase the participation in the urban areas.
- Since the community resides in an urban setting and most of the people remain busy with their day to day affairs, advocacy for such a community needs to be more aggressive, and implemented well beforehand. Exhibitions and poster presentations on DRM can be organized as a starter of the CBDRM activities in urban areas to increase participation.
- Female participants participated very actively and took their share of leadership by becoming leaders of the CDMC. This shows that women could be mobilized to take leadership roles related to their affairs in terms of Disaster Management.

- The women of village Dar Boola of Bhakkar were encouraged to speak in class and they did. It was one of the achievements because they participated in such training for the first time.
- Women took more interest in working in female groups.

Delivery of Activities

- Practical activities increase and retain the interest and attention of the participants.
- There was little knowledge on scientific aspects of disasters. Considering the low literacy rate, visual materials such as videos and visual demonstrations of experiments draw attention and interests of the participants.
- For some participants, theory was not very interesting. The method of delivery needs to be interesting and unique, which requires more interaction.
- Schedule of sessions has to be flexible and as per the actual ground conditions.
- Town Watching and Mapping exercises draw attention, but more facilitators are needed to monitor the work of each group.
- Since the contents of the session were designed to tailor to the needs of the community, it was appreciated by the participants throughout.
- Lecture based sessions using white boards and writing on the board were appreciated by participants.
- The successful mob drill on the last day with both males and females participating in equal numbers stands as towering evidence that the community had learned from the workshop.

Mapping Exercise

- Risk and resource mapping increases enthusiasm of participants
- A large number of participants were involved in the risk and resource mapping group activity.

Continuation of the DRM Activities

- Evacuation drills, Information Distribution Drills and other DRM activities should be carried out within the community to maintain the level of sensitization. Some intervention by public officials is necessary to monitor their activities. To realize this, a budget for travel and technical support needs to be secured.

Intervention of Public Officials

- Participation of local government officials adds to the credits of the program
- Discussions among public officials were effective and gave local government officials a clear image of actual ground conditions.

- The community and the Community Disaster Management Committee (CDMC) wish to have a permanent link with the implementing organizations of this project, so a comprehensive plan for follow up would help retain the cohesion in the newly formed committee and the level of interaction between the government and local stakeholders.
- The action plan formulated during this workshop needs serious attention and a full-fledged mechanism of follow up to ensure that the activities go smoothly by the concerned organizations identified therein.
- Government departments should come up with mechanisms/strategies that keep the committee involved in activities on similar subjects.
- The link between the government and the CDMC, which until now has been in the papers communicated with the responding agencies, should be strengthened through programs/activities of mutual interest. The budget for such activities needs to be secured at the district level.
- DRM Plan should be considered seriously by the government officials to ensure structural and non-structural mitigation measures for the community.

Establishing Mechanism of Incorporating Local Needs into Planning

- DRM plans were effectively discussed among community and local government officials to move ahead for implementation. However, establishing a mechanism of incorporating village DRM needs into local government development plans needs more time and effort. Establishment of community DRM needs into DRM plans in the local governments has materialized to an extent.

Implementing Mitigation Measures

- Participants are willing to implement mitigation methods at micro levels.
- Participants in the drought site of Bhakkar are keen to learn about droughts and ask a lot of questions to the drought expert. They are also interested in changing crop patterns and methods of cultivation instructed by the expert, though we were initially worried that the farmers might want to continue their conventional methods of agriculture.

Model Schedule of Training

The CBDRM activities were conducted for 5-7 days consecutively. The methodologies of the activities were a combination of presentations, brainstorming, group discussions and works, map preparation, participatory planning, practical exercises, simulations, games, etc.

The model training program is summarized in the following table.

Table 0.3 Model Training Schedule

S.#	TASK	CONTENT	SUB CONTENT	TIMING/mins	TIMING/hrs
1	**Basic Knowledge on DRM**	Introduction		15	
		Sharing Baseline Survey	Facts & Figures	15	
		Introduction of DRM	Terminologies, DRM cycle	40	
		Scientific Knowledge on Target disaster (PPT,Video	Earthquake,Flood,Cyclone& Heavy rain, Tsunami,Drought	45	
		Formulation of DRM committee	Introduction of Community based Disaster Management Committee (CDMC), Role & Responsibilities, Involvement of stakeholders	45	2 hr40 mins
2	**Vulnerability and Capacity Assessment**	Introduction of vulnerability	Explaining examples	20	
		Vulnerability	Preparing matrices	40	
		Capacity	Preparing matrices	40	1 hr 40 mins
3	**Town Watching**	Introduction risks and resources in the community	give idea to community regarding resources & risk of area	20	
		Breifing on Town watching and Grouping	Briefing on task	20	
		Town Watching	Field Group activity	60	1 hr40 mins
4	**Mapping**	Inputting information in a map	Group Work input information of their given area	90	
		Preparation of Map	Community area final map with all given information	30	1 hr 20 mins
5	**CBDRM Planning**	Disaster Imagination Game	Group Activity with given scenario using material	120	
		Preparation of Community DRM plans	Early warning, Pre-, during, post- DRM, Information, Evacuation route, Safe Heaven, Resources, Land & Infrastructure plan, Stock management, etc	60	3 hrs
6	**Practical Training of CBDRM**	Search and Rescue	Basic Search and Rescue	15	
		Theory & Practical	Victim Evacuation Technique	45	
			Rope Management	120	
		First Aid	Basic First Aid	10	
		Theory & Practical	wounds & Bleeding	10	
			Bandages	40	
			Spinal Injury	30	
		Fire Fighting	Fire Safety	15	
		Theory & Practical	Fire Response	75	
		Camp Management	Camp Safety	20	
			Camp Data	20	
			Camp Committee	20	6 hrs 20 min
7	**Drill (Expect Drought)**	Preparation	Briefing on task	30	
			Task Distribution	60	
		Action	Demonstration	90	3 hrs
				1160	19 hrs 40 mins

Module 1 Basic Knowledge on CBDRM

Basic Terminology on Risk Management

Some of the key basic terminologies on disaster management are listed as basic knowledge by referring to NDMA, IFRC and UNISDR.

Disaster Management is defined as ***A collective term of all disaster related activities***

Disaster Management is a collective term encompassing all aspects of planning for and responding to disasters. It refers to the management of both the risks and consequences of disasters.

Disaster Risk Management is defined as ***A systematic process of using resources to manage the risk of disasters.***

The comprehensive approach to reduce the adverse impacts of a disaster. DRM encompasses all actions taken before, during, and after the disasters. It includes activities on mitigation, preparedness, emergency response, recovery, rehabilitation, and reconstruction.

Disaster Risk Reduction is defined as ***A conceptual framework to reduce vulnerabilities in the context of sustainable development.***

The conceptual framework to: minimize vulnerabilities and disaster risks throughout a society; to avoid or limit the adverse impacts of hazards; done within the broad context of sustainable development.

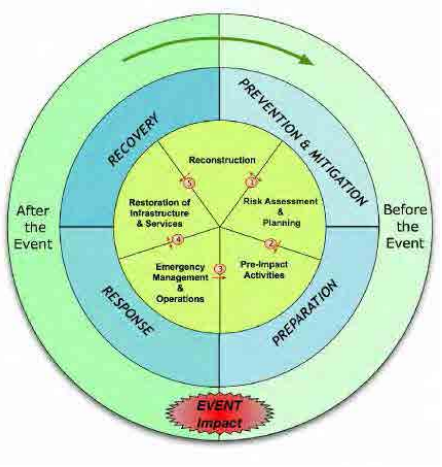
Mitigation is defined as ***The lessening or minimizing of the adverse impacts of hazards and related disasters.***

Preparedness is defined as ***Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.***

Disaster Management Cycle is defined as ***A cycle with phases that reduce or prevent disasters***

Disaster management is a cyclical process; the end of one phase is the beginning of another (see figure below), although one phase of the cycle does not necessarily have to be completed in order for the next to take place. Often several phases are taking place concurrently. Timely decision-making during each phase results in greater preparedness, better warnings, reduced vulnerability and/or the prevention of future disasters. The complete disaster management cycle includes the shaping of public policies and plans that either addresses the causes of disasters or mitigates their effects on people, property, and infrastructure. The mitigation and preparedness phases occur as improvements are made in anticipation of an event. By embracing development, a community's ability to mitigate against and prepare for a disaster is improved.

As the event unfolds, disaster managers become involved in the immediate response and long-term recovery phases.



Source: Atkinson et al, 2006

Figure 1.1 Disaster Management Cycle

Necessity of CBDRM

Mainstreaming disaster risk reduction into local development process and community participation has been emphasized lately. The Great Hanshin Awaji Earthquake of 1995 was the first milestone, proving the effectiveness of community participation. Statistics show that 72% of the people were either self-evacuated or were rescued from the debris by their neighbors. This indicates the importance of community, and community-based disaster management committees immediately after a disaster. The greater the devastation and vastness of disaster impacts is, the less chance there will be of outreach by public assistance. Secondly, community participation and involvement has become a universal process. Under such circumstances, the necessity of Community Based Disaster Risk Management (CBDRM) has been stressed and recognized widely. In the JICA project, we have applied the CBDRM approach as we recognize the importance and necessity of CBDRM.

Basic Philosophy of CBDRM

CBDRM activities need to be conducted by not only public authorities (Public Help), but also by each individual (Self Help), constituents of the community (Mutual Help) and joint efforts of these three actors. To protect lives and property, awareness raising of each individual, creating appropriate risk perception, promoting preparedness at home and in the community and enhancing resilience as communities are necessary.

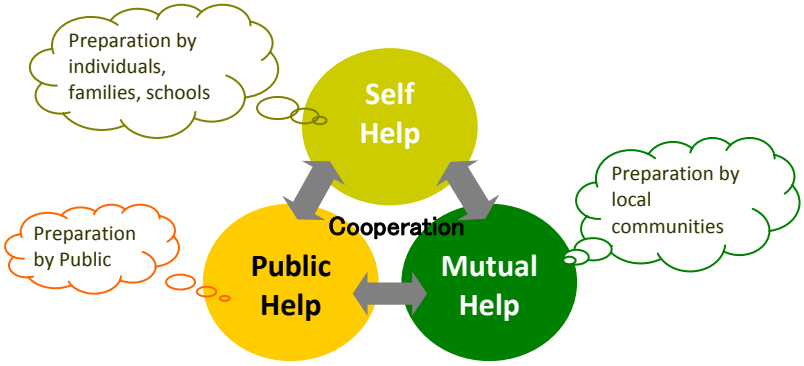


Figure 1.2 Three Actors of Disaster Management

What is CBDRM?

The most quoted definition of CBDRM is "Community-based disaster risk management. CBDRM is a process in which at-risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities. This means that people are at the heart of decision-making and implementation of disaster risk management activities. The involvement of the most vulnerable social groups is considered as paramount in this process, while the support of the least vulnerable groups is necessary for successful implementation." (Abarquez and Murshed, 2004)

Aim of CBDRM

CBDRM aims at involving the community in the disaster risk management process to 1) reduce vulnerability; 2) increase/strengthen community capacity to prepare for and respond to disasters; and 3) undertake sustainable development and poverty reduction.

Principles of CBDRM

Key principles for conducting CBDRM are listed below.

- People's participation is a must
- Priority is given to the most vulnerable people
- Interventions are based on Vulnerability and Capacity Assessment (VCA)
- Different perceptions of risk are recognized
- Risk reduction measures are community specific
- CBDRM activities are managed/operated/sustained by the communities themselves.

Community Unit

In these guidelines, community is defined as a unit in which constituents can feel a sense of unity. Thus, it is a much smaller unit than a Union Council. The members of the community are community leaders, school principals, teachers, Imam of the mosques, leaders of CBOs, and residents of the community.

Actors of CBDRM

Actors of the CBDRM are at first hand, community constituents, the Union Council, Tehsil, Township, and District.

However, CBDRM requires a high level of coordination and cooperation and it is important to develop relationships between the communities and the government national disaster management authorities focusing on disaster risk reduction to instill sustainability measures for continued activity support.

Target Groups

Target groups for CBDRM activities include a diverse group of people: representatives of residents, mosque leaders, school teachers and representatives of CBOs, NGOs, and volunteer groups in the localities. The workshops should be held jointly for them all.

Process of CBDRM

To develop these instructors' guidelines, CBDRM activities were conducted from October 2010 to July 2011. The activities and the schedule of each activity are summarized in the following table.

Step 1 Identifying Participants

Identifying appropriate participants is vital for understanding the social and institutional context. From the beginning, it is important to consider who will be affected, who can influence others, which individuals, groups, and organizations need to be involved, and how and whose capacities should be enhanced. At the first meeting, clarifying whose plan it will be and setting the planning goals can be discussed. Stakeholders of the planning exercise include community leaders, health and medical representatives, social workers, health workers, schools, mosques, community-based organizations, local private enterprises, officials from the district, tehsils, union councils etc. The following questions are useful to draw a preliminary road map for guidance.

- Who can contribute financial and technical resources?
- Whose behavior will be influential for the effort to succeed?
- Who is responsible for overall direction and intent?
- Who can mobilize support or opposition for/against what is intended?
- Who are the voiceless?

Step 2 Establishing Planning Committee

A planning committee consisting of core members is a practical way to begin formulating community plans. This committee will act as the secretariat of planning activities and its roles will be identified. Be sure that representatives from the community and key persons from local organizations are involved.

Step 3 Mapping Out Stakeholders' Commitment

Once the participants are identified, it is useful to categorize the degree of participation and roles and responsibilities for the entire planning effort. Each individual and institution needs to be committed to the planning process and if they cannot attend a meeting or workshop, alternative persons should be identified and the process needs to be handed over.

Step 4 Needs Analysis

To know the local stakeholders' needs is an essential factor. To prepare for disasters requires not only disaster risk management, but also attaining overall development. For sustainable development, local needs and priorities should be researched and analyzed. Development needs, problem identification, constraints and driving forces for each problem need to be identified.

Step 5 Disseminating Damage Estimation (if any)

Identification of the possible local hazards and the possible effects from them on each and every community is essential. This process provides the basis for risk management planning. This enables local people to set planning objectives and identify problems in planning. In this step, this information is disseminated at a meeting or workshop with the participation and explanation ideally given by an expert from a relevant organization.

Step 6 Identifying Vulnerability and Capacity

Vulnerability and Capacity Assessment (VCA) is the starting point of disaster risk management. It is important to know weaknesses and strengths to overcome disasters. VCA aims to identify, analyze and evaluate disaster response capacities, for not only physical resources but also social, attitudinal, and organizational aspects. It involves the community's participation to analyze their own capacities, which will encourage the community to build a sense of ownership.

In the participatory risk assessment, various survey methods such as semi-structured interviews, focus group discussions, and tools for Participatory Rural Appraisal such as maps, seasonal calendars, historical profiles, institutional and social network analysis, and problem trees can be employed.

Vulnerability and capacity assessment is a good opportunity to develop local skills and capacity. Involve community people in this survey to understand their own situation, and get community participants involved in assessing the results. It is important for them to realize their own capacities and vulnerabilities. This self-evaluation process is essential to create motivation to reduce local vulnerability.

Step 7 Locating the Vulnerabilities and Capacities

After identifying the vulnerabilities and capacities, locating them on a map will help participants to visualize local situations more clearly. The location of the vulnerability and capacity will make it easier to discuss how to manage the disaster situation and make a plan for it. To accomplish this, "Town Watching" and "Risk and Resource Mapping" are two useful tools.

Step 8 Setting Planning Objectives

After gathering all the necessary information about hazards, vulnerabilities, and capacities, the areas for special attention and support will become clear. Setting planning objectives is recommended in the earlier stage of the planning session. If it is difficult to agree on certain objectives, a practical approach is setting provisional objectives and in the course of the planning process they can be revised and finalized upon the consensus of each stakeholder.

Step 9 Allocation of Responsibilities

Responsibilities for each task will be decided. Functions of control, command and coordination will be crosschecked to avoid overlap between teams / task forces and other actors.

Step 10 Documenting the Plan

After the plan has been developed, putting it in the document is the most important process. A common format can be developed within the same district. The statement should be simple and clear. Organizational charts, lists of equipment, and risk and resource maps can be attached. Even though the initial plan seems perfect at the time, it can be developed further through the regular drills. Steps 8-10 can be done through use of a Disaster Imagination Game as a tool.

Step 11 Testing and Reviewing the Plan

After completion of the plan, exercises are important to ensure that the plans are effective and workable. In this exercise it is essential to involve, not only community people but also planners and members of disaster response organizations. These opportunities will enable the testing of each disaster response agency's abilities and cooperation with each other. Moreover, testing the plan can identify any gray zones where more than two agencies are involved. Exercises can suggest the boundaries of tasks.

One cost effective exercise is a Table Top map maneuver, which can be conducted indoors employing a precisely planned scenario. The other option is an on-site exercise, which provides communities with first hand practical experience. On-site drills have two types: one is the training exercise and the other is a scenario-type drill. The training exercise is a basic thematic training on tasks such as search and rescue, first aid, fire extinguishing, and information management. Teams / Task force teams will be organized and the exercise will be based on a plan.

The scenario-type drill is an advanced practice. In this exercise, only the controllers will know the scenario, and the rest of the people (called players) will react to the scenario provided by the controllers. Drawings of fires, road blockages, fallen trees, and dolls will be prepared. This training will be conducted

in the community and include simulated fire and road blockage; human casualties will be set in the real community. Players need to search for fire extinguishers and first aid kits to identify the places where they are located. The process can be video taped and a debriefing session should be organized to share suggestions and opinions to improve the plan. Finally the plan should be revised. It is important to make and keep a schedule for reviewing and updating the plan. Regular exercises should be conducted to update the plan and to provide the community members with an opportunity to practice the proper response to the disaster, ensuring that they know how to protect themselves and assist their neighbors.

Module 2 Basic Knowledge regarding Disasters

In this module, scientific knowledge such as generating mechanism of the disasters, historical damage, and both structural and non-structural measures are described in this module. The indigenous knowledge of the localities needs to be introduced in the knowledge session, such as symptoms and reaching time of disasters, and cost effective measures.

Earthquake

An earthquake is a sudden movement of the Earth, caused by the abrupt release of strain that has accumulated over a long time.

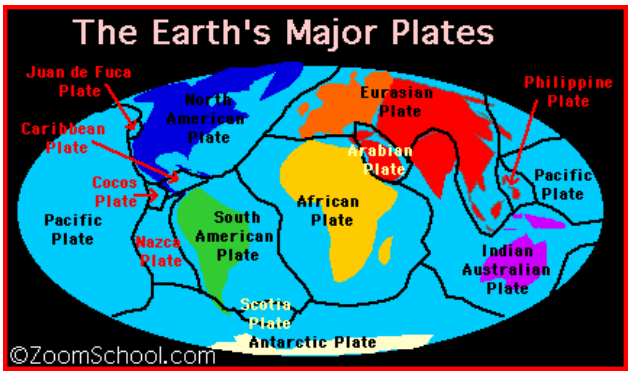
At the Earth's surface, earthquakes manifest themselves by shaking and sometimes displacing the ground. When the accumulated energy grows strong enough, the plates break free. If the earthquake occurs in a populated area, it may cause many deaths and injuries and extensive property damage.

Source: http://www.flickr.com/photos/imran_nissar/

Figure 2.1 Damages of Pakistan Earthquake 2005

Causes

For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface slowly and move over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. The boundaries of plates are called “faults”. The sudden slip at the fault causes the earthquake — a violent shaking of the Earth when large elastic strain energy is released and spreads out through seismic waves that travel through the body and along the surface of the Earth.



Source: Tsunami Glossary - EnchantedLearning_com.mht

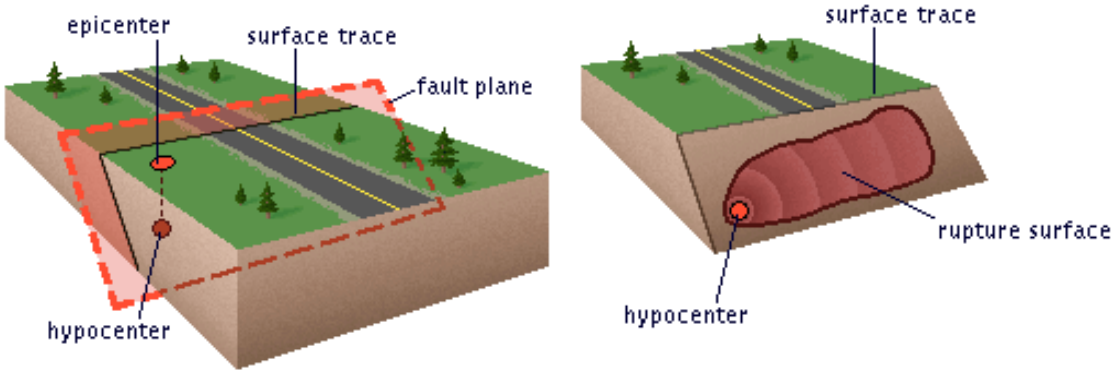
Figure 2.2 Major Plates

Aftershocks

Aftershocks are small earthquakes that occur after a large earthquake.

Epicentre

The epicentre is the point on the Earth's surface directly above the place that an earthquake occurred.



Source:http://earthquake.usgs.gov/learn/kids/eqscience.php

Figure 2.3 Epicentre and Hypocentre

Magnitude / Richter Scale

The intensity of an earthquake is described by a number on the Richter scale, called the magnitude. The magnitude of an earthquake is calculated from the logarithm of the amplitude of the waves as recorded by seismographs. A magnitude 2.0 or less earthquake is called a micro-earthquake and is not felt by people. A magnitude 4.5 or more earthquake can be measured by seismographs all over the world. Tsunamis can be caused by undersea earthquakes of magnitude 7.5 or greater. When scientists refer to a "great" earthquake, they mean it was huge. Informally, earthquakes are classified according to their magnitude size:

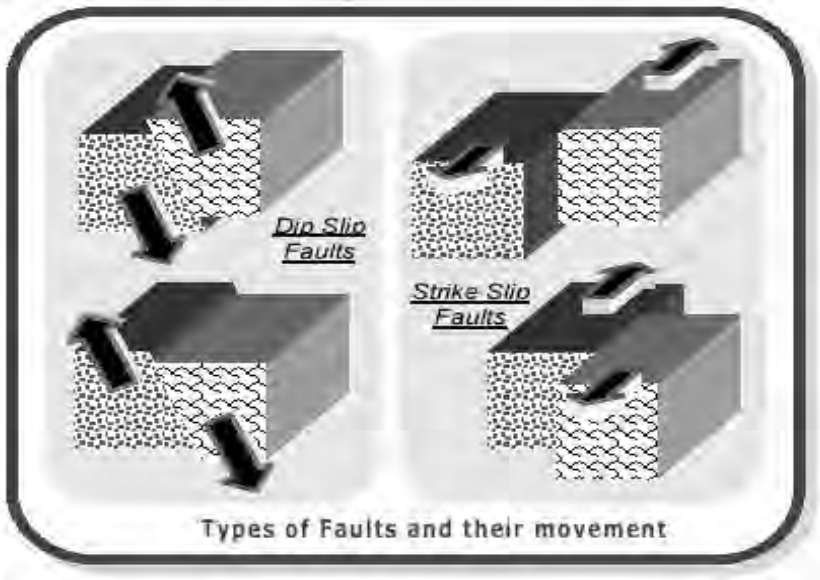
- Under 5: Small
- 5 – 6: Moderate
- 6 – 7: Large
- 7 – 7.8: Major

- 7.8 or above: Great

What is a Fault?

The crust of the Earth is broken into plates. The plates are enormous chunks of rock that float atop the soft mantle. The plates are moving at a speed that has been estimated at 1 to 10 cm per year. Oceanic plates (those that are under the ocean) are thinner and denser than continental plates.

Earthquakes occur on faults. A fault is a thin zone of crushed rock between two blocks of rock, and can be any length, from centimeters to thousands of kilometers. When an earthquake occurs on one of these faults, the rock on one side of the fault slips with respect to the other. The fault surface can be vertical, horizontal, or at some angle to the surface of the earth. The slip direction can also be at any angle. We classify these into two basic cases: strike slip and dip-slip motion.



Picture Source: http://earthquake.usgs.gov/learn/kids/eqscience.php

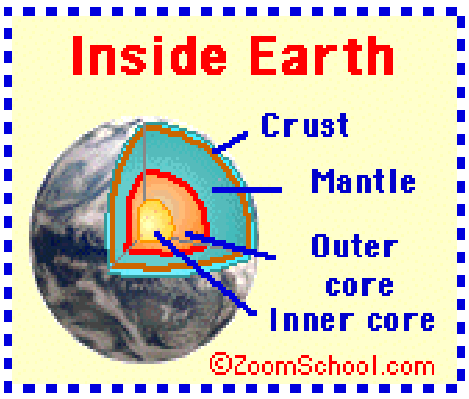
Figure 2.4 Types of Faults

Tectonic Plates

Plate tectonics is the now-established theory that chunks of the Earth's crust (plates) float on the surface and change both position and size over time. The Earth's crust is its outermost, rocky layer.

Plate Movements

The plates are moving at a speed that has been estimated at 1 to 10 cm per year. Oceanic plates (those that are under the ocean) are thinner, younger, and denser than continental plates. These underwater plates are about 75 kilometers thick and are made of basalt rock. They are relatively young since plate formation (seafloor spreading) occurs at the margins of oceanic plates



Picture Source: Earth's Continental Plates - ZoomSchool_com.mht

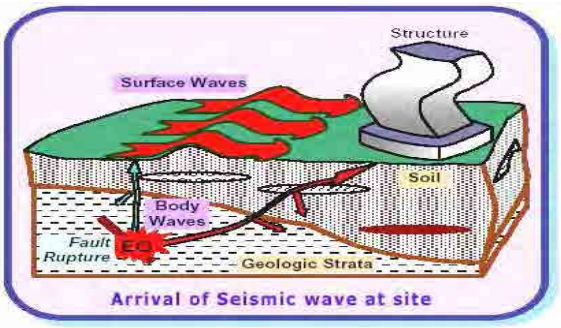
Figure 2.5 Inner Structure of the Earth

Picture Source: U.S. Geological Survey (USGS) Website

Figure 2.6 Plate Movements

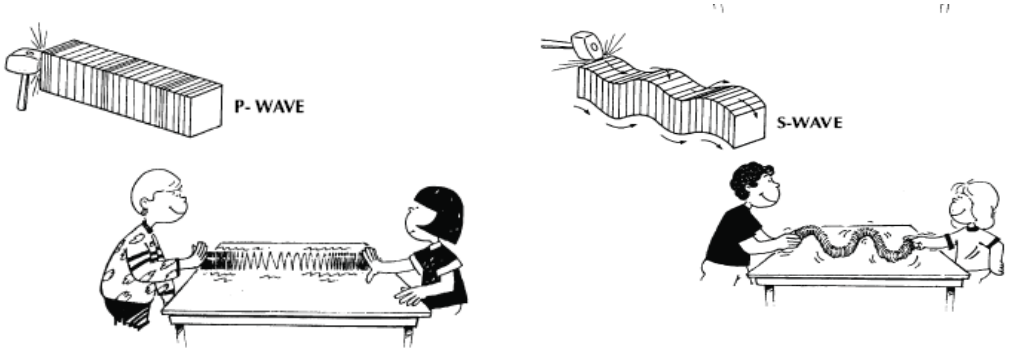
How the Ground Shakes? Seismic Waves

The large strain energy released during an earthquake travels as seismic waves in all directions through the Earth's layers, reflecting and refracting at each interface. These waves are of two types - body waves and surface waves; the latter are restricted to near the Earth's surface. Body waves consist of Primary Waves (P-waves) and Secondary Waves (S-waves), and surface waves consist of Love waves and Rayleigh waves.



Source: http://earthquakw.usgs.gov/learn/glossary/?=fault

Figure 2.7 Seismic Wave



Source:http://www.pdc.org/TAK/Educators/Teacher_Guides/Teacher/HighSchool_teacher.pdf

Figure 2.8 Difference of P Wave and S Wave

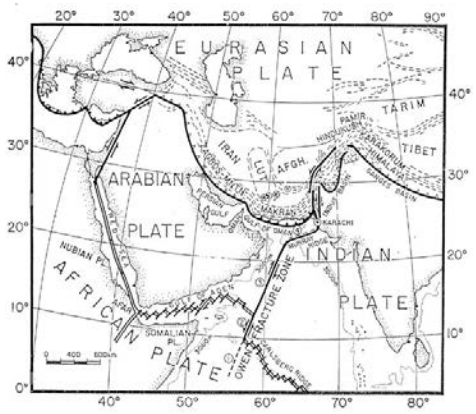
Seismicity in Pakistan

Plates around Pakistan

Earthquakes and active faults in northern Pakistan and adjacent parts of India and Afghanistan are the direct result of the Indian subcontinent moving northward at a rate of about 40 mm/yr (1.6 inches/yr) and colliding with the Eurasian continent. This collision is causing uplift that produces the highest mountain peaks in the world including the Himalayan, the Karakoram, the Pamir and the Hindu Kush ranges.

National Seismic Hazard Map

Figure 2.9 shows the tectonic setting around Pakistan. The plate boundary between the Eurasian plate and the Indian plate runs through Pakistan's territory from southwest to northeast, and the Arabian plate subducts beneath the Eurasian plate in the southern part of Pakistan, at a rate of 19 mm/year.



Source: Quittmeyer & Jacob (1979), BSSA, vol.69, No.3.

Figure 2.9 Location of Plats and Epicentres of Major Earthquakes Along the Arabian Coast

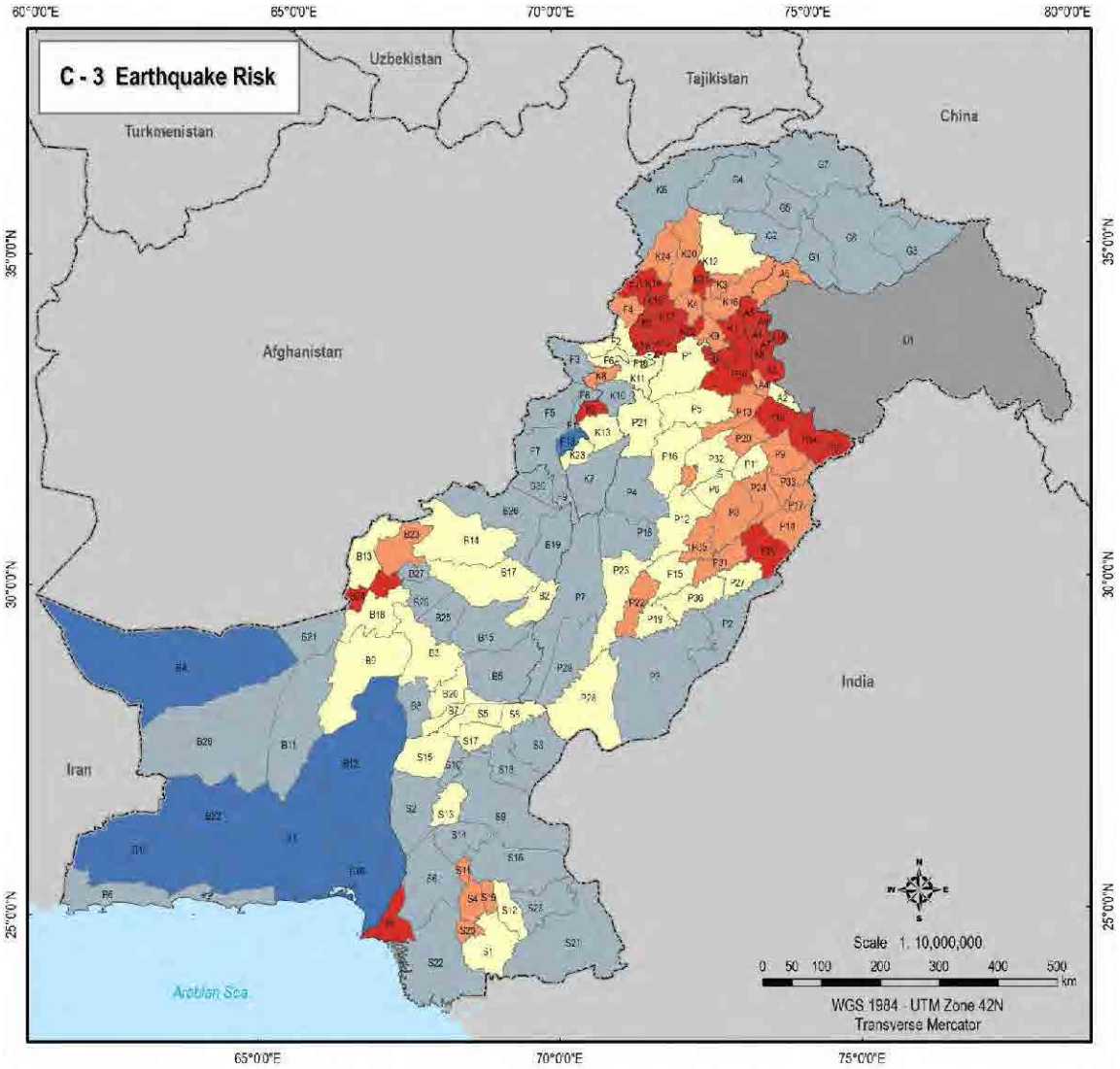
The Earthquake Risk Map prepared by JICA Expert Team is shown in Figure 2.10[1] below. Seismic hazard maps on a local scale have also been developed. ERRA has developed probabilistic seismic zoning maps in earthquake-affected areas, and seismic hazard microzonation maps for Balakot and Muzaffarabad.

NDMA developed the seismic hazard assessment map of Muzaffarabad and Mansehra, employing deterministic and probabilistic approaches. Furthermore, NDMA conducted risk analysis and developed an earthquake scenario in Muzaffarabad and Mansehra for the purpose of planning and preparedness for an earthquake disaster.

In Karachi, the Karachi Building Control Authority compiled information on seismic risk in Karachi and published a book on seismic zoning and recommendations for seismic design of buildings (Loya et al., 2000[2]).

[1] Earthquake hazard and risk maps, along with other disasters were prepared in the JICA project for "National Disaster Management Plan in the Islamic Republic of Pakistan" in 2010.

[2] A. Razzak Loya, Nayyer Alam Zaigham, and Mushtaq H. Dawood, 2000, Seismic zoning of Karachi and recommendations for seismic design of buildings



No.	District Name	No.	District Name	No.	District Name	No.	District Name	No.	District Name
A1	Bagh	B20	Nasirabad	G5	Gilgit	P2	Battagram	P31	Sahiwal
A2	Bhimber	B21	Nushki	G6	Skardu	P3	Bhakkar	P32	Sargodha
A3	Kotli	B22	Panjgur	G7	Hunza-Nagar	P4	Chakwal	P33	Sheikhupura
A4	Mirpur	B23	Pishin	I	Islamabad	P5	Dera Ismail Khan	P34	Sialkot
A5	Muzaffarabad	B24	Quetta	K1	Abbottabad	P6	Faisalabad	P35	Toba Tek Singh
A6	Neelum	B25	Sibi	K2	Bannu	P7	Gujranwala	P36	Vehari
A7	Poonch	B26	Zhob	K3	Batagram	P8	Gujrat	S1	Badin
A8	Sudhnoti	B27	Ziarat	K4	Buner	P9	Hafizabad	S2	Dadu
A9	Hattian	B28	Washuk	K5	Charsadda	P10	Jhang	S3	Ghotki
A10	Haveli	B29	Harnai	K6	Chitral	P11	Kasur	S4	Hyderabad
B1	Awaran	B30	Shorani	K7	D. I. Khan	P12	Khanewal	S5	Jacobabad
B2	Barkhan	E1	Disputed Area	K8	Hangu	P13	Khushab	S6	Jamshoro
B3	Bolan	F1	Bajaur Agency	K9	Haripur	P14	Lahore	S7	Karachi
B4	Chagai	F2	Khyber Agency	K10	Karak	P15	Layyah	S8	Keshmore
B5	Dera Bugti	F3	Kurram Agency	K11	Kohat	P16	Mandi Bahauddin	S9	Khairpur
B6	Gwadar	F4	Mohmand Agency	K12	Kohistan	P17	Mianwali	S10	Larkana
B7	Jaffarabad	F5	North Waziristan Agency	K13	Lakki Marwat	P18	Multan	S11	Matiari
B8	Jhal Magsi	F6	Orakzai Agency	K14	Lower Dir	P19	Muzaffargarh	S12	Mirpur Khas
B9	Kalat	F7	South Waziristan Agency	K15	Malakand	P20	Narowal	S13	Naushahro Feroze
B10	Kech	F8	FR Bannu	K16	Mansehra	P21	Okara	S14	Nawabshah
B11	Kharan	F9	FR D. I. Khan	K17	Mardan	P22	Pakpattan	S15	Qamber and Shahdadkot
B12	Khuzdar	F10	FR Kohat	K18	Nowshera	P23	Rahim Yar Khan	S16	Sanghar
B13	Kila Abdullah	F11	FR Lakki Marwat	K19	Peshawar	P24	Sahiwal	S17	Shaheed Benazirabad
B14	Kila Saifullah	F12	FR Peshawar	K20	Swabi	P25	Sargodha	S18	Shikarpur
B15	Kohlu	F13	FR Tank	K21	Swat	P26	Sheikhupura	S19	Sujawal
B16	Lasbela	G1	Astore	K22	Tank	P27	Sialkot	S20	Tando Allahyar
B17	Loralai	G2	Diamir	K23	Torghar	P28	Toba Tek Singh	S21	Tharparkar
B18	Mastung	G3	Ghanche	K24	Upper Dir	P29	Vehari	S22	Thatta
B19	Musakhel	G4	Ghizar	P1	Attock	P30	Rawalpindi	S23	Umerkot

Legend
Earthquake Risk
Category
Very High
High
Medium
Low
Very Low
No data

Source: JICA Study Team

The Project for National Disaster Management Plan in the Islamic Republic of Pakistan

Source: JICA Study Team

Figure 2.10 Earthquake Risk Map of Pakistan

Impact

Historical Earthquakes in Pakistan

The historical database comprises of 58 earthquakes from year 25 A.D. to 1905. A concentration of earthquakes has been observed in the northern belt from Islamabad/Rawalpindi to Peshawar, around Quetta, four earthquakes in the Karachi-Ahmadabad and regions of low historical activity are Makran, Chagai hills, Toba-kakar range north of Quetta and Punjab. In 1935, in Quetta, the great earthquake of Magnitude 7.7 was felt at 3:03 A.M. on 31st May 1935, and 30,000 people died. On 28th December, 1974 at 12:11 Universal Time, Coordinated (UTC) a strong earthquake was felt in Swat, Peshawar, Islamabad and Lahore, and its epicentre was in Pattan. This left 5300 persons dead, 17,000 injured and thousands of houses destroyed.

Table 2.1 Past Historical Earthquakes in Pakistan

Date	M	Location	Killed	Affected
31/ 05/ 1935	7.5	Quetta (Balochistan)	60,000	
27/ 11/ 1945	8	Makran (+ Tsunami)	4,000	
28/ 12/ 1974	6.2	North Indus R. Valley	4,700	50,200
12/ 09/ 1981	6.1	Karakoram, Darel,	250	2,000
31/ 01/ 1991	6.4	Malakand, Chitral,	300	204,794
08/ 10/ 2005	7.7	Bagh, Muzzafarabad,	73,338	5,128,000
29/ 10/ 2008	6.4	Khanozai, Rod Mulazai,	166	75,320

Source: EM-DAT, Center for Research on Epidemiology and Disasters (CRED)

2005 Pakistan Earthquake

The most recent and deadliest earthquake occurred on 8th October 2005 in northern parts of Pakistan measuring 7.6 on the Richter scale. The focal depth of the earthquake was 10 km and its epicentre was in the north of Muzaffarabad (Azad Kashmir) about 90km north of Islamabad. The earthquake occurred at 08:50:30 PST.

Source: after rnews.bbc.co.uk

Figure 2.11 Affected Areas of Pakistan Earthquake

- Magnitude: 7.6 on the Richter Scale
- Affected Area: 30,000 sq km
- Human Loss: 73,338 dead and 128,304 severely injured
- Physical Loss: 3.5 million rendered homeless
  over 600,000 houses destroyed
  5,808 educational facilities destroyed
  307 health facilities destroyed
  715 government sector buildings damaged
  2,393 km major roads damaged

Table 2.2 Damage Statistics from the 2005 Earthquake

		a	b	c	d	e	f			
Province	District	Population in 1998	Houses in 1998	House full damage	Hpuse partial damage	Death	Injuries	MMI	Full damage ratio (%) =c/b	Death ratio (%) =e/a
KP	Abbottabad	880,666	153,819	6,961	27,051	515	1,730	8	4.5	0.1
	Batagram	307,278	44,585	28,712	8,656	3,232	3,279	10	64.4	1.1
	Kohistan	472,570	74,087	4,350	18,395	661	639		5.9	0.1
	Mansehra	1,152,839	203,109	31,323	43,282	24,511	30,585	10	15.4	2.1
	Shangla	434,563	67,003	15,661	10,281	423	957	5	23.4	0.1
AJK	Bagh	393,000	59,623	47,619	18,226	8,157	6,644	9	79.9	2.1
	Murpur	334,000		0	0	6	11	7		
	Muzaffarabad	746,000	123,679	108,157	17,120	33,724	21,374	10	87.4	4.5
	Neelum			3,692	7,215	447	1,013	9		
	Rawalakot(Poonch)			15,086	25,405	1,025	1,909	9		
	Sudhnoti	224,000		429	1,719	4	16	9		
	Total			261,990	177,350	72,705	68,157			

MMI: Modified Mercalli Intensity

Source: ADB and WB, 2005[3], Census data, 1998.

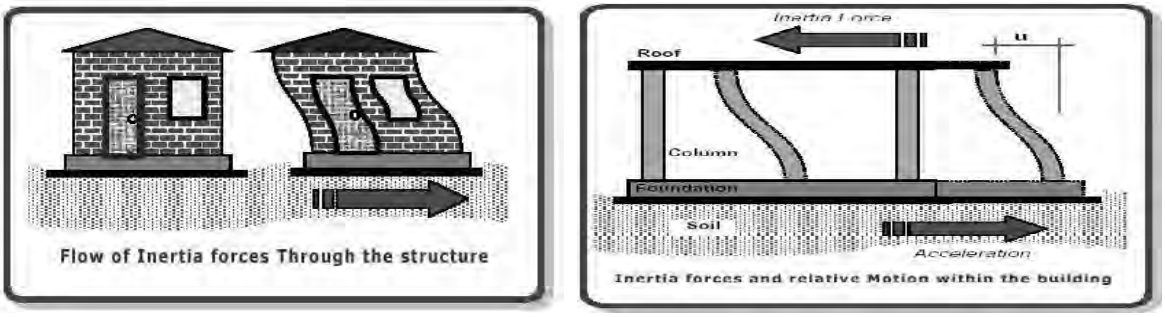
Source: uphaa.com

Figure 2.12 Glimpse of Devastation in Kashmir and Margala Tower, Islamabad Collapsed by 2005 Pakistan Earthquake

Engineering: Seismic Effects on Structures

The following pictures show how buildings behave during an earthquake:

[3] ADB-WB (2005), "Preliminary Damage and Needs Assessment – Pakistan 2005 Earthquake", prepared by Asian Development Bank and World Bank, Islamabad, Pakistan, November 12, 2005.



Inertial forces and relative motion within the buildings
Source: http://www.iitk.ac.in/nicee/EQTips/EQTip05.pdf

Figure 2.13 Inertia Forces through the Structure

If the building and infrastructure are not built considering seismic impact there could be huge loss and damage to:

- Houses /civil structures
- Infrastructure, i.e., roads, bridges, etc.,
- Utilities, i.e., water supply, sewage, etc

According to Government of Pakistan estimates, in the hard-hit areas 80 percent of public buildings, 25 percent of main roads, and 75 percent of local roads were severely damaged in the 2005 Pakistan earthquake.

Source: Images of Kashmir earthquake

Figure 2.14 Infrastructural Damage of Earthquake

Economic: Overall Impact on the Economy

The economy is very much affected by earthquakes and they produce tangible as well as intangible losses:

- Business
- Material
- Wealth
- Jobs
- Skilled Manpower

The 2005 earthquake caused losses of $5 billion (Asian Development Bank and World Bank, 2005) where as Pakistan's total budget in 2008-09 was $25.125 billion. This means a budget share of $148/person and damage share $29/person i.e. everyone lost 20% of his budget share.

Population

Earthquakes and associated secondary hazards can cause deaths and injuries as well as making people homeless and affecting their livelihoods. For example the 2005 earthquake caused[4]:

- Deaths → 73,338

[4] Source: Impacts of Earthquake in Pakistan, Mohammad Riaz, NCEG, University of Peshawar.

- Injuries → 128,304
- Homeless → 3.5 million

UN estimates 3.5 million people were directly affected.

Geological Impacts (Hazards)

Liquefaction

Earth shaking causes a 'slurry' of water saturated soil that causes the foundations to fail and the buildings to collapse e.g. Nigata, Japan (1964)

Ground Rupture

Ground rupture also causes damage to:

- Land/property
- Agriculture
- Water channels

Avalanches

Localized but swift and thus can be deadly:

- December 2001 Chilas earthquake triggered some avalanches but no damage reported. (Source: Impacts of Earthquake in Pakistan)

Source: Mohammad Riaz, National Centre of Excellency in Geology (NCEG), University of Peshawar

Figure 2.15 Images of Avalanches

Landslide

Earthquake shaking can cause land sliding on many scales. An earthquake can cause a slope to become unstable by the inertial loading it imposes or by causing a loss of strength in the slope materials.

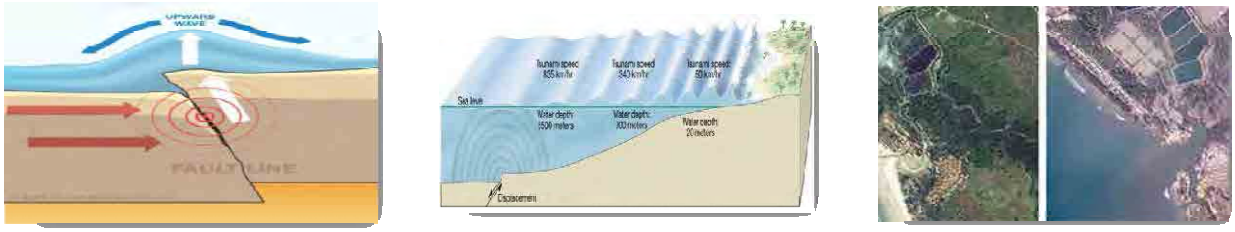
- Loss of life and property
- River channel damming and flooding, e.g., Chikar (Hattian Bala), Nisar Camp (2005 E.Q)& Hunza (Jan 2010)
- Forest/Crop loss
- Loss of Soil

Source: Source: Impacts of Earthquake in Pakistan, Mohammad Riaz, NCEG, University of Peshawar

Figure 2.16 Ataabad Landslide on Jan 04, 2010, in Hunza caused flooding in the river and created a lake more than 300 feet deep.

Tsunami

Earthquakes cause tsunamis when the seafloor rises or falls. This occurs when two tectonics plates collide into each other at a plate boundary. The denser plate would subduct under the other plate, which leads to a rise or fall of the seafloor. This movement of the seafloor will cause a rapid displacement of water, and a wave would form. As the wave approaches a coastline, it would get higher as the seafloor gets shallower, causing a tsunami.



Source: Impacts of Earthquake in Pakistan, Mohammad Riaz, NCEG, University of Peshawar

Figure 2.17 Tsunami Generation

Mitigation and Preparedness

Structural

Building codes/designing (critical)

When constructing a new building, seismic provisions need to be catered for. From experience, the cost of construction of a seismically resilient building is only 5-8% more than that of a conventional building. Following are some of the structural elements that need to be incorporated to make buildings seismically resilient.

Retrofitting

Existing buildings/ structures should be strengthened with retrofitting

- Land use restrictions
- Hazard mapping and land use zonation
- Geological surveys before development

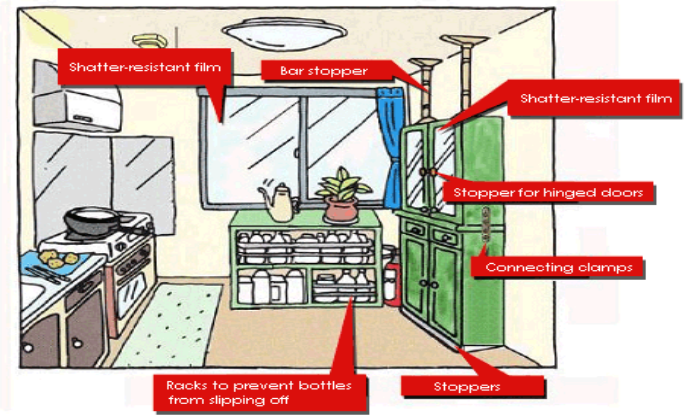
Photo Source: Impacts of Earthquake in Pakistan, Mohammad Riaz, NCEG, University of Peshawar

Figure 2.18 Example of Retrofitting

Non-structural

Safety of non-Structural elements of buildings

Non-structural elements of buildings if not properly fixed and attached to structural elements, can cause death or injury during an earthquake. Therefore, the objects susceptible to fall should be properly attached/ fixed/ installed.

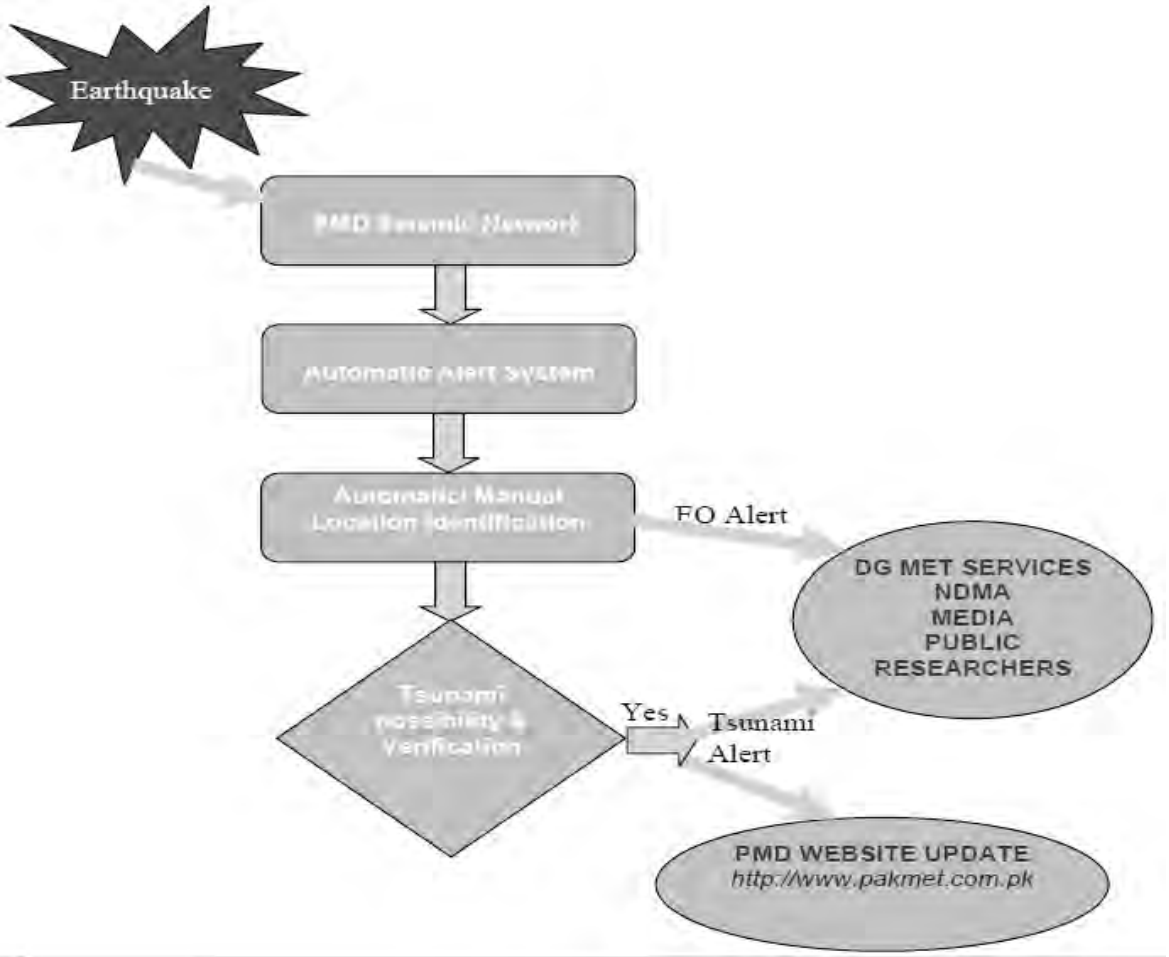


Source: Tokyo Metropolitan Government

Figure 2.19 Non-Structural Measures Preventing from Falling

Warning and Evacuation / Drills

Natural alerts by shaking and dissemination of warnings using mosques, schools or electronic media so that the community will have enough lead time for evacuation.



Source: Pakistan Meteorological Department

Figure 2.20 Outline of PMD's Earthquake Observation / Tsunami Warning System

Public Awareness / CBDRM Program

Countermeasures include:

- Education
- Mandatory portion of curriculum
- Appropriate training in emergency response
- Hazard & resource maps
- Emergency response plan
- Disaster management plan
- Buying insurance

Tsunami

A tsunami is a series of huge waves that can cause great devastation and loss of life when they strike a coast.

Source: The Tohoku Earthquake March 2011
xn--qckua0a9340dnp3a9ke4lm.biz

Figure 2.21 Image of Tsunami

Meanings of Tsunami

"Tsunami" is a Japanese word in which "tsu" means harbor and "nami" means wave. Thus the word means "harbor wave." The waves travel outward in all directions from the disturbance, similar to what you would see if you threw a rock in a pond. The average wave speed is 450 miles per hour (720 km per hour). These waves may be as long as 100km and travel across the ocean at speeds of up to 800km/h[5]. Tsunamis are sometimes incorrectly called "tidal waves" -- tsunamis are not caused by the tides (tides are caused by the gravitational force of the moon on the sea). Regular waves are caused by the wind.

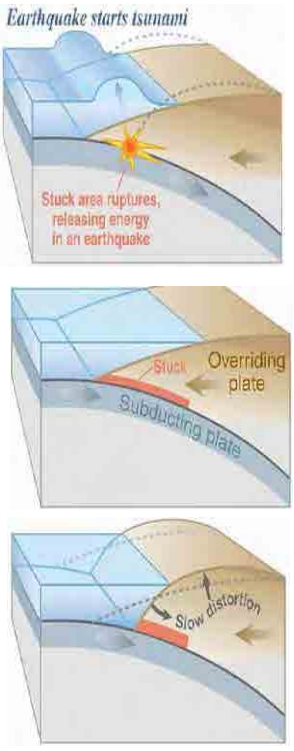
Causes of Tsunami

Undersea Earthquake

Tsunamis are caused when an earthquake causes the seafloor to rise or fall. This is when two tectonic plates collide into each other at a plate boundary. The denser plate would subduct under the other plate, which leads to a rise or fall of the seafloor. This movement of the seafloor will cause a rapid displacement of water, and a wave would form. As the wave approaches the coastline, it would get higher as the seafloor gets shallower, causing a tsunami. The shockwaves produced by the earthquake would radiate out and cause waves to form too.

Subduction zones are potential tsunami locations

Most tsunamis are caused by earthquakes generated in a subduction zone, an area where an oceanic plate is being forced down into the mantle by plate tectonic forces. The friction between the subducting plate and the overriding plate is enormous. This friction prevents a slow and steady rate of subduction and instead the two plates become "stuck".



Source: Tsunami Teacher, UNESCO

Figure 2.22 Tsunami Generation Mechanisms

[5] Source: Tsunami Teacher, UNESCO.

Accumulated seismic energy

As the stuck plate continues to descend into the mantle the motion, it causes a slow distortion of the overriding plate. The result is an accumulation of energy very similar to the energy stored in a compressed spring. Energy can accumulate in the overriding plate over a long period of time - decades or even centuries.[6]

Undersea Landslide

Undersea landslides cause tsunamis due to the forces of gravity and friction. When the force of gravity overpowers the force of friction, landslides occurs.

Undersea Eruption of Volcanoes

Water displacement due to physical land movement can cause an underwater wave in a ripple effect. An underwater wave is different from a regular wind driven surface wave in effect because when the underwater wave reaches shallow waters it is forced up by forward motion causing a tsunami.

Falling Meteorites

Meteorites may slam into the ocean and cause tsunami more often than anyone realizes. Imprints of tsunami impacts discovered on the coast of Australia suggest these giant waves were so powerful that they could only have been triggered by something as cataclysmic as a meteor impact. And we could be due for another one soon.

Scientific Knowledge

Development of Tsunami

A tsunami starts when a huge volume of water is quickly shifted. This rapid movement can happen as the result of an underwater earthquake (when the seafloor quickly moves up or down), a rockslide, a volcanic eruption, or another high-energy event.

Size of Tsunami

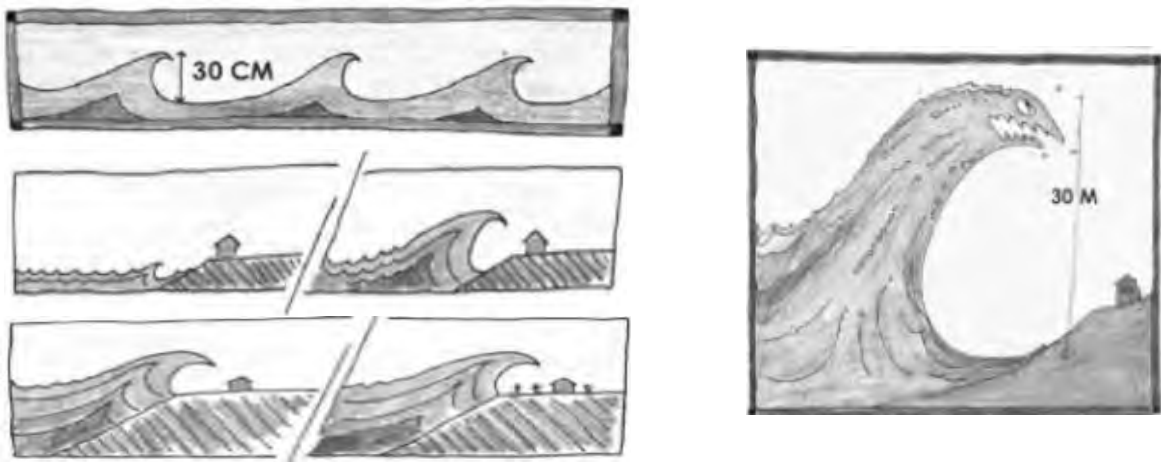
Tsunamis have an extremely long wavelength (wavelength is the distance between the crest (top) of one wave and the crest of the next wave) — up to several hundred miles long. The period (the time between two successive waves) is also very long — about an hour in deep water.

In the deep sea, a tsunami's height can be only about 1 m (3 feet) tall. Tsunamis are often barely visible when they are in the deep sea. This makes tsunami detection in the deep sea very difficult.

A small 30 cm high tsunami wave in the deep ocean can become a 30-meter high giant wave when it reaches the coast. Tsunami waves can be small or big, harmless or destructive. People living along coast

[6] Source: Tsunami Teacher, UNESCO

lines should understand the phenomenon well and in case of earthquake, should move to higher places or inland safe areas.[7]



Source: Tsunami Teacher, UNESCO

Figure 2.23 Amplification of Tsunami at the Coast

Speed of Tsunami

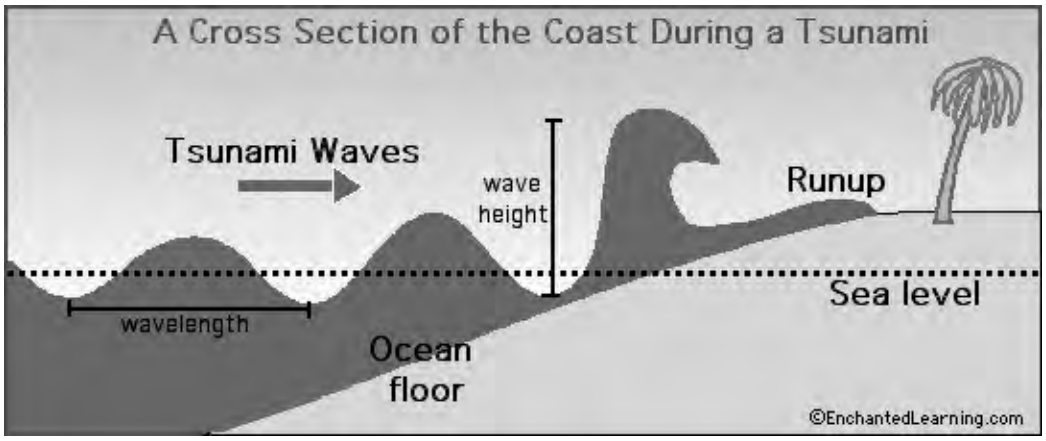
A tsunami can travel at well over 970 km/h (600 mph) in the open ocean - as fast as a jet flies. It can take only a few hours for a tsunami to travel across an entire ocean. A regular wave (generated by the wind) travels at up to about 90 km/hr.

Tsunami Hits the Coast

As a tsunami wave approaches the coast (where the sea becomes shallow), the trough (bottom) of the wave hits the beach floor, causing the wave to slow down, to increase in height (the amplitude is magnified many times) and to decrease in wavelength (the distance from crest to crest). At landfall, a tsunami wave can be hundreds of meters tall. Steeper shorelines produce higher tsunami waves.

In addition to the large tsunami waves that crash onto shore, the waves push a large amount of water onto the shore above the regular sea level (this is called run-up). The run-up can cause tremendous damage inland and is much more common than huge, thundering tsunami waves.

[7] Source; Tsunami awareness book, One UNDRM Programme, UNDP/NDMA



Source: EnchantedLearning.com

Figure 2.24 Size of Amplification at the Coast

Tsunami Detection

Scientific detection: Many tsunamis could be detected before they hit land, and the loss of life could be minimized, with the use of modern technology, including seismographs (which detect earthquakes), computerized offshore buoys that can measure changes in wave height, and a system of sirens on the beach to alert people of potential tsunami danger.[8]

Natural Warning

If there is an earthquake, it may have caused a tsunami, so people should run toward higher ground or inland. The first wave in a tsunami is often not the largest; if there is an abnormally huge wave, it is advised to move inland quickly -- even bigger waves could be coming soon.

If after the earthquake, water recedes quickly and unexpectedly from a beach (this is called drawback), people near the shore should run toward higher ground or inland -- there may be a tsunami coming.

A tsunami moves with the speed of fast train or a jet plane, so if there is a sound like a train or jet plane coming from sea, it can also be a natural sign of a tsunami.

Tsunami Force

After the seafloor rises, the mountain of water comes back down. This pushes the water that was underneath it outwards. The force of the water moves through the ocean causing an underwater force that travels for hundreds of kilometers. The force of the water can reach speeds of up to 800kmh as it surges through the ocean. The energy is underwater and is not noticeable on the surface[9].

As this force travels through the ocean it may eventually reach the shore. At this point, the sea becomes shallower. However, the energy in the water is still the same. The energy is compressed and the water is pushed upwards. This is how the energy is transferred from being underwater into waves on the surface.

[8] Source; Tsunami awareness book, One UNDRM Program, UNDP/NDMA.
[9] Source: Tsunami Teacher, UNESCO.

Source: Tomoko Shaw, JICA Expert Team

Figure 2.25 Damage of Tsunami after Tohoku Earthquake

Tsunami Risk in Pakistan

Being located close to the collision boundary of the Indian and Eurasian plates, Pakistan lies in a seismically active zone. Owing to high population density near seismically active areas, it is imperative that buildings should withstand the seismic hazard to which these may be exposed during their lifetime. The following coastal districts are prone to tsunami:

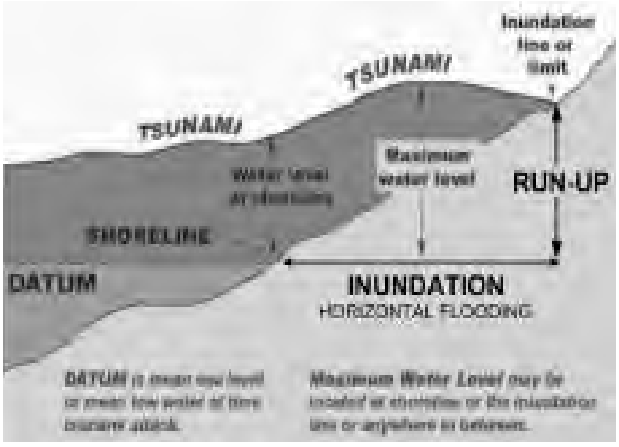
- District Gwadar
- District Lasbela
- District Karachi
- District Badin
- District Thatta

Impact

Means of Destruction

Wave Impact- Floating and drag forces rip houses apart and overturn vehicles. Considerable damage is caused by floating debris, including boats and cars that become dangerous projectiles that can crash into buildings, break power lines and start fires.

- Inundation: distance inland that a tsunami wave floods
- Erosion: erosion of foundation and collapse of bridges and seawalls.



Source: Tsunami Teacher, UNESCO

Figure 2.26 Reach of Tsunami

Historical Events

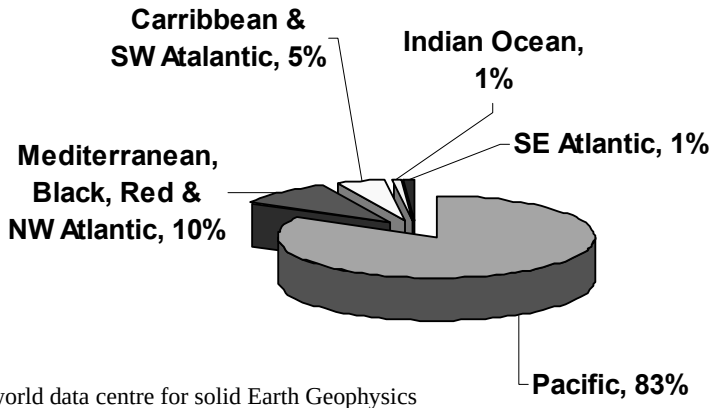
The destructive historical tsunamis are summarized in the following table.

Table 2.3 Historical Tsunami Records

Tsunami Records Since 1650		
Date	Source	Estimated deaths
20 Oct 1687	Peru	500
07 Jun 1692	Jamaica	3,000
26 Jan 1700	Cascadia, Northeast pacific	NA
08 Jul 1730	Chile	0
25 May 1751	Chile	30
01 Nov 1755	Lisbon, Portugal	10,000
24 Apr 1771	Ryukyuu Island	12,000
02 Feb 1835	Chile	3
07 Nov 1837	Chile	62
24 Dec 1854	Japan	3,000
13 Aug 1868	Chile	28,000
10 May 1877	Chile	500
31 Dec 1881	Bay of Bengal	NA
27 Aug 1883	Krakatau, Indonesia	33,000
15 Jun 1899	Japan	22,000
31 Jan 1900	Colombia, Ecuador	500
17 Aug 1906	Chile	NA
07 Sep 1918	Kuril Island	47
11 Nov 1922	Chile	100
03 Feb 1924	Kamchatka, Russia	2
01 Sep 1923	Kanto, Japan	2,144
02 Mar 1933	Sanriku, Japan	3,000
07 Dec 1944	Tonankai, Japan	1,038
01 Apr 1946	Aleutian Islands, USA	170
20 Dec 1946	Nankaido Japan	1,997
04 Mar 1952	Hokkaido, Japan	33
04 Nov 1952	Russia	NA
09 Mar 1957	Aleutian Islands, USA	5
22 May 1960	Chile	2,000
28 Mar 1964	Alaska, USA	132
04 Feb 1965	Aleutian Islands, USA	0
18 May 1968	Honshu, Japan	52
16 Oct 1994	Shikotan Island, Russia	11
21 Feb 1996	Peru	15
26 Dec 2004	Northern Sumatra	250,000
11 Mar 2011[10]	Tohoku, Japan	19,486

Source: Tsunami Teacher, UNESCO

[10] Source: National Police Agency of Japan. The figure includes number of deaths (15,811) and lost (4,035), as of September 26th, 2011.



Source: world data centre for solid Earth Geophysics

Figure 2.27 Location of Tsunami Occurrence

1945 Tsunami

An internationally well-known, large tsunami that impacted the Peninsula was the 1945 Makran tsunami. This tsunami devastated the coasts of Iran, Pakistan, and possibly Oman (Berninghausen, 1966).

Source: Pakistan Meteorological Department (PMD)

Figure 2.28 Location of Tsunami in 1945

On 28th November 1945, a great earthquake off Pakistan's Makran coast (Balochistan) generated a destructive tsunami in the Northern Arabian sea and Indian ocean. More than 4,000 people were killed along the Makran coast of Pakistan by both the earthquake and tsunami.

Indian Ocean 2004 Tsunami

On Dec 26, 2004 a massive earthquake off Sumatra generated a tsunami that quickly and violently hit Indonesia –Andaman island (30 min), Thailand (90 min), Sri Lanka and India (2 hrs), Maldives and finally the east coast of Africa (7 hrs later). The Sumatra earthquake turned out to be more powerful than initially believed.

US seismologists put it at 9.3 and not M8.0 as initially measured in the first few minutes. Wave height along the coastline of Banda Aceh averaged over 75 feet (22.9 meter) with run-ups often reaching 90 feet (27.4 meter) and the tsunami's average speed on the shore was 42 feet/sec (12.8 meter/sec).

Source: Tsunami Teacher,

Figure 2.29 Damages by Indian Ocean Tsunami in 2004

Mitigation and Preparedness

Structural

Sea walls

Sea walls, which protect the coast from tsunamis striking land, are fundamental to mitigation for tsunami. Their crest height should be determined by construction standards of the particular area in which they are built, but planners should bear in mind that a tsunami could still breach the walls and in that event, the effectiveness and safety of the levee walls must be taken into consideration[11].

Embankments

Embankment may refer to a protection band in Pakistan, which is levee or dike, an artificial bank raised above the immediately surrounding land to redirect or prevent flooding by a river, lake or sea.

For transportation, a raised bank to carry a road, railway, or canal across a low-lying or wet area.

Embankment dam: a dam made of mounded earth and rock.

Land reclamation along the banks of a river, usually marked by roads and walkways running along it, parallel to the river.

Breakwater

Tsunami breakwaters alleviate rises of the water level within a designated area. They also are effective in altering tsunami wave reverberation. They are already in place at harbors for large vessels and are being built at various ports.

Bio shields (vegetation)

Coastal vegetation is recognized as a comprehensive strategy to mitigate the destructive force of tsunami events, although it cannot completely stop the tsunami itself and the effectiveness depends on the magnitude of the tsunami and the vegetation structure.

Danielsen et al., (2005) pointed out that mangroves and other coastal vegetation have been cleared or degraded along many coastlines, increasing their vulnerability to storm and tsunami damage and

[11] Source: Tsunami Teacher, UNESCO.

suggested that establishing or strengthening greenbelts of mangroves and other coastal forests could play a key role in reducing the effect of future extreme events[12].

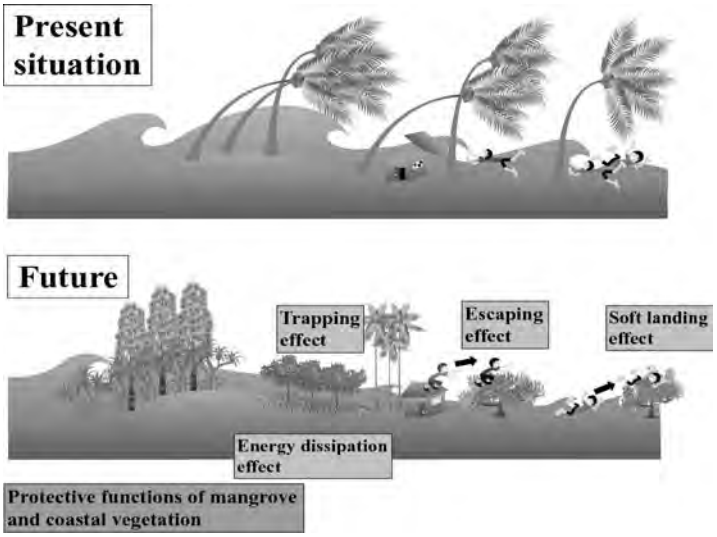


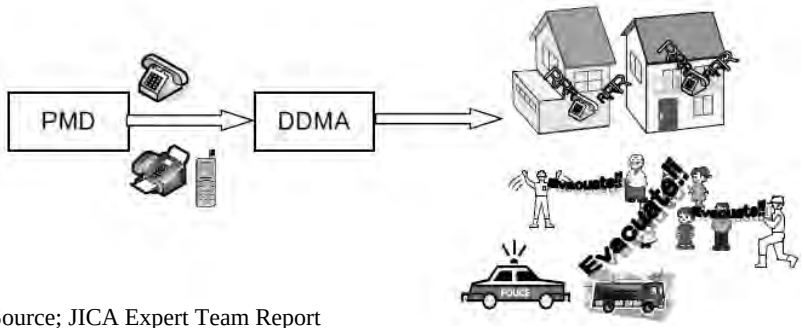
Figure 2.30 Mangrove Plantation for Reducing Impacts

Non-Structural

Early warning system

Warning & communications system of the early warning system is described below.

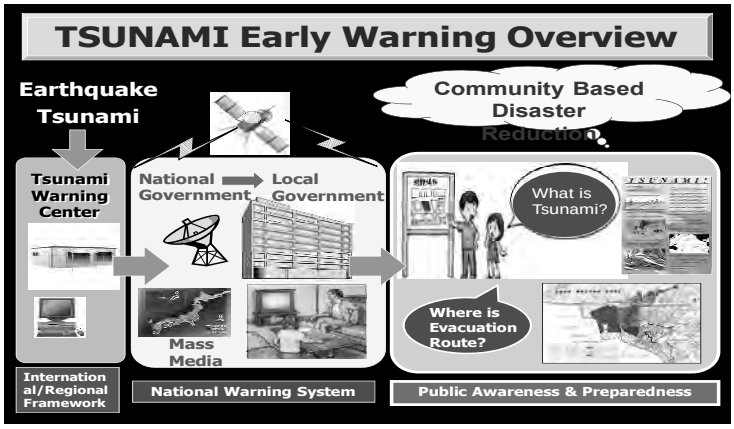
- Estimating the occurrence of a tsunami by seismic information (magnitude, location and depth)
- Database of the simulation with assumptions
- Real-time analysis with the tentative fault model
- Revision of the tentative fault model by the observation data
- Dissemination of warnings though various communications means.



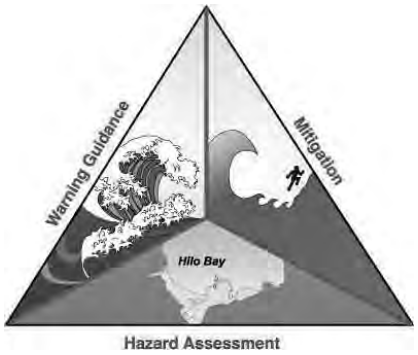
Source; JICA Expert Team Report

Figure 2.31 Current Dissemination of Early Warning

[12] Source: Environmental & Hydrological Lab, Department of Civil Engineering, Santana University



Source: Presentation on community preparedness



Source: Earthquake and Tsunami, Kenji Satake, Univ. of Tokyo, One UN DRM Program, UNDP/NDMA

Figure 2.32 Early Warning System and Three Essential Components of Tsunami

Community Awareness / Training / Evacuation Drill

Prepare community though awareness raising, training, school education, emergency response training. Exercise evacuation drills and train the community to evacuate, e.g.,

Evacuate immediately if told to do so. The following are the evacuation tips[13]:

- Listen to your battery-powered radio and follow the instructions of local emergency officials.
- Wear protective clothing and sturdy shoes.
- Take your family disaster supplies kit
- Lock your home.
- Use travel routes specified by local authorities – don't use shortcuts because certain areas may be impassable or dangerous.

Source: Focus Humanitarian Assistance in JICA Project

Figure 2.33 Evacuation Drill in Muzaffargarh

The following are also effective as tsunami non-structural measures.

- Identification of Safe Evacuation Sites and Routes
- Zoning & Land use planning

[13] Source: Tsunami awareness book, One UNDRM Program, UNDP/ NDMA.

Flood / Flash Flood

Floods occur when a large amount of water overflows over dry land. They may result from prolonged or very heavy rainfall, severe thunderstorms, monsoon rains, or tropical cyclones. People who live near rivers or in low-lying coastal areas live with the greatest threat of floods.

Definition

The definition of flood is classified as is shown in the following table.

Table 2.4 Classification of Floods

Term	Meaning in General	Definition in the Project
(Indus) River Flood	Flood is a phenomenon of inundation by water coming from a river, drainage or other water bodies, such as lakes or seas due to overflowing from ordinary boundary between land and water or water surging.	In the Project, flood refers to "River Flood" resulting from a rise in the water levels of the major rivers, namely, Indus, Jhelum, Chenab, Ravi, Sutlej and Kabul.
Flash Flood	One of flood phenomena. A flash flood is a rapid flooding (mostly less than 6 hours) of geomorphic low-lying areas due to downpour or heavy rains caused by low depression, climate front line (thunderstorm) or cyclone.	Floods due to water overflowing the nullah ordrainage lines caused by heavy rain or due to hill torrents and inundation by rapid flow from hill torrents in property areas are considered as "Flash Floods." City floods due to water overflowing from or drainage channels are also included in a kind of "Flash Flood."
Hill Torrent (Flood)	Hill torrent floods are basically a rapid flooding of geomorphic steep surface areas at alluvial cones or floodplain areas caused by overflowing water from channels due to rapid velocity and any amount of flow quantity.	
City Flood Urban Flood	Flood and inundation phenomena occurring in the city or built-up areas.	
River	A river is a natural waterway, usually freshwater, flowing toward a lower level water surface such as an ocean, a lake, a sea, or another river. Therefore, *nullahs* are kind of like rivers in general.	In the Project, "River(s)" refer(s) to six flows/channels, the Indus, Jhelum, Chenab, Ravi, Sutlej and Kabul Rivers as major rivers in Pakistan.
Nullah (Nallah)	A Pakistani term. Rivers excluding huge rivers in the Indus River System.	Except for the six rivers mentioned above, the flows, channels and bodies of stream water are referred to as "*nullah*."

Source: JICA Expert Team

Typology

Riverine / River Flood

Slow kinds: Runoff from sustained rainfall or rapid snowmelt exceeding the capacity of a river's channel. Causes include heavy rains from monsoons, hurricanes and tropical depressions, foreign winds and warm rain affecting snow pack. Unexpected drainage obstructions such as landslides, ice, or debris can cause slow flooding upstream of the obstruction. In Pakistan, the floods along the middle and lower reaches of Indus, Jhelum, Chenab, Rabi and Sutlej Rivers are classified into River Floods.

Fast kinds/ Flash Flood: include flash floods resulting from convective precipitation (intense thunderstorms) or sudden release from an upstream impoundment created behind a dam, landslide, or glacier[14].

[14] Source: JICA Expert Team.

As the name suggests, flash floods are events with little time occurring between the start of the flood and the peak discharge.

These floods normally occur within six hours of the beginning of heavy rainfall and are usually associated with intensive localized showers and severe thunderstorms.

These floods are particularly dangerous because of the suddenness and speed with which they occur.

Source: Nature and causes of floods and associated secondary hazards, Prof. Amir Nawaz Khan, CDPM, University of Peshawar

Figure 2.34 Flash Flood

Internal Flood

Source: Foundation of River & Basin Integrated Communications, Japan

Figure 2.35 Normal Situation of Rivers and Tributaries

Figure 2.36 Internal Flooding Situation

There is another flood pattern known as an internal flood. In the picture on the right, there is a floodgate and the flood in the mainstream cannot flow into the residential area. But there are no gates in the *nullah* system in Pakistan. Therefore, the flood flows backward into the tributaries and drainage areas. This worsens the situation.

To mitigate internal floods, structural measures, such as the main channel improvement first and then installation of floodgates and pumping stations at the confluence of the tributaries, are needed.

Estuarine Coastal floods/Storm surges

Storm Surges: These are commonly caused by a combination of sea tidal surges, caused by storm-force winds. A storm surge, from either a tropical cyclone or an extra tropical cyclone, falls within this category.

Coastal: Caused by severe sea storms, or as a result of another hazard (e.g. tsunami or hurricane). A storm surge, from either a tropical cyclone or an extra tropical cyclone, falls within this category.

Source: Nature and causes of floods and associated secondary hazards, Prof. Amir Nawaz Khan, CDPM, University of Peshawar

Figure 2.37 Storm Surge

Scientific Knowledge

Causes

Meteorological Causes

Most floods are the result of meteorological phenomena such as:

- Prolonged and intense rainfall
- Cyclones
- Typhoons, storms and tidal surges

Source: Foundation Of River & Basin Integrated Communications, Japan

Source: Reuters

Figure 2.38 Situation of Flood

Hydrological

Flooding can also be caused by increased runoff due to:

- Ice and snow melt
- Impermeable surfaces

- Saturated land
- Poor infiltration rates
- Land erosion

Anthropogenic

Mankind plays a very important role in the magnitude and frequency of floods in many different ways. In fact, it is often the human activities in water catchment areas that drastically intensify floods.

Source: JICA

Figure 2.39 Dumped Garbage in a Channel

Levels and Magnitude of Flood

General classifications are shown in the following:

- Normal Floods (e.g. 1-year flood): Regular inundation of low-lying farmland is common in many tropical Asian countries. They occur almost every year and farming practices, especially rice cultivation are well adapted. Forecasts can be issued to give advice regarding cropping and sowing times to minimize losses.
- Medium Floods (e.g. 5-year flood): Causes some economic loss but is not extensive or serious. They affect farmers and people living in low-lying areas and by rivers. Loss of life is unlikely as people are usually prepared for these regular events.
- Severe Floods (e.g. 20-year flood): River levels continue to rise and effect large geographic areas and people are less familiar with flooding including those living in urban areas. Damage and losses to the physical environment and economic sector are generally significant
- Catastrophic Floods (e.g. 100-year flood): Inundates extensive areas. They are extremely devastating with multi-fold impacts to life and property. However, the flooding doesn't have only negative impacts; it sometimes makes the land more fertile.

In terms of intensity of flow discharge indicated in Routine Daily Flood Forecast (RDFF), major river floods are classified into five (5) levels as shown in the table below.

Table 2.5 Classification of Floods Issued by Flood Forecasting Division

S. No.	Classification	Description
1	Low Flood	A flood situation when the river is flowing within deep channel(s) but is about to spread over river islands/*belas*.
2	Medium Flood	When the river flow is partly inundating river islands/*belas* but below half of its highest flood level.
3	High Flood	When the water level of the river is almost fully submerging islands/*belas* and continues to rise up to high banks/bunds but without encroaching on the freeboard.
4	Very High Flood	When the water level of the river flows is between high banks/bunds with encroachment on the freeboard.
5	Exceptionally High Flood	When there is imminent danger of overtopping/breaching or a breach has actually occurred or high bank areas become inundated.

Source: PMD

Flood intensifying Conditions

These conditions determine the key features of a flood event:

- Magnitude of the flood
- The speed of onset
- The flow velocity
- The sediment load
- The duration of the event

Flood Risks in Pakistan

During the last 62 years, Pakistan has suffered a cumulative financial loss of billions of US $ on account of 19 major flood events, more than 10,000 precious lives have so far been lost, and additionally, the dislocation of millions of people has resulted. Flood is a major disaster to consider. 56% of the Basin is located in Pakistan comprising the Indus and its tributaries: Kabul, Jhelum, Chenab, Ravi, Beas and Sutlej.

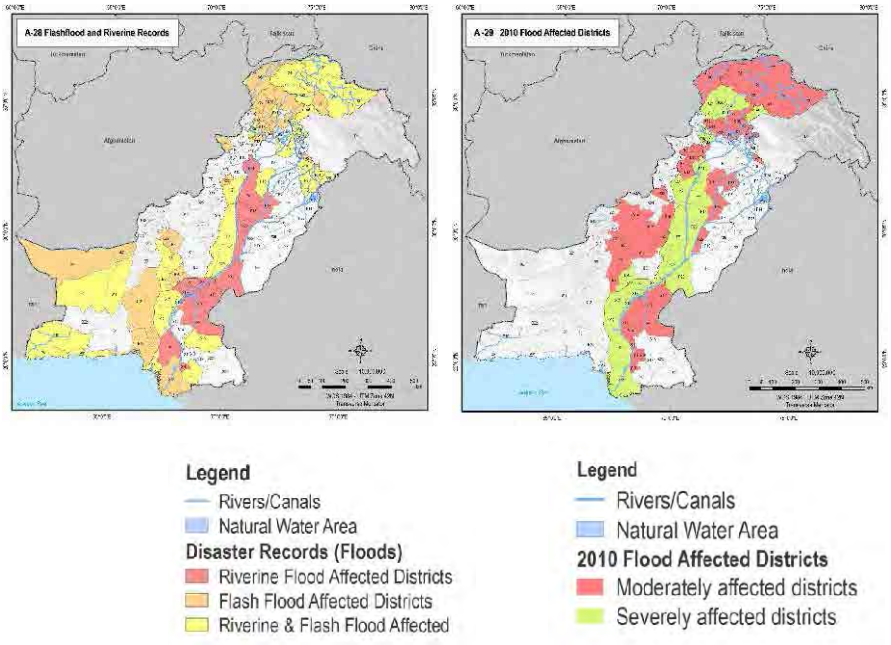


Figure 2.40 The Areas Under Threat of Floods in Pakistan

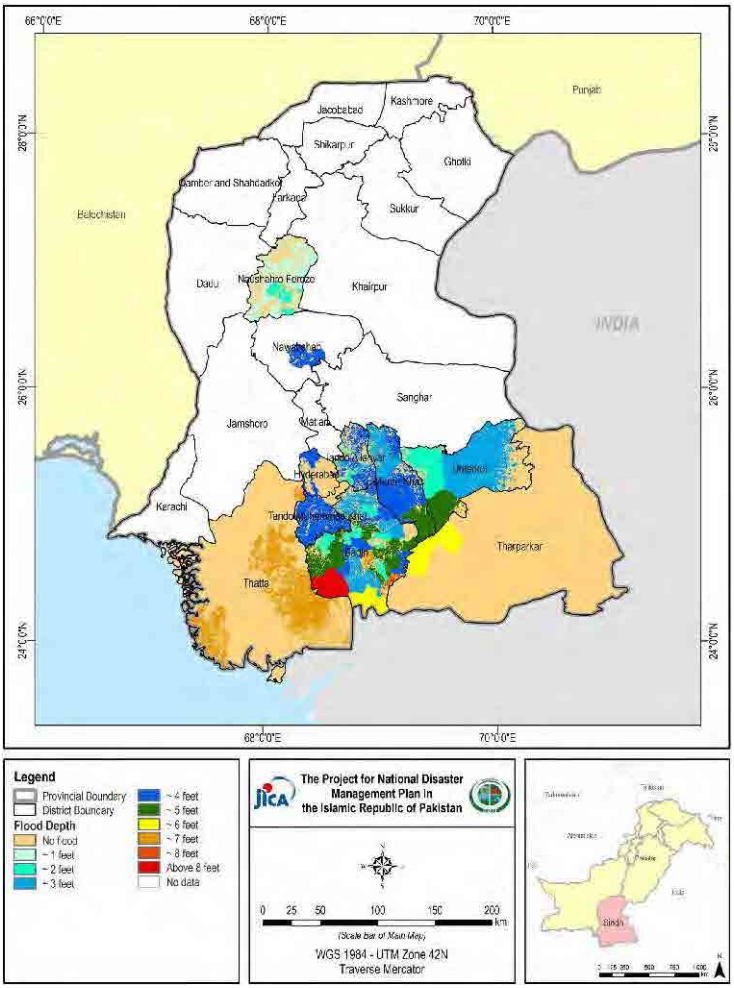


Figure 2.41 The Areas Affected by 2011 Flood in Sindh, Pakistan

Features of the floods in Pakistan are summarized as follows:

- These floods occur as a consequence of the monsoon rains.
- Northern areas of Pakistan provide the main water source to the river Indus with snowmelt providing an 80% contribution and rainfall a 20% contribution.
- In the Chenab and Jhelum Rivers, besides flash floods, the main source of water is snowmelt from India and occupied Jammu & Kashmir.
- Similarly, in the Sutlej and Ravi Rivers, water inflows are due to rainfall in the upper catchments in Indian territory

Perspectives of flood risk situations in Pakistan are described below:

- River floods
- Torrential rains in the hills
- Flash rains and consequent flash floods
- Cyclones
- Drainage issues
- Ill conceived and implemented projects
- Lack of forecasting facilities and coordination
- Haphazard land development

Impact

Historical Events

The following table summarizes the historical flood damages in Pakistan.

Table 2.6 Historical Flood Damages in Pakistan

Year	Value of Property Damaged (In Million Rs) Unadjusted	Adjusted	Lives Lost (persons)	Villages Affected (number)	Rivers Mainly Affected
2011	324,533		**520**	**38,700**	(Local Rainfll in Sindh/Balochistan)
2010	854,771		**1,985**	**17,533**	Kabul, Indus, Jhelum
2009	Not Reported		99	89	
2008	Not Reported		157	800	
2007	7,208.23		586	6,498	
2006	Not Reported		541	2,477	
2005	Not Reported		59	1,931	Indus
2004	15.00	15.00	85	47	
2003	5,175.00	5,175.00	484	4,376	
2001	450.00	450.00	219	50	Lai Nullah
1995	6,125.00	8,698.00	591	6,852	
1992	34,751.00	69,580.00	1,008	13,208	Indus, Jhelum, and Chenab
1988	6,879.00	25,630.00	508	1,000	Indus/Jhelum, & Chenab/Ravi/Sutlej
1978	4,478.00	51,489.00	393	9,199	
1976	5,880.00	80,504.00	425	18,390	Indus, Jhelum, Chenab and Ravi (Tarbela Dam completed in 1974)
1973	5,137.00	118,684.00	474	9,719	Indus, Jhelum, Chenab, Ravi and Sutlej (Chashma Reservoir completed in 1971) (Mangla Dam completed in 1967) (Warsak Dam completed in 1960)
1957	152.50	6,958.00	83	4,498	Chenab and Ravi
1956	155.50	7,356.00	160	11,609	Indus, Jhelum
1950	199.80	11,282.00	2,190	10,000	Chenab, Ravi and Sutlej
Total		**1,565,125.00**	**10,563**	**156,926**	

Source: Federal Flood Commission (FFC) for 1950 – 2010., Preliminary DNA Floods 2010,2011, and NDMA

2010 Floods in Indus Basin

Following is a general description of the 2010 flood.

- Duration: 26 July 2010-the end of 2011
- Damages: $43 billion (estimated)
- Fatalities: 1,781
- Areas affected: Khyber Pakhtunkhwa, Punjab, Sindh, Balochistan Gilgit-Baltistan and Azad Jammu and Kashimir

Source:http://www.huffingtonpost.com/2010/08/04/pakistan-flood-photos

Figure 2.42 2010 Floods in Indus

Causes of flood damages 2010

Causes of the flood damages are summarized below.

- In August 2010, more than half of the normal monsoon rain fell in only one week. Typically it is spread over three months.
- Climate change may not be the only cause of Pakistan's woes. There is also a sense that the current floods have been exacerbated by the way the Indus has been managed.
- That problem has been made worse by deforestation. Trees protect the headwaters from erosion. But over the past half century, more sediment has been flushed down the rivers as forests have been cut.
- The Indus is choked with sediment eroding off the Himalayas. Building levees causes the river channel to silt up.
- Lack of effective dissemination of early warning as well as the low awareness level of communities to respond to such warnings.
- Unplanned land use, especially construction on riverbanks and floodplanes

Flood in Lai Nullah

Followings are pictures of the people evacuating from flooded road at the time of the flood in Lai Nullah.

Source: Presentation on flood forecasting & warning system, PMD, Pakistan

Figure 2.43 Pictures of Severe Flood July 23, 2001

Effects of Flood

Primary effects of flood are as follows:

- Physical Damages
  - Property
  - Bridges
  - Buildings
  - Sewer systems
  - Roads
  - Railway lines
  - Canals
- Casualties - People and livestock die by drowning. It can also lead to epidemics and waterborne diseases.

Secondary effects of flood are as follows:

- Landslides

  Landslides are a major threat each year to human settlements and infrastructure, and cause property loss. Landslides occur as a result of changes in soil water content, removal of lateral support by erosion or rise in ground water levels.

- Soil Erosion and Land Degradation

  Soil erosion removes valuable topsoil, which is the most productive part of the soil profile. This results in lower yields and higher costs of production.

- Effects on Health

  Direct Effects:

  Direct health effects occur during the flood itself and are caused by the floodwater. For example:

  - Injuries
  - Heart attacks
  - Mortality from drowning

  Indirect Effects:

  - Epidemic diseases
  - Poisoning
  - Post-traumatic stress disorder
  - Unhygienic conditions

  Water Pollution:

  - Water pollution is the contamination of water bodies.
  - Clean drinking water becomes scarce (e.g., lakes, rivers, groundwater).

Source: Nature & causes of Flood and associated secondary hazards, Dr. Nawaz Khan, CDPM, University of Peshawar

Figure 2.44 Skin Disease

- Water pollution affects plants and organisms living in these bodies of water and in almost all cases, the effect is damaging to individual species and populations, and to the natural biological communities.

Tertiary/long-term effects of flood are as follows:

- Economic hardship: e.g., due to temporary decline in tourism
- Rebuilding costs
- Food shortage leading to price increase etc.
- Loss of production and provision of services
- Impact on country's debt position
- Loss of economic growth
- Delay in development programs

Source: Nature & causes of Flood and associated secondary hazards, Dr. Nawaz Khan, CDPM, University of Peshawar

Figure 2.45 Situations of Flood

Mitigation and Preparedness

Structural Measures

Measures to increase flood flow capacity of waterways are:

- River channel improvement
- Drainage channel improvement
- Construction of flood diversion channels

Measures to control flood runoff from river basins are:

- Construction of dams/and storage facilities
- Construction of off-site flood retarding basins
- Construction of on-site flood regulation ponds in the new subdivisions
- Erosion control and sabo works

Flood proofing measures of individual buildings/ units are:

- Raising floor levels of homesteads and industrial facilities above flood levels
- Provision of refuge areas or flood shelters
- Ensuring that water supplies and other health related facilities operate throughout floods

Non-structural Measures

Measures to increase flood flow capacity of waterways are:

- Management for removal of garbage and other drifting materials in the waterway
- Prevention of encroachment into river area

Measures to control of flood runoff from river basin are:

- Control of excessive land development in the river basin
- Legal arrangement for construction of on-site flood regulation pond by land developers
- Reforestation
- Flood warning and evacuation system
- Evacuation awareness
- Guidance to waterproof construction
- Development and dissemination of flood hazard maps
- Unification of related agencies for flood mitigation (such as establishment of a "Flood Mitigation Committee")

Source: 5-day course on flood mitigation (Feb 17, 2010), Islamabad, NDMA/UNDP

Figure 2.46 Flood Proofing of Individual Building by Construction of Protection Wall and Evacuation Shelter

Flood Risk Management

General descriptions of flood risk management are summarized as follows.

Purpose

- Reduce the flood damage and number of victims

Activities by communities

- Experience and Knowledge
- Poster Contest, Pamphlet
- Drills and Exercises
- Hazard Maps
- Information and Communication
- Awareness Program, etc.

Responsibilities and main stakeholders of flood risk management

- Emergence Response
  - NDMA, F/G/S/PDMAs, DDMA (Operation), FFC Rescue1122, Police, Fire Fighting, Armed Force, Civil Defence, etc.

- Recovery & Reconstruction
  - NDMA, F/G/S/PDMAs, DDMA (Rehabilitation & Reconstruction), FFC, Irrigation Dept., WASA, RDA, Armed Forces, etc.
- Preparedness
  - NDMA, F/G/S/PDMAs, DDMA (Management & Planning), Rescue1122, Civil Defence
  - FFC, PMD, Irrigation Dept., WASA and other concerned agencies

Classification of Flood related disasters

- River Flood: "River Flood" includes flooding along the INDUS, JHELUM, CHENAB, RAVI, SUTLEJ and KABUL Rivers in the downstream stretches of major dams (Tarbela, Mangla).
- Flash Flood: Flash Flood" includes not only Hill Torrent/Nullah Flood but also city floods. Compared to River Flood, the flooding period is shorter but their flows have comparatively rapid velocities. "Flash Flood" results from short-time extreme rainfall phenomena within a narrow range.
- Landslide: Strictly speaking from geological engineering aspects, "Slope Failure" and "Landslide" have differences in the mechanism of collapse. These phenomena are treated as "Landslide" in the Project since methodology of public awareness and public evacuation regarding EWS is mostly the same approach.

  Besides, "Landslides" result from not only from the soil in the slope being saturated with water but also from earthquakes. As for an early warning system, a "Landslide" caused by saturated slopes due to heavy rainfall may be considered.
- Cyclone: A cyclone is a low/depression beyond a certain intensification of closed, circular fluid motion rotating in the same direction as the Earth. While tropical cyclones can produce extremely powerful winds and torrential rain, they are also able to produce high waves and damaging storm surges.
- Storm Surge: A storm surge is the phenomena of sea level rise associated with a low-pressure weather system, typically a tropical cyclone. Therefore, an early warning plan for "Storm Surge" should be incorporated with that of "Cyclone".
- Drought: A drought is an extended period of weeks, months or years when a region/province notes a deficiency in its water supply. Generally, this occurs when a region receives consistently below-average precipitation. In addition, extreme climate conditions may occur in the future due to global warning. This could have a substantial impact on the ecosystem and agriculture of the affected region.

Additional Information

Safety Measures before and During Floods

Safety measures before and during floods are summarized below.

Before floods

- Know your local flood history.
- Find out from local government agencies or experts at what river height you are unsafe.
- Avoid building in a floodplain unless you elevate and reinforce your home.
- Find out the evacuation route.
- Elevate the furnace, water heater, and electric panel if susceptible to flooding.
- Install "check valves" in sewer traps to prevent floodwater from backing up into the drains of your home.
- Construct barriers (levees, berms, floodwalls) to stop floodwater from entering the building.
- Seal walls in basements with waterproofing compounds to avoid seepage.

During a flood

- Listen to the radio or television or local/government authorities (if present) for information.
- Be aware that flash flooding can occur. If there is any possibility of a flash flood, move immediately to higher ground. Do not wait for instructions to move.
- Be aware of streams, drainage channels, canyons, and other areas known to flood suddenly. Flash floods can occur in these areas with or without such typical warnings as rain clouds or heavy rain.

Drought

Definition

Drought has many definitions. One of the most commonly accepted definitions is that drought occurs in circumstances arising due to "temporary reduction in water availability below the normal or expected level for a specified period".

Source: Presentation on disaster preparedness by Naveed Shahad

Figure 2.47 Situation of Drought

A drought is an extended period of months or years when a region notes a deficiency in its water supply. Generally, this occurs when a region receives consistently below-average precipitation.

Types

Meteorological

Meteorological drought is brought about when there is a prolonged period with less than average precipitation. Meteorological drought usually precedes the other kinds of drought. Meteorological drought is defined as occurring when the seasonal rainfall received over an area is less than 75% of its long-term average value.

Agricultural

Agricultural droughts affect crop production or the ecology of the range. This condition can also arise independently from any change in precipitation levels when soil conditions and erosion triggered by poorly planned agricultural endeavors cause a shortfall in water available to the crops. However, in a traditional drought, it is caused by an extended period of below average precipitation.

An agricultural drought occurs when there is not

Source: Presentation on disaster preparedness by Naveed Shahad

Figure 2.48 Situation of Drought Area

enough soil moisture and the rainfall isn't adequate to support crops. Agriculture drought happens after meteorological drought.

Hydrological

Hydrological drought is brought about when the water reserves available in sources such as aquifers, lakes and reservoirs fall below the statistical average. Hydrological drought tends to show up more slowly because it involves stored water that is used but not replenished. This refers to marked depletion of surface water and fall in water tables. Generally, hydrological drought follows agriculture drought.

Socio-economic

Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply. The supply of many economic goods, such as water, forage, food grains, fish, and hydroelectric power, depends on the weather. Due to variability of climate, water supply is sufficient in some years but not satisfactory to meet human and environmental needs in other years. The demand for economic goods is increasing as a result of increasing population. Supply may also increase because of improved production efficiency and technology.

Scientific Knowledge

Causes

Natural

Generally, rainfall is related to the amount of water vapor in the atmosphere, combined with the upward forcing of the air mass containing that water vapor. If either of these is reduced, the result is drought.

Factors include:

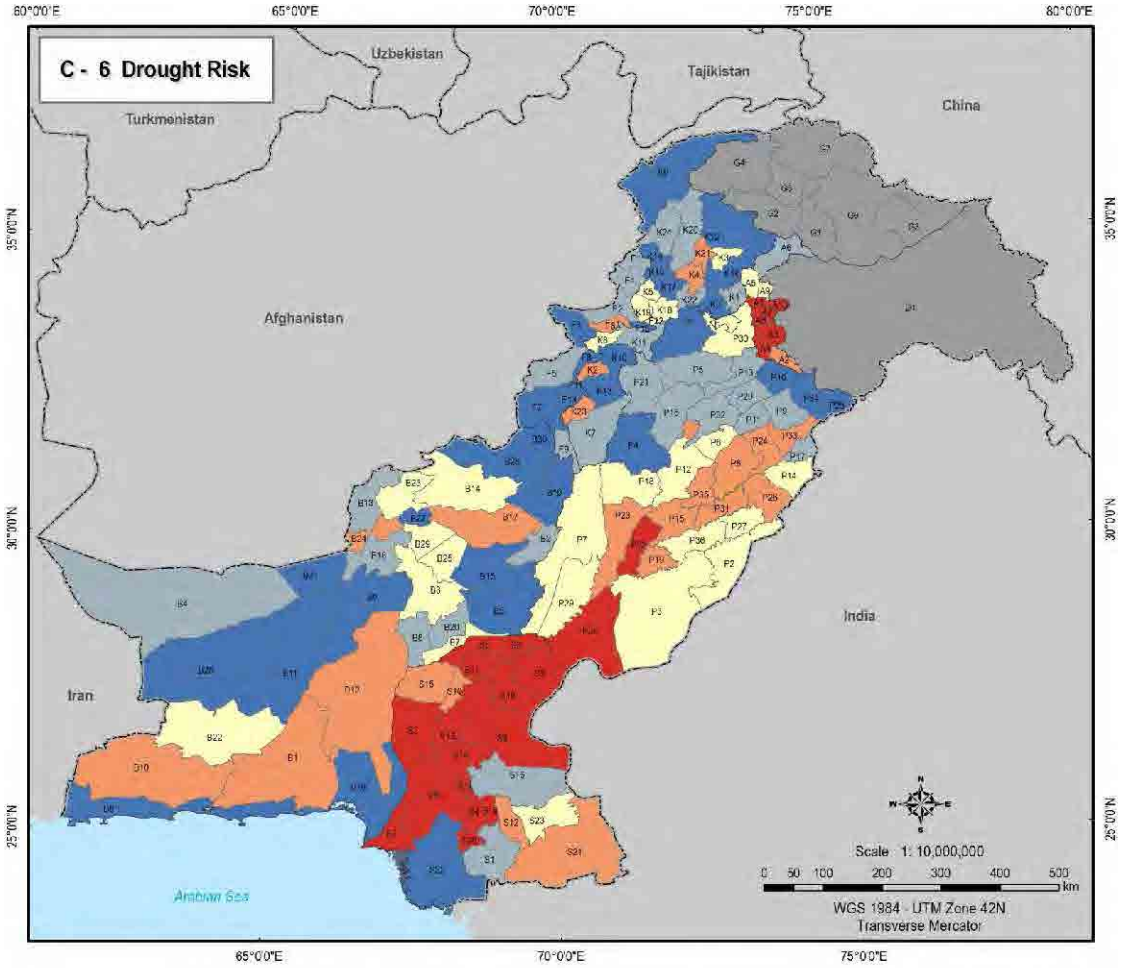
- Above average prevalence of high pressure systems
- Winds carrying continental, rather than oceanic air masses (ie. reduced water content)
- El Nino (and other oceanic temperature cycles)
- Deforestation
- Some speculate that global warming will have a substantial impact on agriculture throughout the world, especially in developing nations.

Human induced causes

Environmental degradation, especially the loss of green cover fields, affects rainfall received in the region, increasing the possibility of water scarcity.

Drought Risk Situation in Pakistan

Figure 2.49 describes the drought risk situation in Pakistan by areas[15].



No.	District Name	No.	District Name	No.	District Name	No.	District Name	No.	District Name
A1	Kech	B20	Nasirabad	G5	Gilgit	P2	Bahawalnagar	P31	Sahiwal
A2	Shimber	B21	Nushki	G6	Skardu	P3	Bahawalpur	P32	Sargodha
A3	Kohi	B22	Pangur	G7	Hunza-Nagar	P4	Bhakkar	P33	Sheikhoupura
A4	Mirpir	B23	Pishin	I1	Islamabad	P5	Chakwal	P34	Sialkot
A5	Muzafarabad	B24	Quetta	K1	Abbotabad	P6	Chiniot	P35	Toba Tek Singh
A6	Neelum	B25	Sibi	K2	Bannu	P7	D. G. Khan	P36	Vehari
A7	Poonch	B26	Zhob	K3	Battagram	P8	Faisalabad	S1	Badin
A8	Sudhnoti	B27	Ziarat	K4	Buner	P9	Gujranwala	S2	Dadu
A9	Hattian	B28	Washuk	K5	Charsadda	P10	Gujrat	S3	Ghotki
A10	Haveli	D29	Harnai	K6	Chitral	P11	Hafizabad	S4	Hyderabad
K1	Awaran	B30	Sherani	K7	D. I. Khan	P12	Jhang	S5	Jacobabad
D2	Darkhan	D1	Disputed Area	K8	Hangu	P13	Jhelum	S6	Jamshoro
B3	Dolan	F1	Bajaur Agency	K9	Haripur	P14	Kasur	S7	Kenarri
B4	Chagai	F2	Khyber Agency	K10	Karak	P15	Khanewal	S8	Kashmore
B5	Dera Bugti	F3	Kurram Agency	K11	Kohat	P16	Khushab	S9	Khairpur
B6	Gwadar	F4	Mohmand Agency	K12	Kohistan	P17	Lahore	S10	Larkana
B7	Jafarabad	F5	North Waziristan Agency	K13	Lakki Marwat	P18	Leiah	S11	Matiari
B8	Jhal Magi	F6	Orakzai Agency	K14	Lower Dir	P19	Lodhran	S12	Mirpur Khas
B9	Kalat	F7	South Waziristan Agency	K15	Malakand	P20	Mandi Bahauddin	S13	Nawabshah Feroze
B10	Kech	F8	FR Bannu	K16	Mansehra	P21	Mianwali	S14	Nawabshah
B11	Khuzar	F9	FR D. I. Khan	K17	Mardan	P22	Multan	S15	Qumbar and Shahdadkot
B12	Khuzdar	F10	FR Kohat	K18	Nowshera	P23	Muzaffargarh	S16	Sanghar
D13	Kola Abdullah	F11	FR Lakki Marwat	K19	Peshawar	P24	Nankana Sahib	S17	Shikarpur
K14	Kola Nandiuh	F12	FR Peshawar	K20	Swabi	P25	Narowal	S18	Sukkur
B15	Kohlu	F13	FR Tank	K21	Swat	P26	Okara	S19	Tando Allahyar
B16	Lasbela	D1	Kohlu	K22	Swabi	K27	Pakpattan	S20	Tando Muhammad Khan
B17	Loralai	G2	Diamir	K23	Tank	P28	Rahim Yar Khan	S21	Tharparkar
B18	Mastung	G3	Ghanche	K24	Upper Dir	P29	Sargodha	S22	Thatta
B19	Musakhel	G4	Ghizer	P1	Attock	P30	Sheikhupura	S23	Umerkot

Legend
Drought Risk Category
Very High
High
Medium
Low
Very Low
Non hazard

Source: JICA Study Team

The Project for National Disaster Management Plan in the Islamic Republic of Pakistan

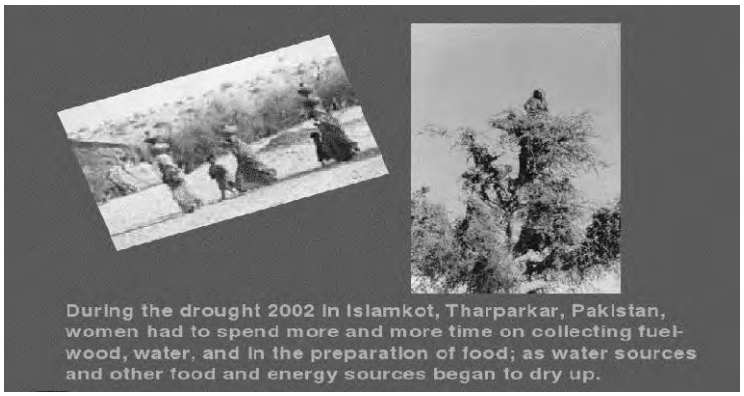
Source: JICA Expert Team

Figure 2.49 Drought Risk Map of Pakistan

[15] Earthquake hazard and risk maps, along with other disasters were prepared in the JICA project for "National Disaster Management Plan in the Islamic Republic of Pakistan" in 2010.

Impact

Agricultural growth suffered a severe setback during 2000-2002 as a result of drought. The majomr crops registered a reduction of almost 10 % while the overall agriculture recorded a reduction of 2.6 %. The drought persisted throughout 2001-2002, resulting in a water shortage of as much as 51% of normal supplies against 40% in the previous year. The total flow of water in major rivers declined (to 109 billion m^3 against an average of 162 billion m^3) 33% from the average. Rainfall had also been below normal. The canal head withdrawals had also witnessed significant decline.



Source: Gender issues in disaster management, glimpse from South Asia, Madhavia, IIDG South Asia, Colombo

Figure 2.50 Gender Issues on Drought

Historical Review

Features of drought of 1997-2001 in Pakistan are summarized below.

- This drought caused a loss of Pak. Rs. 71.50 billion in the agricultural and livestock sector in the year 1999-2000.
- About 2.21 million people and 23.51 million livestock were affected due to severe drought conditions during 1999-2000.
- Sindh had 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

Table 2.7 Impact of 1997-2001 Drought on Agriculture in Balochistan

Crop	% of Farmers that Grow Crops		Average Area Sown (ha)		Average Area Damaged (ha)	
	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated
Wheat	38.2	96.7	5.6	2.5	4.8	0.0
Cotton	1.8	1.7	0.4	8.1	0.2	3.2
Fodder	2.8	4.9	2.2	2.0	1.4	0.6
Vegetable	25.4	7.0	1.7	1.6	1.3	0.6
Orchards	32.0	0.0	0.0	2.8	0.0	2.1

Source: Presentation on: Drought in Pakistan by JICA Study Team

Effects

Economic effects of droughts are as follows:

- Loss of national economic growth, slowing down of economic development
- Damage to crop quality, less food production
- Increase in food prices
- Increased importation of food (higher costs)
- Increased infestation
- Plant disease
- Loss from dairy and livestock production
- Unavailability of water and feed for livestock which leads to high livestock mortality rates
- Range fires and wild land fires
- Damage to fish habitat, loss from fishery production
- Income loss for farmers and others affected
- Unemployment from production declines
- Loss to recreational and tourism industry
- Loss of hydroelectric power
- Loss of navigability of rivers and canals

Environmental effects of droughts are as follows:

Physical

- Scarcity of water for drinking, domestic and irrigation purposes
- Depletion in ground water level
- Reduced flow from perennial water sources
- Land degradation

Bio-physical

- Increase in deforestation
- Scarcity of fodder
- Damage to crop quality
- Livestock death or incapacitation
- Unusual movements of flocks and herds in search of pasture
- Impaired productivity of forestlands
- Direct loss of trees, especially young ones
- Extinction of endangered species and loss of bio-diversity
- Drying up of water sources and deterioration in water quality
- Damage to fish habitat
- Decline in crop production / negative impacts on agricultural economy

Social effects of droughts are as follows:

- Food shortages
- Loss of human life from food shortages, heat, suicides, violence
- Mental and physical stress
- Water user conflicts

- Political conflicts
- Social unrest
- Public dissatisfaction with government regarding drought response
- Inequity in the distribution of drought relief
- Loss of cultural sites
- Reduced quality of life, which leads to changes in lifestyle
- Increased poverty
- Population migrations
- Negative impacts on nutritional status

Effects on increased mental & physical stress (e.g. anxiety, depression, loss of security, domestic violence etc.) and morbidity are as follows:

- Increase in crime rate
- Social cost of migration, e.g., breakup of communities and families
- Inability of certain groups within the population to afford increased food prices results in switch to cheaper and sometimes less preferred foods / reduction in overall food intake, etc.
- Loss of education due to reduction in school attendance by children lacking energy and/or money for fees, and increase in child labor

Mitigation and Preparedness

Drought is a natural hazard, it has a slow onset, and it evolves over months or even years. It may affect a large region and causes little structural damage. The impacts of drought can be reduced through preparedness and mitigation. Some of the preparedness and mitigation measures are

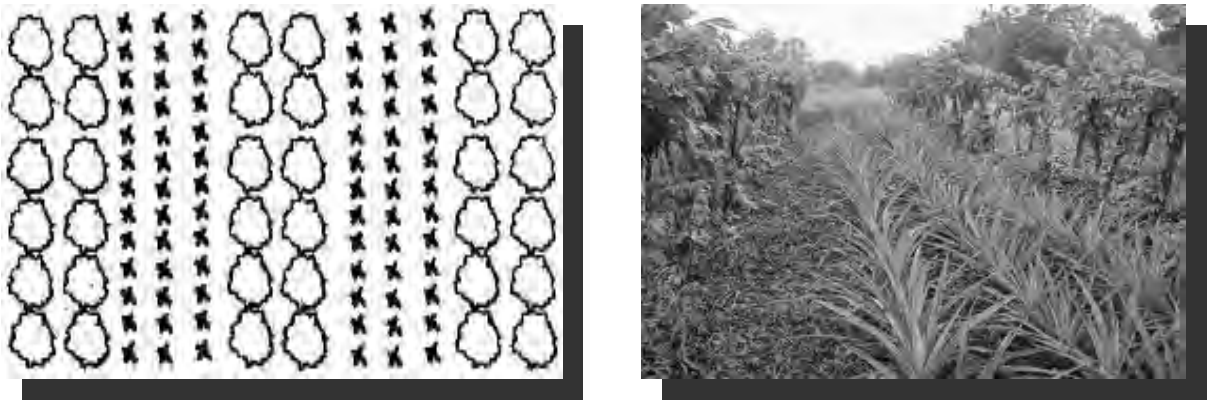
Water Conservation

Means of water conservation are as follows:

Water-Saving Devices - should be incorporated into daily life for using less water (low-flow toilets and showerheads, etc.).

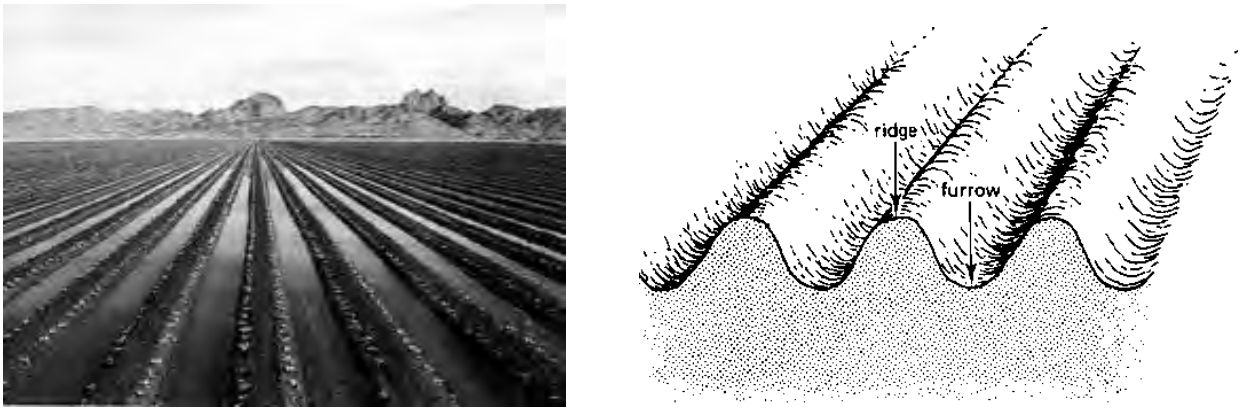
Water Recycling -Former wastewater (sewage) that has been treated and purified for reuse.

Land Use- Carefully planned crop rotation can help to minimize erosion and allow farmers to plant less water-dependent crops in drier years.



Source: Wajid Ali, The National Centre of Excellence in Geology, University of Peshawar

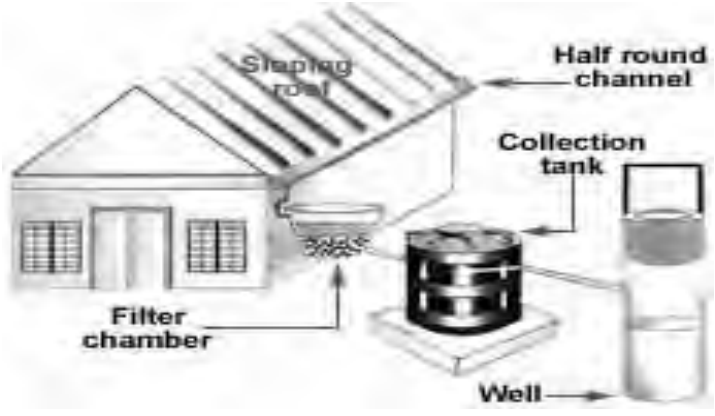
Figure 2.51 Alley Cropping



Source: Wajid Ali, The National Centre of Excellence in Geology, University of Peshawar

Figure 2.52 Furrow System

Rainwater Harvesting - Collection and storage of rainwater from roofs or other suitable catchments



Source; Report on school safety initiatives (Drought), India

Figure 2.53 Rain Harvesting System

Aqueducts - Building canals or redirecting rivers as massive attempts at irrigation in drought-prone areas.

Outdoor Water-Use Restriction -Regulating the use of sprinklers, hoses or buckets on outdoor plants, filling pools, and other water-intensive home maintenance tasks.

Drought Monitoring

Benefits of drought monitoring and its methods are summarized below.

- Continuous observation of rainfall levels and comparisons with current usage levels can help prevent man-made drought. For instance, analysis of water usage in Yemen has revealed that their water table (underground water level) is put at grave risk by over-use from fertilizing their Khat crop. Careful monitoring of moisture levels can also help predict increased risk of wildfires, using such metrics as the Keetch-Byram Drought Index or Palmer Drought Index.
- Creating, storing, and distributing water supplies
- Building the infrastructure for water supplies in drought prone areas (dams, canals, pipelines, wells, etc.)
- Desalination of seawater for irrigation or consumption

Additional Information

Vegetation Cover

Environmental improvements help to restore ecology in the region. Vegetation cover helps the rainwater seep into the ground. This would increase the water table and over time precipitation is also increased due to the vegetation cover.

Source: Wajid Ali, The National Centre of Excellence in Geology, University of Peshawar

Figure 2.54 Mulching and No Tillage Method

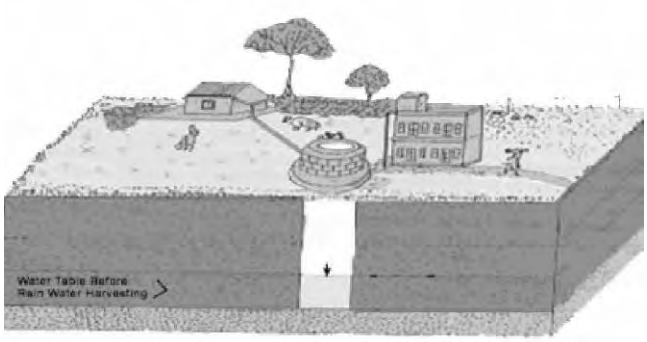
A long-term defence against drought is construction of dams and reservoirs for artificial storage of water. This water is then supplied to the water supply system from these storage reservoirs. Water is stored in the reservoirs during high rainfall periods and then is used during the lean rainfall period. Village ponds and tanks are also good strategies to combat the effects of droughts. The capacity of these ponds and reservoirs will decrease due to the deposition of silt that is carried with the water that comes into the reservoirs. This settles at the bottom. Thus, periodic cleaning of these reservoirs is necessary as the capacity of these ponds, reservoirs, etc. will decrease due to the deposition of silt that is carried in the water.

Water Shed Management

The land area that sheds water into a particular river is called its watershed. The surface runoff from this area ultimately finds its way to the river. When the watershed of the river is heavily forested, the surface runoff is less. Roots of the trees and littered leaves on the ground help in absorbing water. However in deforested areas, the run off from the watershed is considerable. Water here is not retained in the watershed and thus flows into its river and then to the sea. This leads to less groundwater replenishment and the wells also go dry during lean seasons. It is therefore important to grow more and more trees wherever possible or build embankments that will also help to reduce soil erosion.

Rainwater Harvesting

Rainwater harvesting is the collection of rainwater. Rainwater thus collected can be stored for either direct use or can be recharged into the ground. In other words, it implies catching rainwater for use at the place where it falls.

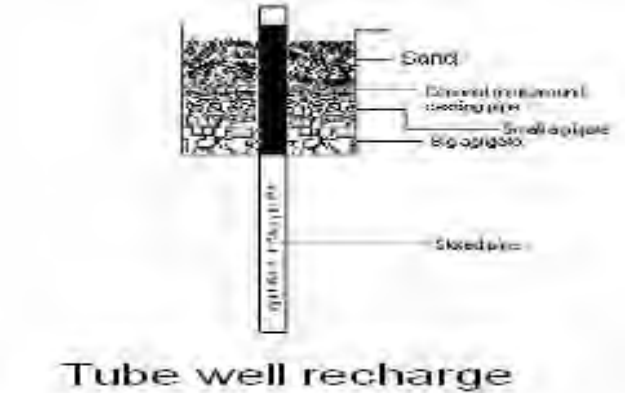


Source: Report on school safety initiatives (Drought), India

Figure 2.55 Rainwater Harvesting

Recharging Groundwater Tube Well Recharging

Using this simple technique, tubes can be recharged easily with rainwater by diverting the farm water towards the tube well through a filter system. In the rainy season all rainwater will go into the tube well.



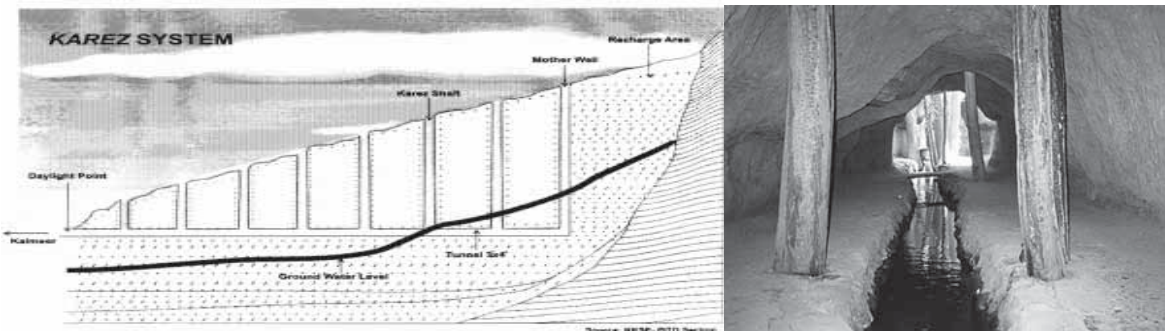
Source: Report on school safety initiatives (Drought), India

Figure 2.56 Tube Well Recharging

Drought Mitigation Measures in Pakistan

Water harvesting conservation by traditional methods

Water harvesting is a common practice in Sindh and Balochistan. Water harvesting captures rainfall and/or runoff and utilizes it for drinking or farming either directly or by storing it in small surface ponds and sub-surface reservoirs like the Krez system.



Source: Report on Drought mitigation in Pakistan, Current Status and options for future strategy by Shahid Ahmed, Zahid Hussain, Rashida Majeed and Mohammad Saleem

Figure 2.57 Traditional Karez System

Small dams

Several small-scale dams have been constructed in hilly and mountainous areas at some places to store rainwater. These are typical in the Kohistan area of Sindh.

Wells

In most of the rangelands, the most dependable and common source of water is a well where ground water is of drinkable quality. The wells are dug along riverbeds and channels to harvest the shallow seepage water.

Source: Report on Drought mitigation in Pakistan, Current Status and options for future strategy by Shahid Ahmed, Zahid Hussain, Rashida Majeed and Mohammad Saleem

Figure 2.58 Well

Artificial recharge to ground water

A possible solution is artificial recharge of groundwater. The artificial recharge techniques include:

- planting of appropriate plant species
- inverted wells
- recharge dams
- loose stone check dams
- deep dug wells
- ponds and recharge basins
- depressions
- benching
- spreading of water

Watercourse improvement

Considerable wastage of water occurs in watercourses. In Sindh Province, such losses were in the range of 44%. After lining with Poly Vinyl Chloride (PVC) Geo-membrane, water losses were reduced to 33%. Overall in Pakistan, about 33% of total watercourses have been improved.

Improved furrow-ridge planting

The basin irrigation method is commonly used in the Sindh and Balochistan provinces, with the highest water consumption and the lowest water efficiency. Furrow-bed irrigation is considered the most efficient method of water application. Raising row crops like cotton on beds with row-to-row spacing of 75cm is gaining popularity amongst the farmers, mainly because it saves water; the cost of crop production is also substantially reduced. Planting of cotton in beds and furrow irrigation has resulted in a 30-35% increase in yield with around a 40-45% saving in water **(**International Water Management Institute:IWMI 1999a). The technique is also being evaluated for rice production and has the potential to enable growing rice with less water (Gill et al., 2002)

Adjusting cropping patterns

Sindh: Cotton instead of rice, sugarcane instead of mango and banana orchards

Balochistan: Apple orchards replaced with pomegranate

Drought monitoring

Monitoring of drought related hydro-meteorological and other variables in Pakistan is carried out by several agencies, including the Pakistan Meteorological Department, Water and Power Development Authority, Provincial Irrigation and Drainage Authorities and district governments.

Developing regional drought monitoring systems

The success of drought preparedness and mitigation depends, to a large extent, upon timely information on the components of any drought management program. Drought monitoring and early warning systems should be the major national initiatives emphasize this need.

Analysis of drought related policies and institutions

The success of drought mitigation is determined by the effectiveness of drought related policies and institutions.

A number of issues for policy development will certainly also emerge from the results of socio-economic surveys described in the next section.

All studies emphasize that a shift is needed from the current emphasis on ad-hoc relief measures to drought preparedness with a focus on measures taken in advance of a drought.

A Pakistan study revealed that no national-level integrated institutional mechanism is operational in the country at present and that drought related programs at federal and provincial levels and the efforts of civil society and NGO's are not coordinated. The suggestion was made to develop a National Drought Policy Commission, which will guide the relevant policy and institutional development for drought mitigation and will coordinate the different ministries and line agencies involved. For implementation of the National Drought Policy to be developed, it is suggested to establish an apex organization, which would coordinate and monitor policy interventions at the federal level and motivate provincial governments to establish similar organizational set-ups. A drought expert's input will be useful to prepare the outline for the proposed organization at all levels.

Source: Wajid Ali, The National Centre of Excellence in Geology, University of Peshawar

Figure 2.59 Water Dripping Irrigation

Socio-economic surveys

Where livelihoods of the large strata of population are directly dependent on agriculture, physical water availability and access to reliable water sources are the two fundamental factors influencing the level of poverty in general and the magnitude of detrimental impacts of droughts and responses to drought in particular. The agricultural sector is the most vulnerable to drought. Traditional irrigation systems get completely exhausted during prolonged droughts and rehabilitation of such systems should be given a priority.

Consequences of Droughts

The present drought situation in Pakistan is as follows.

- Diminished crop growth or yield productions and carrying capacity for livestock
- Dust bowls, themselves a sign of erosion, which further erode the landscape

- Dust storms, when drought hits an area suffering from desertification and erosion
- Famine due to lack of water for irrigation
- Habitat damage, affecting both terrestrial and aquatic wildlife
- Malnutrition, dehydration and related diseases
- Mass migration, resulting in internal displacement and international refugees
- Reduced electricity production due to insufficient available coolant for power stations; and reduced water flow through hydroelectric dams
- Shortages of water for industrial users
- Snake migrations and increases in snakebites
- Social unrest
- War over natural resources, including water and food

Present Drought Situation in Pakistan

The present drought situation in Pakistan is as follows.

- The Government of Balochistan has declared all 22 districts as calamity-hit on account of drought. The only exceptions are the urban parts of Quetta and Pat Feeder regions. The affected districts are Quetta, Chagai, Kharan, Khuzdar, Kalat, Mastung, Loralai, Killa Saifullah, Pishin, Zhob, Kohlu, Lasbela, Sibi, Dera Bugti, Ziarat, Awaran, Kech, Panjgoor, Killa Abdullah, Gwadar, Kachhi and non-irrigated areas of Tehsils Chattar and Tamboo of Nasirabad District.
- The Government of Sindh has likewise declared the entire Tharparkar and Dadu districts calamity-hit along with parts of 10 other districts as well as the defunct Malir district. The districts declared calamity-hit are: Tharparkar, Dadu, Thatta, Mirpurkhas, Badin, Ghotki, Sanghar, Larkana, Jacobabad, Sukkur, Khairpur, Shikarpur and parts of the defunct Malir district.
- Attock District in Punjab has also been declared c calamity-hit by the provincial government due to the drought. Additionally, the rain fed regions of Punjab province namely: Pothohar belt, Mianwali, D.G. Khan, Rajanpur and southern districts of Punjab province continue to suffer from serious drought affects.
- The Khyber-Pakhtoonkhwa Government has declared Haripur and Mansehra districts as calamity-hit. The southern districts of the province, namely: Kohat, Karak, Bannu and D.I. Khan, are also impacted by the ill effects of drought.

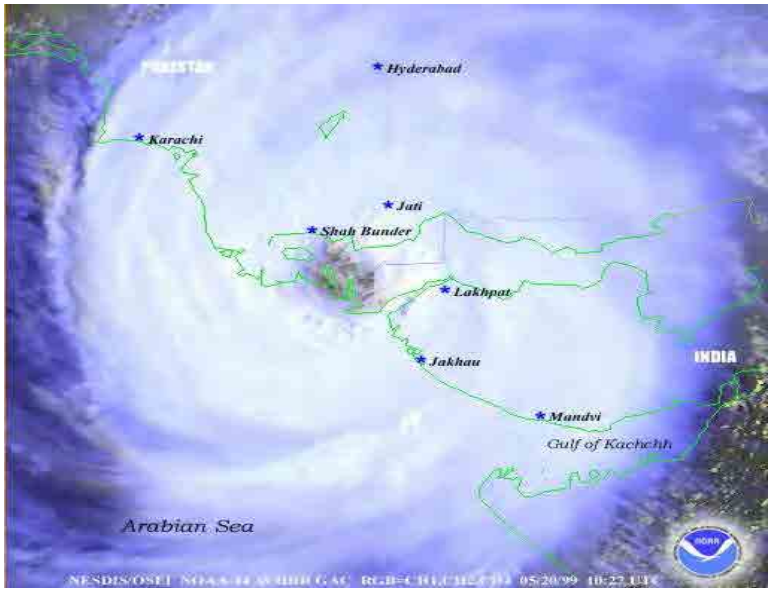
Cyclone

A cyclone is an area of closed, circular fluid motion rotating in the same direction as the Earth. This is usually characterized by inward spiraling winds that rotate counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere of the Earth.

Scientific Knowledge

Causes

Cyclones (including typhoons and hurricanes) are caused by warm tropical moisture bearing clouds developing in open oceans or seas. Cyclones can only form over warm waters in the tropical regions of the oceans where the sea temperatures are 26.5 degrees Celsius or higher. They occur in areas of very low pressure when air that is heated by the sun rises rapidly, and becomes saturated with moisture which then condenses into high thunderclouds.



Cyclones circulate counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere

Source: National Oceanic Atmospheric Administration (NOAA), Cyclonic Storm on Thatta & Badin Districts on 20/05/1999.

Figure 2.60 Cyclone Storm on Thatta and Badin on 20/05/1999

When the hot air rises, cooler air rushes in to fill the area left vacant by the hot air. The Coriolis Effect of the Earth spinning on its axis causes the air to spiral upwards with considerable force. This in turn causes the winds to rotate faster, causing the tropical low to deepen in intensity into a tropical depression, and eventually a cyclone, which is anywhere between hundreds of kilometers to thousands of kilometers wide.

Formation

Four atmospheric and oceanic conditions are necessary for development of a cyclonic storm:

- A warm sea temperature in excess of 26 °C, to a depth of 60 m
- High relative humidity (degree to which the air is saturated by water vapor) of the atmosphere to a height of about 7000 m
- Atmospheric instability (an above average decrease of temperature with altitude)
- A location of at least 4-5 degrees of latitude from the Equator allows the influence of the forces due to the earth's rotation (Coriolis force) to take effect in inducing cyclonic wind circulations around low pressure centres.

Types of Cyclones

Types of cyclones are categorized as follows:

- A **tropical cyclone** is the generic term for non-frontal synoptic scale low-pressure systems over tropical or sub-tropical waters with organized convection (i.e. thunderstorm activity) and definite cyclonic surface wind circulation.
- **Tropical Depressions** is a cyclone with maximum sustained surface winds of less than 17 m/s (34 kt, 39 mph).
- If a **Tropical Storm** is with winds of at least 17 m/s (34 kt, 39 mph), a name is assigned. If winds reach 33 m/s (64 kt, 74 mph), then they are called as follows.
  - **"Hurricane"**: occurs in the north Atlantic Ocean, the northeast Pacific Ocean east of the dateline, or the south Pacific Ocean east of 160oE
  - **"Typhoon"**: occurs in the northwest Pacific Ocean, west of the dateline
  - **"Severe tropical cyclone"**: occurs in the southwest Pacific Ocean, west of 160oE or Southeast Indian Ocean east of 90oE
  - **"Severe cyclonic storm"**: occurs in the north Indian Ocean
  - **"Tropical cyclone"**: occurs in the southwest Indian Ocean

Tropical cyclones are classified according to the maximum winds that accompany them as indicated in the following:

Table 2.8 Major Types of Cyclone

Type		Classification
Depression		winds up to 33 Knots
Cyclone	Storm	winds from 34 to 47 Knots
	Severe Tropical Storm	winds from 48 to 63 Knots
	Categorized Cyclone (Hurricane)	winds of 64 Knots or more

Source: PMD

Scales of Intensity

Intensity of a "tropical cyclone" is determined according to:

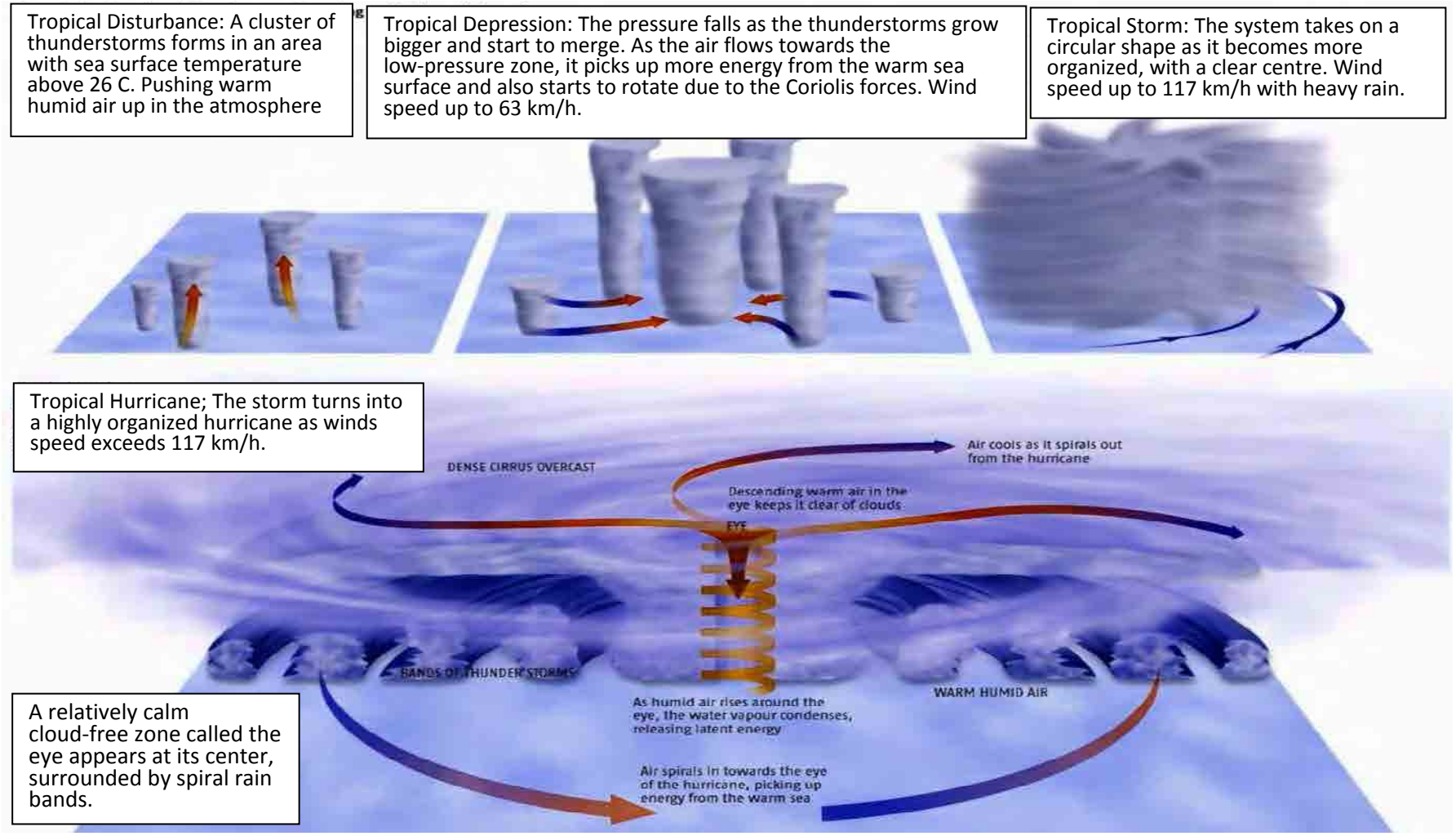
- the Saffir-Simpson Scale in the United States, and
- the Beaufort Scale.

The intensity of a cyclone with winds of 64 knots or more has been divided into the following five categories shown in the Table 2.9.

Table 2.9 Categories of Cyclone

Category	Sustained Winds	Storm Surge (feet)	Central Pressure (mbar)
Category-1	64-82	4-5	980-989
Category-2	83-95	6-8	965-979
Category-3	96-113	9-12	945-964
Category-4	114-135	13-18	920-944
Category-5	>136	>19	<920

Source: PMD



Source: Causes, impacts and associated secondary hazards of cyclones, presentation by Sajid Mahmood Farooqi, University of Karachi.

Figure 2.61 Generating Mechanism of Cyclone

Source: Causes, impacts and associated secondary hazards of cyclones, presentation by Sajid Mahmood Farooqi , University of Karachi.

Figure 2.62 Situations of Tropical Storm by Categories

Cyclone Warning Centres

There are six Regional Specialized Meteorological Centres (RSMCs) worldwide. These organizations are designated by the World Meteorological Organization and are responsible for tracking and issuing bulletins, warnings, and advisories about tropical cyclones in their designated areas of responsibility.
Additionally, there are six Tropical Cyclone Warning Centres (TCWCs) that provide information to smaller regions.
Pakistan Meteorological Department (PMD) is responsible for issuing cyclone warnings and updates at the national, provincial and district levels.

Cyclone Risks in Pakistan

Features of cyclone risks in Pakistan are summarized below.

- Due to the rarity of the phenomena this hazard has gotten little attention and usually only after the hazard strikes.
- Only three tropical cyclones of different intensities have made landfall on Pakistani coasts.
- Changing global climatic patterns are showing a change in the trend of occurrences of weather related hazards.
- The Pakistani coast being in a subtropical location and in close vicinity to warm waters might be hit by tropical cyclones in the future.
- There is an ever increasing need to be prepared in advance to cope with any such disastrous event in the future.

Areas Vulnerable to Cyclones

Areas that are vulnerable to cyclones are as follows:

- Sindh Province (Karachi, Thatta, Badin)
- Balochistan Province (Gwadar, Kech, Lasbella)

Impacts

Historical review

The history of cyclone occurrences is described as below.

- **The Cyclone of 1999** seriously impacted Thatta and Badin Districts (affected 0.6 million people and caused the loss of 202 lives)
- **Cyclone Yemyin in 2007** affected 26 districts of Balochistan and Sindh (affected 2.5 million people and caused loss of 400 lives).

  Damages in Sindh

  - 110 dead
  - Approx 50,000 homeless

- Over two dozen missing at sea
- Severe electric power disruption; especially in Karachi
- Damage to crops, orchards, poultry farms, livestock and fishing boats
- Over 3000 kacha houses damaged

Damage in Balochistan

- 132 dead
- 170 people missing
- Total affected population was one million
- Over 100,000 homeless due to collapsed/ damaged houses
- Severe disruption of electric power, water and communications
- Large-scale damage to Makran coastal highway

- **Phet Cyclone 2010**
  - On 31 May 2010, a tropical depression in the Central Arabian Sea resulted in formation of tropical cyclone "Phet". "Phet" struck the northeast tip of Oman coast during the night of June 4, 2010 and moved towards the coastal areas of Balochistan and Sindh. Cyclone Phet entered Pakistan's coastal areas on June 6, 2010 with a sustained wind speed of 60 to 80 km/hour. Phet had already lost much of its intensity after hitting the Omani coastal areas two days prior to reaching landfall in Pakistan. By the time it hit the coastal area of Pakistan, the cyclone had been downgraded to a tropical storm. Nevertheless, Phet caused heavy rainfalls – as much as 370 mm in the coastal town of Gwadar in Balochistan.
  - The cyclone narrowly missed Karachi and made landfall near the fishing town of Keti Bandar and then it hit Thatta, Badin and Hyderabad Districts in Sindh. The storm disrupted life in the coastal areas of Balochistan and Sindh, where several hundred mud houses collapsed and roads were blocked and damaged. Thousands of coastal communities were evacuated before the cyclone hit the coastal areas and as a result, the loss of lives was greatly reduced.

Means of Destruction

Tropical cyclones are characterized by their destructive winds, storm surges and exceptional level of rainfall that may cause flooding.

Destructive winds

- The strong winds generated by a tropical cyclone circulate counterclockwise in the Northern Hemisphere, while spiraling inwards and increasing toward the cyclone centre. Wind speeds progressively increase toward the core.
- 150 to 300 km from the centre of a typical mature cyclone, winds of 63-88 km/h
- 100-150 km from the centre, storm force winds of 89-117 km/h

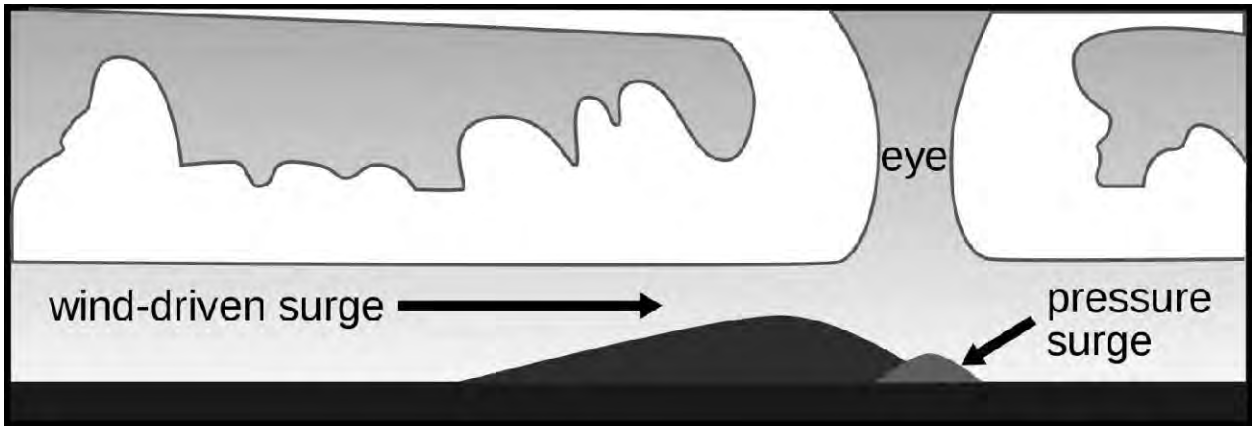
- 50 to 100 km from the centre; winds in excess of hurricane force, 117 km/h or greater
- 20 to 50 km from the centre, on the edge of the inner core contains winds 250 km/h or higher

Storm Surges

- The storm surge, defined as the rise in sea level above the normally predicted astronomical tide, is frequently a key or overriding factor in a tropical storm disaster
- The friction of strong on-shore winds on the sea surface
- Suction effect of reduced atmospheric pressure
- Piling up of the sea water along a coastline near a cyclone's landfall
- In cyclones of moderate intensity the surge effect is limited to several meters
- In the case of exceptionally intense cyclones, storm surges of up to eight meters can result

Major factors include the following:

- A fall in the atmospheric pressure over the sea surface
- The effect of the wind
- The influence of the sea bed
- A funneling effect
- The angle and speed at which the storm approaches the coast
- The tides



Source: Causes, impacts and associated secondary hazards of cyclones, presentation by Sajid Mahmood Farooqi, University of Karachi.

Figure 2.63 Situation of Surge

Associated Secondary Hazards

Exceptional rainfall occurrences

The world's highest rainfall totals over one or two days have occurred during tropical cyclones. The highest 12 and 24-hour totals, 114 cm and 182 cm have both occurred during cyclones at La Reunion Island in the SW Indian Ocean. The very high specific humidity condenses into exceptionally large

raindrops and giant cumulus clouds, resulting in high precipitation rates. When a cyclone makes landfall, the rain rapidly saturates even dry catchment areas and rapid runoff may explosively flood the usual watercourses and create new ones.

Physical damage

Structures can be damaged or destroyed by wind force, through collapse from pressure differentials, by flooding, storm surge and landslides. Standing crops may be lost to floods, storm surges, and seawater salinity. Salt from storm surges may also be deposited on agricultural lands and increase groundwater salinity. Fruit, nut or lumber trees may be damaged or destroyed by winds, flood or storm surges. Plantation type crops such as banana and coconut are extremely vulnerable.

Erosion could occur from flooding and storm surges. Additional items subject to severe damage include overhead power lines, bridges, culverts and drainage systems, jetties and retaining walls, embankments and coastal dikes, general lack of weatherproofing of buildings, huge losses to building work in progress, scaffolding, marinas, and roofs of most structures. Falling trees, wind-driven rain and flying debris cause considerable damage.

Casualties and public health

There are usually relatively few fatalities but there may be numerous casualties requiring hospital treatment due to the high winds associated with cyclonic storms. Storm surges may cause many deaths but usually few injuries among the survivors. Due to flooding and possible contamination of water supplies, malaria and other viruses may be prevalent several weeks after the flooding.

Contamination of water supplies

Open wells and other ground water supplies may be temporarily contaminated by floodwaters and storm surges. They may be contaminated by pathogenic (disease producing) organisms if bodies of people or animals are lying in the sources or sewage is swept in. Normal water sources may be unavailable for several days.

Disruption of communications and logistics

Communications may be severely disrupted as telephone lines, radio antennas and satellite disks are brought down, usually by wind. Roads and railroad lines may be blocked by fallen trees or debris and aircraft movements will be curtailed for at least 12 to 24 hours after the storm. Modes of transportation such as trucks, carts and small boats may be damaged by wind or flooding. The cumulative effect of all damage will be to impede information gathering and transport networks.

Mitigation and Preparedness

Structural

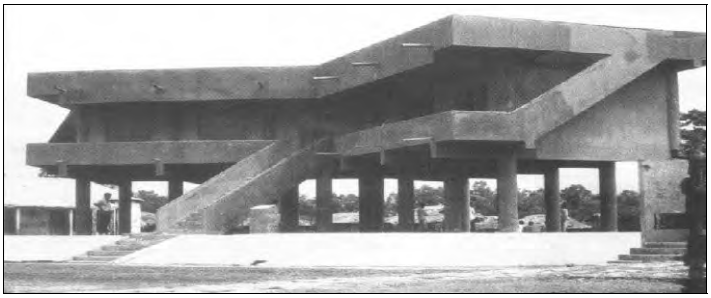
Sea walls and embankments

A sea wall is a coastal defence constructed usually of reinforced concrete on the inland part of a coast to prevent the ingress of storm surges arising out of cyclones. The height of the sea wall is determined

according to the maximum observed height of storm surges, which may be as high as 10 m (30 ft approximately). Sea walls and embankments are a massive and capital-intensive solution, and therefore can only be recommended when valuable assets like a city or harbor is to be protected.

Cyclone shelters

Community cyclone shelters constructed at appropriate places can provide immediate protection from deaths and injuries to the vulnerable communities. Such shelters are usually built on pillars above the danger level of storm surges/ inundation, are spacious enough to accommodate a few hundred people of neighboring hamlets and provide provisions of dinking water, sanitation, kitchens, etc. During the normal times such shelters can be utilized as schools, dispensaries or for other community purposes.



Source: Caritas, 1992

Figure 2.64 Community Cyclone Shelter

Bio shields

Bio shields usually consist of mangroves, palms, bamboos and other tree/shrub species that inhabit lower tidal zones. These can block or buffer wave action with their trunks which can measure up to 30 m (90 feet approximately) and several meters in circumference. They trap sediments in their roots; thereby maintaining a shallow slope on the seabed that absorbs the energy of tidal surges. They also block the high velocity of winds and thus protect the agricultural crops and shelter grazing land for the livestock and farms. Besides this, they promote sustainable fisheries by releasing nutrients into the water.

Early warning and communication

Early warning of cyclones and its dissemination to the local habitants is an important preparatory measure to reduce the loss of life and property during cyclones. With the rapid development of science and technology, it is possible to tack the movement of atmospheric depressions and accurate early warnings can be issued 48-72 hours in advance regarding the probability of a cyclone. Such warnings are broadcast though radio and television networks for the information of the people in the coastal areas. The dissemination system can be made more effective with the active involvement of the communities and households in the preparation of their own cyclone contingency plans.

Cyclone resistant housing and infrastructure

Avoid linear-type development because the wind forces through straight, open and parallel channels increases in speed, the “wind-tunnel effect”. Implement and ensure building safety measures i.e. cyclone

resistant construction techniques for new construction and retrofitting of the old structures can reduce the risk of loss of life and property.

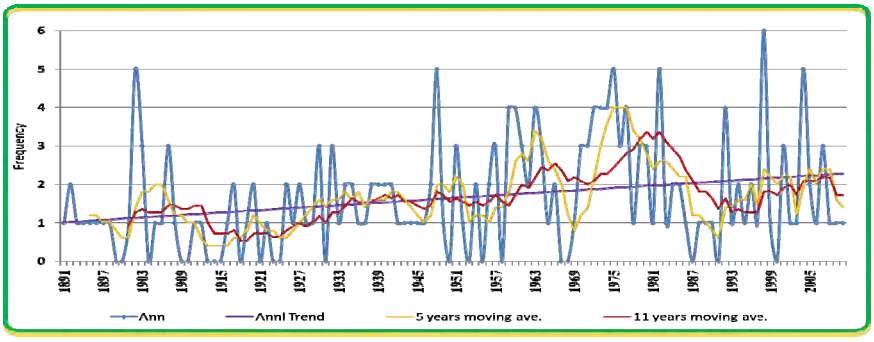
Non-Structural

- Awareness and educational campaigns that provide advice to the community on cyclone preparedness as well as mitigations measures
- Risk communication
- Information sharing regarding threats and possible mitigation measures
- Capacity building and training to all concerned stakeholders (govt. officials, search and rescue workers, volunteers, women, children, elderly, and the local community as a whole).
- Coastal regulations Zone Act amalgamation & implementation (no development within 500 m of the high tide line with an elevation of less than 10 m above mean sea level)
- Evacuation plans to be developed and shared with all stakeholders.
- Contingency plans at all levels (community, government and civil society), which include disaster mitigation strategies with emphasis on self reliance for sustenance within the coastal community
- Maintaining natural sand dunes

Additional Information

Historical Damages[16]

About 14 cyclones were recorded during the period 1971-2001. Meteorological data on the cyclonic storms in the north Arabian Sea is available for more than a century. During the last 100 years, a number of cyclonic storms have struck Pakistan's coastal areas. Including the intensity of the depression, there were approximately 200 cyclones and depressions spawned during the period of 1891-2010 as shown below.



Source: Muhammad Riaz, Chief Meteorologist, PMD

Figure 2.65 Annual Frequency of Tropical Cyclones and Depressions over the Arabian Sea (1891-2010)

[16] Source: JICA Expert Team.

The years when these cyclones and depressions occurred in Pakistan are as follows:

Table 2.10 Years Having Cyclone Occurrence in Pakistan

Item	Years
Years Involved	1895, 1902, 1907, 1948, 1964, 1965, 1985, 1993, 1998, 1999, 2007 and 2010

Source: JICA Study Team

The cyclonic storms in 1895 struck the Mehran coast near Pasni and Jiwani. In the early 1900s, three cyclonic storms–two in 1902 (13 May and 16 June) and one in 1907 (6 June) - struck the coast in the vicinity of Karachi within a short span of six years. The cyclonic storm in 1964, which actually entered the Indian coast, caused great loss of life and property in Hyderabad and Tharparkar districts as it moved northeastward into south eastern areas of Sindh. The cyclonic storms in 1984 struck the Mehran coast near Pasni and Jiwani, similar to the cyclone of 1895. In 1998 and 1999, southwestern districts in Sindh were affected by the Cyclones Gujarat and 2A in 1998 and 1999, respectively.

The 2007 cyclone (Cyclone Yemyin) killed at least 213 people in Karachi from rains and winds that might have been associated with an outer band of the cyclone, packing at least 70 mph (112 km/h) winds that lashed at the city on 23 June 23 2007. PMD had warned of heavy rains and wind from the system as early as 22 June. The heavy downpour also flooded the Kech Korandi riverine, inundating the city of Turbat and forcing more than 10,000 people to evacuate their houses. At least another 380 people died in Balochistan, with another 250 dead in Sindh and 100 in KP. More rains associated with the remnants of the cyclone hampered rescue efforts. The cyclone affected at least 10 districts of Balochistan and 4 districts of Sindh, affecting the lives of at least 1.5 million people. At least 2 million people were indirectly affected by the cyclone from power outages and water shortages in Balochistan. More than 2 million livestock, worth over Rs.4 billion, were killed by the cyclone. Property losses from the storm were estimated at Rs.24 billion.

In 2010, Cyclone Phet brought extremely heavy rainfall over the coastal areas of Balochistan (Gwadar 370 mm, Jiwani 208 mm, Pasni 139 mm) accompanied with very strong winds gusting to 120 km/h. On 6 June, rain started in Karachi (Masroor 133 mm, Faisal 92 mm, Saddar 84 mm up to midday of 6 June) with 35 mph (56 km/h) winds under the influence of the cyclone, disrupting the city's railways and electricity transmission systems. At least 15 people were killed, mostly by electrocution, and dozens were injured. Cyclone Phet has also left thousands of Pakistanis homeless. In the evening, the storm moved past Karachi about 50 km away and made landfall between the coastlines of Thatta and Badin, causing heavy rains in the area. The Hyderabad power supply was also disrupted from the downpour.

References:

1. Sajid Mahmood Farooqi, Research Student University of Karachi, Presentation presented in cyclone training, April 26, 2010, Organized by NIDM
2. Wajid Ali, National Centre of Excellence in Geology, University of Peshawar
3. Power Point Presentation: Scientific Knowledge on Cyclones in Pakistan, JICA Expert Team
4. NOAA Technical memorandum

Landslide

The term "landslide" describes a wide variety of processes that result in the downward and outward movement of slope-forming materials including rock, soil, artificial fill, or a combination of these. The materials may move by falling, toppling, sliding, spreading, or flowing.

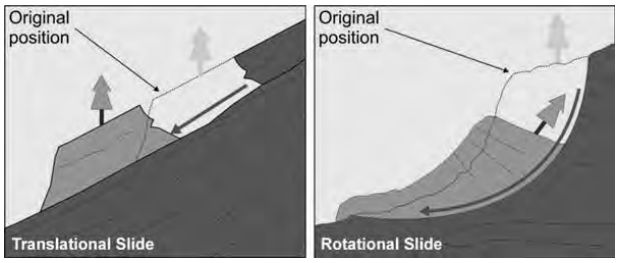
Definition

Debris and mudflows are rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or "slurry." They can flow rapidly, striking with little or no warning at avalanche speeds. They can also travel several miles from their source, growing in size as they pick up trees, boulders, cars, and other materials.

Types

Although landslides are primarily associated with mountainous regions, they can also occur in areas of generally low relief. In low-relief areas, landslides occur as cut-and-fill failures (roadway and building excavations), river bluff failures, lateral spreading landslides, collapse of mine-waste piles (especially coal), and a wide variety of slope failures associated with quarries and open-pit mines. The two major types of slides are **rotational slides** and **translational slides**. Slide types and images are shown on the right.

Source: Earthquake Engineering Field Investigation Team (EEFIT) report on Atabad landslide, Hunza
Richard Huhges, Consultant, Aga Khan Cultural Services



Source: Geological Survey of Canada

Figure 2.66 Atabad Landslide Area

Scientific Knowledge

Causes

Landslide problems can be caused by land mismanagement, particularly in mountain, canyon, and coastal regions. Land-use zoning, professional inspections, and proper design can minimize many landslide, mudflow, and debris flow problems.

A landslide occurs when part of a natural slope is unable to support its own weight. For example, soil material on a slippery surface underneath, can become heavy with rainwater and slide downward due to its increased weight. A landslide is a downward or outward movement of soil, rock or vegetation under the influence of gravity. This movement can occur in many ways. It can be a fall, topple, slide, spread or flow. The speed of the movement may range from very slow to rapid. The mass of moving material can destroy property along its path of movement and cause death to people and livestock.

Impact

Historical Events

Pakistan 2005 earthquake

The magnitude 7.6 earthquake that shattered Pakistan on October 8, 2005, caused the most damage in the region surrounding the city of Muzaffarabad, about 10 kilometers southwest of the earthquake's epicentre. The quake flattened buildings and triggered landslides throughout Kashmir. The Ikonos satellite captured an image of a landslide (top) in Makhri, a village on the northern outskirts of Muzzaffarabad, on October 9 2005. The western face of the mountain has collapsed, sending a cascade of white-grey rock into the Neelum River. The landslide is likely only one of many to occur along the river, which was almost unrecognizable after the earthquake.

Source: http://earthquakeobservatory.nasa.gov/images/imagerecords/5000/5952/neelum_iko2005282_irg.jpg

Figure 2.67 Satellite Image after 2005 Earthquake

Hunza Landslide 2010

On January 4th, 2010 in the remote Hunza River Valley of northern Pakistan, a massive landslide buried the village of Attabad, destroying 26 homes, killing 20 people, and damming up the Hunza River. As the newly-formed lake grew, authorities rushed to evacuate and supply those affected in the landslide area and upstream. The lake is now over 300 feet deep and 16km (10 mile) long, submerging miles of highway, farms and homes.

Source: EEFIT report on Atabad landslide, Hunza Valley, Northern Area of Pakistan, Richard Hughes, Consultant, Aga Khan Cultural Services

Mitigation and Preparedness

Vulnerability to landslide hazards is a function of location, type of human activity, use, and frequency of landslide events. The effects of landslides on people and structures can be lessened by total avoidance of landslide hazard areas or by restricting, prohibiting, or imposing conditions on hazard-zone activity. Local governments can reduce landslide effects through land-use policies and regulations. Individuals can reduce their exposure to hazards by educating themselves on the past hazard history of a site and by making inquiries to planning and engineering departments of local governments. They can also obtain the professional services of an engineering geologist, a geotechnical engineer, or a civil engineer, who can properly evaluate the hazard potential of a site, developed or undeveloped.

The hazard from landslides can be reduced by avoiding construction on steep slopes and existing landslides, or by stabilizing the slopes. Stability increases when ground water is prevented from rising in the landslide mass by:

- Covering the landslide with an impermeable membrane
- Directing surface water away from the landslide
- Draining ground water away from the landslide
- Minimizing surface irrigation

Slope stability is also increased when a retaining structure and/ or the weight of soil/rock is placed at the toe of the landslide or when mass is removed from the top of the slope.

Debris Flow

Scientific Knowledge

Causes

Debris flows can be triggered by many different situations. Here are a few examples:

Addition of Moisture: A sudden flow of water from heavy rain, or rapid snowmelt can be channeled over a steep valley filled with debris that is loose enough to be mobilized. The water soaks down into the debris, lubricates the material, adds weight, and triggers a flow.

Removal of Support: Streams often erode materials along their banks. This erosion can cut into thick deposits of saturated materials stacked high up the valley walls. This erosion removes support from the base of the slope and can trigger a sudden flow of debris.

Failure of Ancient Landslide Deposits: Some debris flows originate from older landslides. These older landslides can be unstable masses perched on a steep slope. A flow of water over the top of the old landslide can lubricate the slide material or erosion at the base can remove support. Either of these can trigger a debris flow.

Wildfires or Timbering: Some debris flows occur after wildfires have burned the vegetation from a steep slope or after logging operations have removed vegetation. Before the fire or logging the vegetation's roots anchored the soil on the slope and removed water from the soil. The loss of support and accumulation of moisture can result in a catastrophic failure. Rainfall that was previously absorbed by the vegetation now runs off immediately. A moderate amount of rain on a burn scar can trigger a large debris flow.

Volcanic Eruptions: A volcanic eruption can flash melt large amounts of snow and ice on the flanks of a volcano. This sudden rush of water can pick up ash

Emergency and Survival Preparedness Dehydrated Food / Survival Gearwww.crisisfoodsource.com

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and pyroclastic debris as it flows down the steep volcano and carry them rapidly downstream for great distances. In the 1877 eruption of Cotopaxi Volcano in Ecuador, debris flows traveled over 300 kilometers down a valley at an average speed of about 27 kilometers per hour. Debris flows are one of the deadly "surprise attacks" of volcanoes.

Impact

141 Houses (1652 individuals) of Village Attabad & Sarat were displaced due to a landslide on 4 January 2010. The following have been displaced due to inundation (starting from 10 January onwards as of November, 2010):

Village Ainabad	32 Houses
Village Shishkat	130 Houses
Part of Village Gulmit	61 Houses
Hussaini	10 Houses
Gulkin	7 Houses
Total	240 Houses
Grand Total: (including Atta Abad & Sarat)	381 Houses

Mitigation and Preparedness

The following are steps you can take to protect yourself from the effects of a land/debris flow.

- Do not build near steep slopes, close to mountain edges, near drainage ways, or natural erosion valleys.
- Get a ground assessment of your property.
- Consult an appropriate professional expert for advice on corrective measures.
- Minimize home hazards by having flexible pipefittings installed to avoid gas or water leaks, as flexible fittings are more resistant to breakage (only the gas company or professionals should install gas fittings).

Module 3 Risk Assessment / Vulnerability and Capacity Assessment

Risk Assessment Process

The risk assessment process is described in the following steps: 1) Establish context, 2) Identify risks, 3) Analyze risks, 4) Evaluate risks, 5) Treat risks. The stakeholders participate in each step. In 2) Identify risks, hazard assessment, risk assessment, and vulnerability and capacity assessment are conducted.

In this module, 2) Identify risks, 3) Analyze risks, and 4) Evaluate risks are described. Regarding stage 5) Treat risk, and 6) Monitor and Review, modules 4, 5, 6, 7 and 8 describe the activities respectively.

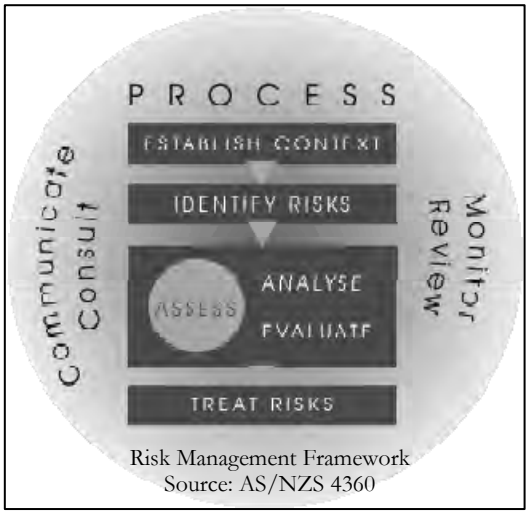


Figure 3.1 Risk Management Framework

Table 3.1 Disaster Management Process and Contents

Process	Contents
Establish Context	Objectives Stakeholders Criteria Define key elements
Identify Risks	What can happen? How can it happen? ● Hazard Assessment ● Risk Assessment ● Vulnerability and Capacity Assessment
Analyze Risks	Review controls Likelihoods Consequences Level of risk
Evaluate Risks	Evaluate risks Rank risks
Treat Risks	Identify options Select best responses Develop risk treatment plans Implement
Monitor and Review	Monitor changing circumstances Monitor operation of other 5 stages
Communicate and Consult	Communicate with all stakeholders Consult so as not to miss high priority issues

Source JICA Expert Team

Hazard Assessment

Hazard assessment is a process of determining the frequency, severity, potential, duration, and impact of hazards. The following table is a sample matrix to summarize the hazard assessment.

Table 3.2 Hazard Assessment

Hazard	Warning Signs	Speed of Onset	Frequency	Duration	Season	Impact
Types of hazard	Scientific and indigenous indicators	Rapidity of arrival	Frequency of occurrence	How long the hazard lasts	When the hazard occurs	Extend of damage, death, injury
Flood	Early warning	3 days	Occasionally in rainy season in July – Sep.	2 weeks	Rainy season in July – Sep.	Some simple houses collapsed, A few deaths and injuries in the severest cases during 10 years
Landslide	…	…	…	…	…	…
…	…	…	…	…	…	…

Recent Emphasis on Vulnerability

In order to understand how people are affected by disasters, it is clearly not enough to understand only the hazards themselves. There are shifts of emphasis in disaster management: from focus on the hazards to focus on vulnerability. Disasters happen when a natural phenomenon affects a population that is inadequately prepared and unable to recover without assistance.

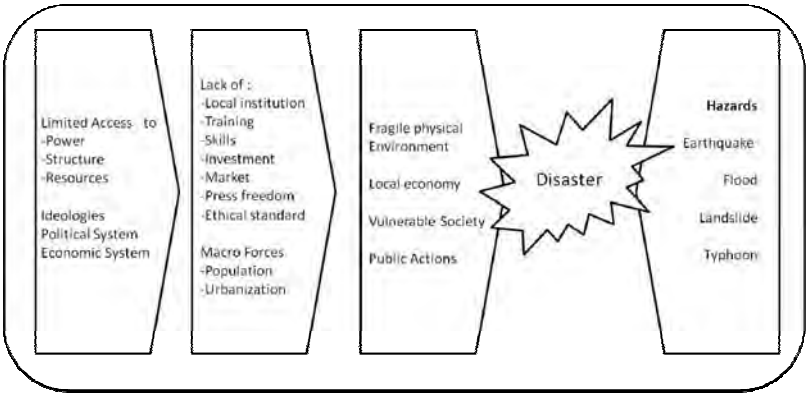
Vulnerability refers to the capacity of an element exposed during the impact of a hazard event.

Pressure and Release Model

The following model shows disaster as the intersection of two forces: those pressures generating vulnerability on the left hand, and physical exposure to a hazard on the right. The left hand side illustrates the progression of vulnerability. A series of levels of social factors generate vulnerabilities. The root causes of the disaster sometimes lie in the distance, like the economic and political sphere. These are normally a function of the economic structure, political system, legal definitions of rights, gender relations, etc.

This model describes the pressure and release function, where disasters are considered as the results of hazard and vulnerability. The vulnerability is a function of physical, social, economic and political factors. The goal of disaster reduction activities is to reduce vulnerability and enhance capacity.

It has been increasingly recognized that while it is important to reduce vulnerability, it is also required to enhance the capacity of the system to cope with the natural disasters. Capacity is often described as the potential in the communities, which should be explored in the appropriate way to maximize its use to reduce the potential losses due to disasters.



Source: Wisner et al. 2004)

Figure 3.2 Pressure and Release Model

VCA Framework

Several VCA frameworks have been suggested by different people. Some of the examples are introduced here. It is not necessary to follow everything, but the framework can be modified according to the local situations.

The most classic framework is the simple matrix of Anderson and Woodrow (1998) for viewing vulnerabilities and capacities in three broad, interrelated areas: physical/material, social/ organizational and motivational/attitudinal. Each of these three areas covers a wide range of features:

- **Physical / Material**

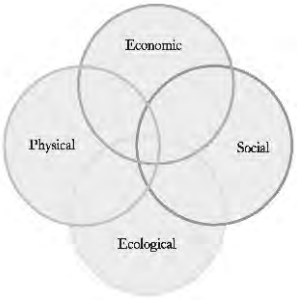
This is the most visible area of vulnerability. It includes land, climate, environment, health, skills and labor, infrastructures, housing, finance and technology.

- **Social / Organizational**

This includes how society is organized, its internal conflicts, and extern al networks.

- **Motivational / Attitudinal**

This includes how people in society view themselves and their ability to affect their environment. It includes ideology, belief system, awareness and traditional wisdom. Living with Risk by UN-ISDR (2004), which is a worldwide white paper for disaster management, describes four aspects of vulnerability, namely social, economic, physical, and environmental ones. It also explains that VCA is one of the steps of a disaster risk management framework.



Source: Anderson and Woodrow (1998)

Figure 3.3 Vulnerability and Capacity Framework

Table 3.3 Vulnerability and Capacity Framework and its Contents

Categories	Contents
Physical	The location considerations and susceptibilities of the built environment density levels, remoteness of a settlement, its sitting, design and materials used for critical infrastructure and for housing
Economic	Economic status / levels of individual, community and national economic reserves, levels of debt and the degree of access to credit and loans, insurance, economy lacking in diversity inadequate access to critical and basic socio-economic infrastructure, including communication networks, utilities and supplies, transportation, water, sewage and health care facilities
Social	Level of well being of individuals, communities and society, levels of literacy and education, the existence of peace and security, access to basic human rights, systems of good governance, social equity, positive traditional values, knowledge structures, customs, ideological beliefs, overall collective organizational systems, less privileged in class and caste structures, ethnic minorities, the very young and very old, disadvantaged and marginalized segments of the population, gender, public health concerning physical, mental and psychological well being, disabilities, predisposition to infection, exaggerated exposure to communicable diseases, lack of defensive mechanisms, insufficient basic infrastructure, especially water supply, sanitation, inadequate health care facilities and supplies, levels of literacy and training, traditional knowledge, systems, and access to information on disaster risk and measures, cultural aspects, such as indigenous beliefs, traditions and ways of coping, deeply rooted beliefs that are destiny oriented or pose a fatalistic vision of disasters, the state of domination and power relations in the concerned society, social cohesion and regulation, social insecurity, decline of traditional structures, civic groups or communities formerly engaged in the collective well being, protection of the weakest people
Ecological	The extent of natural resource depletion, the state of resource degradation, loss of resilience of the ecological systems, loss of biodiversity, exposure to toxic and hazardous pollutants

Source: after ISDR Living with Risk 2004

Vulnerability Assessment

The vulnerability assessment is a process of estimating the susceptibility of 'elements at risk' (people, households, community, facilities, services, livelihood, economic, social activities, natural environment etc.) to various hazards and analyzing the causes due to which they are at risk.

The following table is a sample matrix to summarize the vulnerability assessment.

Table 3.4 Vulnerability Assessment

Hazard	Category	Vulnerability	Impact of Hazard to the Element at Risk	Characteristics of Elements at Risk
Types of hazard	Types of vulnerability	Vulnerable elements	Consequences by the elements at risk	Reasons, root causes, situations of the vulnerabilities
Flood	Physical	Physically challenged	Evacuation difficulties may cause death	Disabilities to evacuate alone
…	…	…	…	…
…	…	…	…	…

Capacity Assessment

Capacity Assessment is the process to determine how people cope in times of crisis to reduce the damaging effects of hazards. Through capacity assessment, the community's coping strategies and resources that are available for disaster preparedness, mitigation and prevention are identified. The capacity assessment process involves 1) understanding people's previous experiences and actions involving hazards, 2) the coping strategies they have developed, and 3) analyzing available resources used and that can be used by the community to reduce the disaster impact.

VCA Tools

Different tools are utilized to assess the vulnerabilities and capacities in a participatory manner as is shown in the following table. Most of the tools have their origin in the Participatory Rural Appraisal (PRA) tools. A number of vulnerability and capacity assessment tools exist, and are practiced by different agencies. Among these, the most prominent one is that of the International Federation of the Red Cross for in-depth study.

Table 3.5 VCA Tools

Tools	Description
Reviewing Secondary Data	Compiling different existing data and information
Community Baseline Survey	Interview / Questionnaire survey to be conducted to learn the situation before starting CBDRM activities
Semi-structured Interview Survey	Guided interview in which most questions are open (not decided before hand). It can be conducted to disseminate knowledge and collect information.
Focus Group Discussions	Resource person in the community discusses given topics. Participants can also share views among them. Excellent quality of facilitation Skill is required for the moderator.
Town Watching (Transect Walk)	Observing the situations of the community by walking through to be recorded on a map.
Mapping	Information collected in the town watching is drawn on a map.
Seasonal Calendar	Monthly activities such as harvesting patterns, disasters, economic activities taking place through the year by month are prepared in a chart to analyze the stresses and vulnerabilities.
Historical Profile	The important events and activities are listed and described to understand the community development and social cohesion.
Livelihood Analysis	Livelihood activities, assets, resources and threats to them are described.
Venn Diagram (Institutional and social network analysis)	Local organizations, linkage, and networks are illustrated to learn the institution and social networks.
Problem Trees	Problems are summarized by cause and effect relationship.

Analyzing Risk

After completion of the vulnerability and capacity assessment, potential impact of the different possible disasters on elements at risk is analyzed.

- What kind of impacts will a hazard have on various elements at risk?

- How many people will be injured, killed?
- How much land will be affected?

Evaluating Risk

Evaluating risks is done to decide how to prioritize the actions to treat risks. When risk maps are prepared by Union Council level, for example, priority Union Councils can be identified to conduct certain countermeasures. By conducting risk evaluation, decision-making can determine whether any countermeasures are required, and which places should be prioritized.

Module 4 Participatory Community Based Disaster Management Planning

Setting Objectives

The CBDRM activities can have effect only when community residents become aware of the disaster risk management activities and continue working on increasing the resilience of the community. Therefore, it is important to set mid-term and long-term objectives and prepare annual plans to attain the objectives. By setting such objectives, the motivation of the residents is expected to increase and eventually help increase the capacity for disaster management. It is important to prepare continuous and sustainable plans and activities, by considering the level of the community disaster management committee to increase the community resilience gradually.

Before setting objectives, it is advisable to learn the basic knowledge on disaster management and local vulnerabilities and capacities. It is advised to pay special attention to the following points.

Important Points

- Acquire basic DRM knowledge from DRM experts of districts, tehsil, UC
- Understand local vulnerabilities and capacities by preparing VCA reports and risk and resource maps
- Set concrete viable objectives considering institutional capacity

Continuous Cycle of Preparing DRM Plans

First of all, the current capacities are examined. Considering the current situations, once objectives and community disaster management plans are prepared, which include mid and long-term plans, and annual plans, they will be implemented and put into activities. After that, progress and capacity are going to be monitored and evaluated. Based on the situations, the level of the targets and plans will be upgraded.

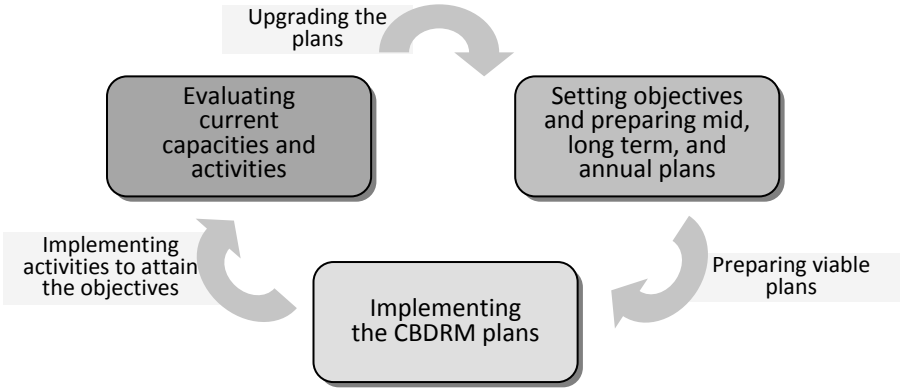


Figure 4.1 Cycle of Preparing DRM Plans

Planning Steps and Planning Components

The planning steps and components of community disaster risk management plans are summarized in the following table. In the participatory planning, all the participants are encouraged to express their opinions and to discuss the measures to be taken as community actions.

Table 4.1 Planning Components

Institutionalization	
Community Boundary	・Demarcate the community boundary
Stakeholders	・Identify stakeholders such as schools, enterprises, CBOs, mosque leaders
Key Persons	・Identify key persons for the CBDRM activities
Members of CBDRM	・Call for core members 10-20 people for preparing DRM plan
Institutionalization Leader Sub-leaders Teams / Task Forces leaders	・Decide leaders, sub-leaders, and teams/task force leaders ・Allocating responsibilities in ordinary and emergency time ・Nominating / deciding members of teams / task forces
Countermeasures	
Listing Measures	**List all the possible measures without thinking of viabilities** ・Mitigation measures (measures which can be conducted before disasters) ・Preparedness measures ・Emergency response which community can conduct ・Recovery works which community can conduct ・(after 2 weeks of the disasters)
Categorize Measures	**Categorize the above measures by themes, shown as examples.** ・Awareness raising and disaster knowledge development ・Infrastructure measures ・CBDRM activities, community responses ・Evacuation places, public facilities ・Publicity work ・Early warning ・Landuse plan ・Budget
Preparing Community Disaster Risk Management Plan	
Objectives	・Set overall objectives of CBDRM
Action Planning	・Discuss community actions to realize the measures ・Make a list of actions ・Identify each action in detail: timeframe (by when), responsible person (by who), resources available and needed (how it will be conducted), budget (how much)
Prioritization	**Prioritize the actions** ・Viable actions within a year ・Actions which everyone wants to conduct within 2-3 years ・Actions which require 3-5 years ・Actions which require longer perspective (more than 5 years)
Documentation	**Document the discussions to cover the following** ・Objectives ・Types of disasters to tackle ・Vulnerability and Capacity Assessment (see module 3) ・Countermeasures ・Actions ・Schedule for implementation ・Responsible persons, institutions to realize the actions

Implementing the Plan	
Resource Mobilization	**Discuss how to secure human, physical, and monetary resources** ・Identify affordable resources ・Identify unaffordable resources and think about possible ways of acquiring them (consult with external assistance)
Implementation	**Document activities to improve the future activities** ・Documentation of activities, difficulties, lessons learnt
Collaboration and Coordination	**Coordination with public authorities** ・Report CBDRM activities ・Submit maps, diagnosis information, DRM plans ・Request regular, refresher training **Cooperation with local enterprises** ・Plan for sharing resources and equipment ・Involve enterprises in CBDRM activities and DRM planning ・Plan and conduct joint training **Cooperation with other communities** ・Share knowledge, lessons learnt on CBDRM activities ・Plan and conduct joint training
Annual Activity Plan	**Plan annual activity**
Monitoring and Evaluation	
Evaluate the Activities	**Review the validity of the activities** ・Appropriate stakeholders ・Appropriate schedule ・Are activities completed within the budget? ・Achievement of countermeasures? ・Achievement of objectives
Evaluate the Plans	**Review the community based disaster management plan annually and revise it according to the following points** ・Necessity to change the plan after conducting activities ・Necessity to change the plan after lessons learnt ・Necessity to change the plan after changing geographical, physical, or environmental conditions

Action Planning

During action planning, the following tables can be developed to clarify the plan in detail for implementation.

Table 4.2 Action Planning Sheet

Measures					
Action	Time frame (when)	Resources (how) available & needed	Budget (how much)	Quantity (how many)	Responsible persons (who)
Action 1	…	…	…	…	…
Action 2	…	…	…	…	…

Preparing Annual Plans

In the actual situation, it is neither realistic to think that community residents immediately have become aware of the disaster management, nor that level of the activities will have been upgraded rapidly. Continuous efforts are especially important. Even though the level of activities is upgraded, if activities are not continuous, the interest of the residents cannot be maintained. To make the DRM activity

sustainable, it is very important that the action plans are developed and implemented to attain the objectives.

In preparing the action plans, review the DRM activities in the past or previous year and think about what kind of actions are needed and select necessary actions. Even though they are simple, annual plans need to be developed. The following are the important points to pay attention to.

Important Points

- Get as many opinions as possible. Get opinions from all the teams / task forces.
- Categorize the opinions by theme and prioritize.
- Select the actions and make an annual activity plan considering time, budget, and responsible persons.
- Make sure to continue the activities.
- Select the main special feature actions yearly to distinguish their importance.

Table 4.3 Format of Annual Plan

Month	Date	Activity	Resource	Budget	Responsible Person
January	12th	Lecture of basic CBDRM	DDMA expert	3000Rs	XXX
February	10th	Conducting DRM games	DDMA expert	3000Rs	YYY
March	3rd	Conducting VCA	DDMA expert	3000Rs	ZZZ
April	20th	Preparing DRM map	DDMA expert Base maps	Printing 500Rs	ZZZ
…	…	…	…	…	…

Participatory Planning Tool: Disaster Imagination Game (DIG)

Disaster Imagination Game (DIG) is a map maneuver, which can be used as a tool for participatory disaster management planning at community workshops (see DIG Manual in Annex).

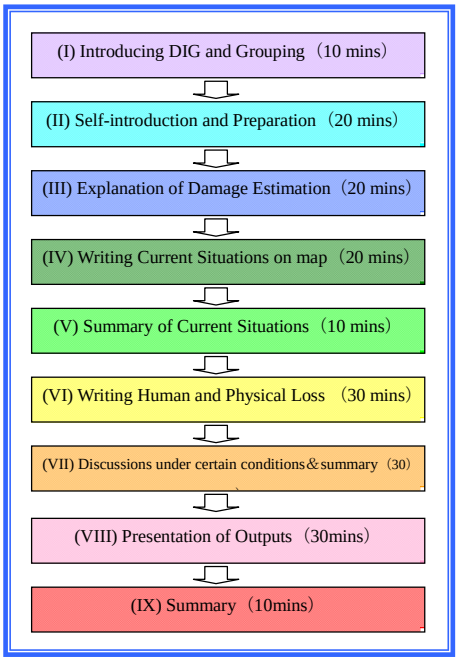
What is DIG?

DIG stands for Disaster Imagination Game, which is a training program for disaster risk management. The English term ‘dig’ has meanings of “understand”, thus it is expected to imply “understand disaster”, “raising awareness of disaster management”, and “explore the locality”.

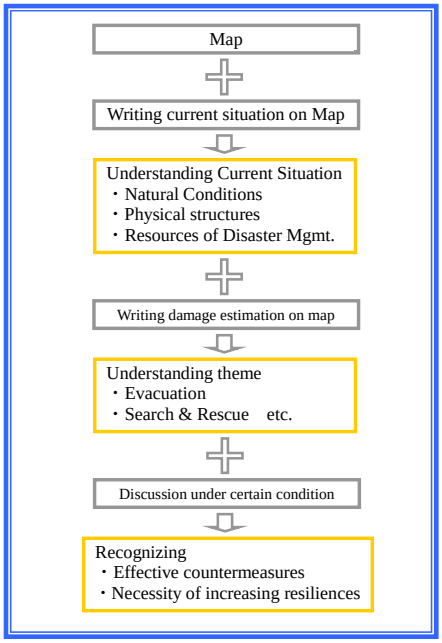
Overall Program and Target Outputs

The activity of DIG is at first, to understand possible damage situations in the locality and eventually to prepare disaster management plans after discussing how to deal with issues of different themes. The overall program, workflow, and target outputs are summarized in the following figures.

【Overall Program】



【Workflow and Target Outputs】



Key Activities

Key activities of DIG are explained briefly with some photos.

Setting a Map on Table

Set a map on the table. A transparent sheet is placed on top and held with scotch tape.

Identifying Natural Conditions

Current natural conditions shown below are identified. If possible, old natural conditions are identified.

Filling in City Structures

The city structures, roads and open spaces are identified and plotted on the transparent sheet (a legend is prepared).

Summarizing Local Characteristics

Local characteristics, advantages and disadvantages in terms of disaster risk management are summarized on a memo pad and summarized on the flip chart.

Choosing Possible Hazards in the Target Area

As related hazards, possible disaster affected areas are marked and the damages caused by these hazards is considered.

Writing Risk and Resources / Damage Estimation

Damage is estimated by grid. The estimated location, numbers, characteristics of damage to buildings, infrastructure, and possible human losses are colored in red (high risk), orange (medium risk), yellow (low risk).

- Filling in risks and resources
- Estimating and recording possible human and physical losses
- Discussion by providing set-conditions
- Providing estimated conditions / situations of post disasters

Discussion and Preparing Disaster Risk Management Plans

Participants are given issues of different themes. The solutions are discussed among the participants over the map. Realistic plans are expected to be prepared by considering distances, existing infrastructures, etc. An example of a guiding question is listed as below.

Source: DIG Manual JICA Study Team

Example: Theme: Communication Method

Questions

- District Coordination Officer (DCO) wants to issue an evacuation order to the residents of District Thatta. Both land lines and mobiles are cut off.
- How do you communicate with the necessary persons?
- Think about TO WHOM, TO WHERE, and HOW do you announce the message?

Think about the situation when most of the roads are blocked. Landlines and mobile phones are out of order. How do you inform district, Union Councils, and local community leaders? Think about the information flow such as DCO, District DRM coordinators, UC Secretary, Community Disaster Management Committee leader, etc.

Expected Outcome

At the end of the exercise the participants train themselves by imagining the situations of the target area from pre-conditions and plan countermeasures and community actions.

Some Ideas to Minimize the Budget for CBDRM

To make the CBDRM activities sustainable, the budget for the activities needs to be minimized and new ideas created to make use of the budget and conduct the activities effectively. To minimize the costs for conducting activities, consider alternative ways of conducting them economically, and consider substitutions such as for disaster management equipment. It is advisable to collaborate with other communities and enterprises for certain equipment to borrow and thereby reduce both budgets.

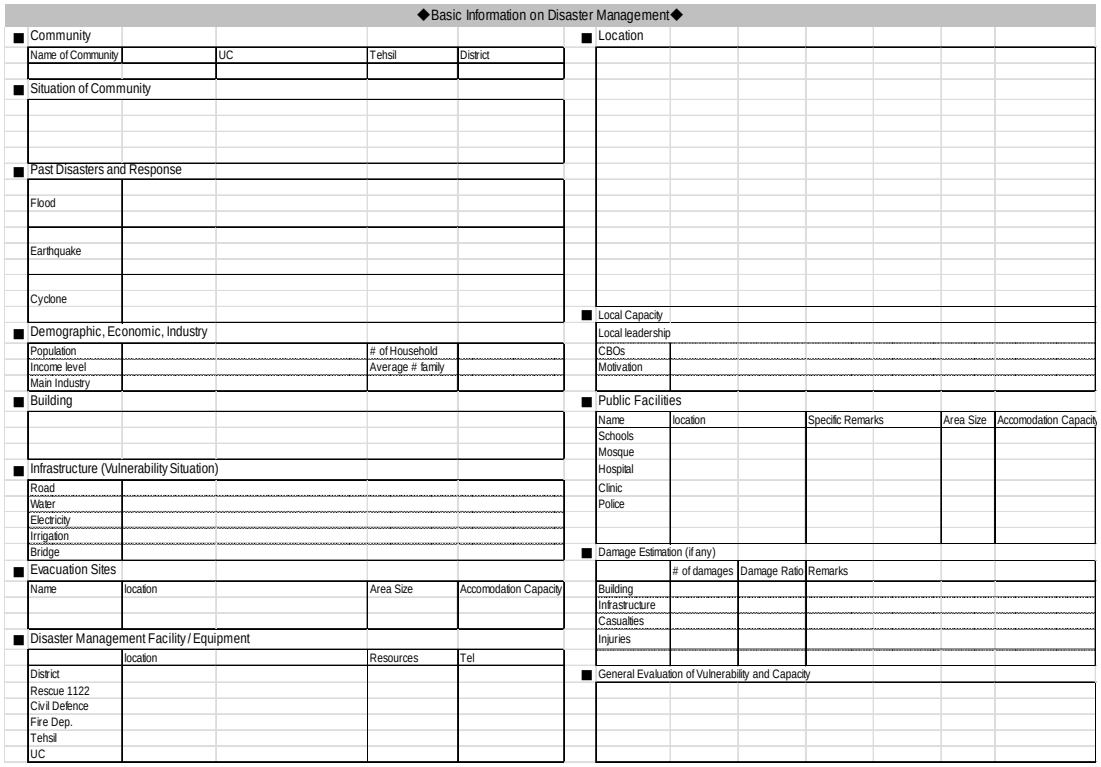
It is important to start some activities that cost little or nothing. The important point is to implement all possible actions. Basically the autonomous DRM activities need to be organized and self supported. However, technical support may be sought from DDMA, Rescue 1122, and Civil Defence.

Compiling Database at District

It is advisable to prepare data and information on community based disaster management. This information is not only useful for the community as a summary of the vulnerability and capacity assessment, and participatory DRM planning, but it is also valuable for district relevant organizations to prepare concrete and realistic disaster risk management plans at district level. In some districts, organizations specialized in disaster management such as DDMA, Rescue 1122, and Civil Defence exist. In terms of collaboration and coordination, such locally based information needs to be compiled for sharing.

Currently, districts are the key organizations for implementing CBDRM; however, after some years of decentralization they are dispersed. At that point, tehsil can possibly take over handling such basic data. For example, the tehsil could compile such data from the communities and submit it to the district regularly every few years. As for providing base maps and dispatching disaster management experts to guide CBDRM activities, the district can play such roles in the near future, and the tehsil is also a good option to be empowered in the longer term.

The following shows a sample format of data to be compiled as a result of CBDRM activities. The first sheet describes basic information on disaster management, the second one is a simple summary for a community disaster management plan, and the third one is a risk and resource map / disaster management map of the community.



◆Basic Information on Disaster Management◆

■ Community

Name of Community		UC	Tehsil	District

■ Situation of Community

■ Past Disasters and Response

Flood	
Earthquake	
Cyclone	

■ Demographic, Economic, Industry

Population		# of Household	
Income level		Average # family	
Main Industry			

■ Building

■ Infrastructure (Vulnerability Situation)

Road	
Water	
Electricity	
Irrigation	
Bridge	

■ Evacuation Sites

Name	location	Area Size	Accomodation Capacity

■ Disaster Management Facility / Equipment

	location	Resources	Tel
District			
Rescue 1122			
Civil Defence			
Fire Dep.			
Tehsil			
UC			

■ Location

■ Local Capacity

Local leadership	
CBOs	
Motivation	

■ Public Facilities

Name	location	Specific Remarks	Area Size	Accomodation Capacity
Schools				
Mosque				
Hospital				
Clinic				
Police				

■ Damage Estimation (if any)

	# of damages	Damage Ratio	Remarks
Building			
Infrastructure			
Casualties			
Injuries			

■ General Evaluation of Vulnerability and Capacity

◆Community Disaster Management◆

■ Structure of Community Based Disaster Management Committee

■ Measures

Category	Measures	Time	Resources	Budget	Responsible Psn

■ Action Plan

Action	Time frame	Resources	Budget	Quantity	Responsible Persons

■ Responsibilities of Team / Task Forces

	Ordinary Time	Emergency Time
Safety Inspection		
Evacuation		
Search and Rescue		
Fire Extinguishing		
First Aid		
Food and Water		

■ Disaster Management Equipments

Location of Equipment					
list of equipments	#	Remarks		#	Remarks
a			j		
b			k		
c			l		
d			m		
e			n		
f					
g					
h					
i					

■ Annual Plan

Month	Date	Activity	Resources	Budget	Responsible Person

■ Collaboration with Other Organizations

Name of Organization	Details of Collaboration

Figure 4.2 Sample Data Sheet Compiling at District


RISK GROUP-A
RESOURCE
RV=01
RV=02
RV=03
RV=04
RV=05
RV=06
RV=07
R=3
R=4
Group B
Javed Colony
Town Watching
RISK
RESOURCE

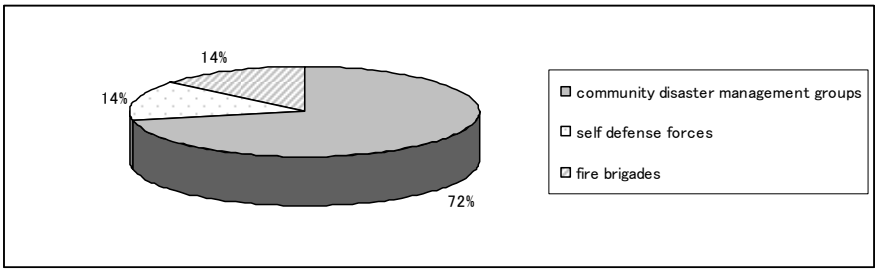
Module 5 Formulating a Community Disaster Risk Management Committee

Necessity of a Community Disaster Risk Management Committee

In the devastating disasters, assistance of public authorities may not arrive in time. Some of the reasons are as follows:

- Due to damage to roads, bridges, and other infrastructures, emergency vehicles such as ambulances, fire engines, and police cars may not be able to pass over the roads.
- Due to telecommunication failures, telephone calls to public authorities become difficult.
- In earthquakes, or landslides, due to the collapse of many buildings, public help cannot respond to all the incidents in different places immediately.
- In earthquakes, short circuits may cause fires. Due to collapse of water pipelines, fire extinguishing work will be hindered.

In the 1995 earthquake in Kobe, 72% of the people who needed rescue assistance were rescued by community people.



Source: Miyano, Osaka City University

Figure 5.1 Community People Are Saved by Community

If someone in your neighborhood is trapped in the debris or some are injured, and public authorities cannot come, community assistance to rescue people and treat the injured can minimize the disaster impacts. Cooperation within the community can have effect. It is necessary to protect your community by your own efforts.

Unit of Community Disaster Risk Management Committee

To protect your own community, an organizational approach is more effective than individual acts. To make this approach more effective, collaboration during ordinary times is important. If community people have regular interaction with each other, they can have a sense of unity for the common objectives such as “protecting our community by ourselves” and they can make the disaster management activities sustainable.

It is advised that one Community Disaster Risk Management Committee be formulated for each community. If the community organizes festivals and religious activities during ordinary times, the existing community unit can be utilized, since community risk management activities need to be based on the regular collaboration networks that exist during ordinary times. Community people need to feel a sense of unity within the community unit.

Structure of Committee

The Community Disaster Risk Management Committee needs to be structured to allocate clear responsibilities to the members and to relate their responsibilities. If there are existing groups within the community such as youth groups or women's groups, the Community Disaster Risk Management Committee can be structured by utilizing such existing groups.

The committee is designed with necessary teams / task forces by analyzing necessary activities and local situations. The structure consists of a committee leader, sub-leaders, and teams / task forces. It is advised to conduct regular drills in order to improve the suitable compositions for each community. In emergency situations, things may not work as planned. Flexibility to react to different situations is necessary. It is also important to decide responsibilities for both ordinary times and emergency times. The reason for deciding responsibilities during ordinary time is that practicing and conducting responsibilities regularly makes the team / task forces active and well united.

The community needs to be divided into smaller units, considering the size of the population. It is advisable to identify members of all task forces / teams for each small unit. The manageable size of one small unit is about 20 households.

Try to ask participation of professional persons such as medical practitioners in the community. If there are enterprises, factories in the neighborhood, try to collaborate with them for providing heavy machinery, equipment, food, water etc.

Roles of Leaders

The leaders are expected to be interested in disaster management activities, gain knowledge of and techniques for disaster management, and cooperate with local residents. In ordinary times, leaders need to take leadership for safety inspections of the community, knowledge dissemination and awareness raising activities for residents, installing and maintenance of disaster management equipment, understanding risks and resources in the community, understanding people who have difficulties in evacuation, and conducting drills. During an emergency, the leaders take initiative for protecting the safety of the residents, minimizing the disaster impacts, and take leadership of task forces / teams for effective disaster risk management activities.

To achieve this, leaders need to cooperate and collaborate with relevant public organizations. It is also important for sub-leaders to link with women, children and challenged persons. Females are also encouraged to assume responsibilities.

Requirements for leaders

- Interest in disaster risk management
- Experience with disaster risk management activities
- Vitality
- Popularity among community members
- Coordination capacity with different people
- Considerate of others and not an egocentric
- Considerate of minor opinions

Roles / Responsibilities of Task Force Teams

One of the examples of the structure of community disaster risk management committee and roles and responsibilities of Task Force Teams under the committee is delineated in Figure 5.2. The important thing is to set roles and responsibilities before the disasters. Setting responsibilities in pre-disaster time is more important than setting them in emergency time. Since task force members need to be familiarized with their own tasks and know each other from pre-disaster time.

As for the Task Force for Safety Inspection, the responsibilities for pre-disaster time can be decided as 1) checking locations of vulnerable areas, and hazardous materials. 2) identifying local resources, and 3) preparing risk and resource maps. Responsibilities in emergency time can be assigned as 1) inspecting vulnerable areas and 2) announcing dangerous areas and hazardous materials. For the recovery phase, it can be assigned as 1) inspecting and preparing a list of repairing points and 2) requesting repairs to relevant authorities. Refer to Figure 5.2 for responsibilities of other task forces.

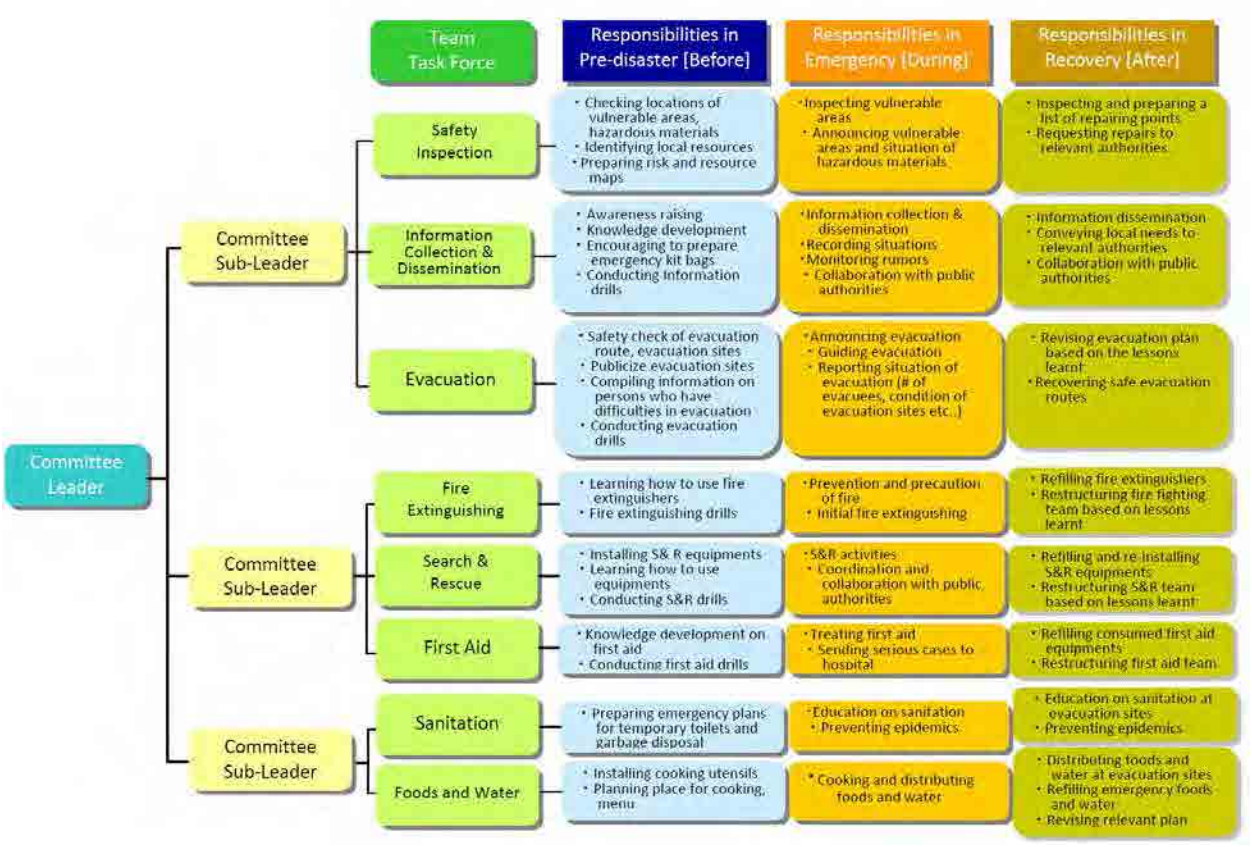


Figure 5.2 Structure of Community Disaster Risk Management Committee (Example)

Equipment for Disaster Risk Management

It is ideal to install community equipment for disaster risk management at village/community level, for each unit of community disaster risk management committee. Equipment for disaster risk management is differentiated from different target disasters. Thus, at each community, based on the community disaster risk management plan, equipment needs to be customized. An example of equipment installed for a flood-prone pilot village in Muzaffargarh is shown in Table 5.1.

Table 5.1 Community Equipment for Disaster Risk Management

S.#	ITEM USED FOR	ITEM NAME	#	Remarks
1	SEARCH AND RESCUE	Axes	4	
2		Hammers	4	
3		Shawals	4	
4		Picks	4	
5		Crowbars	4	
6		Tool Boxes (10 Items)	4	Screw driver set, Small hammer, wire cutter, pliers, saw, chiesel , taster, tin cutter, inchi tape, squash tape
7		Torches	10	
8		Helmets	10	
9		Figure of Eight	2	
10		D Rings	4	
11	FIRST AID	Polls	8	
12		Blanket	4	
13		Spinal Bpard	2	
14		First Aid Boxes (8 Items)	4	Crape Bandage 4 inch, 3 inch 12 pcs each, Cotton Bandage 12 pcs Triangular Bandage 8 Pcs, Sunny plast 100 pcs , Alcholaic swab 100 pcs, splints, sissors
15	FIRE FIGHTING ITEM	Fire Stand	1	
16		Fire Bucket	6	
17		Fire Blanket	4	
18	WATER RESCUE ITEM	Life Jacket	12	
19		Life Buoy	4	
20		Ropes (9 mm)	2	45 meter each
21		Ropes(7 mm)	1	100 meter
22		Gloves	24	
23	OTHER ITEM	Tarpal	2	
24		Mega Phone	2	
25		Battery	12	

Module 6 Emergency Management and Response

Fire Extinguishing

Fire Safety/Prevention

Basic Information

Fire is heat and light from the rapid combination of oxygen and other materials. The flame, which gives the light, is composed of glowing particles of burning material and luminous gases. For fire to exist, a combustible substance must be present, the temperature must be high enough to cause combustion, and enough oxygen must be present to sustain rapid combustion.

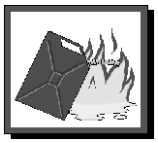
Points

The basic strategy of fire prevention is to control or isolate sources of fuel and heat in order to prevent combustion.

Classification of Fires

Not all the fires are the same or have same effects. Fires can be classified according to the type of fuel that burns. These are class A, B and C fires:

Table 6.1 Classification of Fires

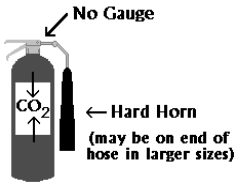
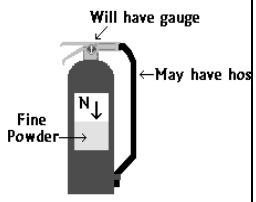
Class "A"	Class "A" fire involves common solid combustible fuels such as wood, cloth, plastic, trash or paper products that are being burned.	
Class "B"	Class "B" fire involves flammable liquid or gas phase fuels that are being burned.	
Class "C"	Class "C" Fire involves energized electrical equipment - As long as it's "plugged in," it would be considered a class C fire.	

Source: Enabling Communities to Live Responsibility with Disasters, FOCUS Humanitarian Assistance

Types of Fire Extinguishers

One way to extinguish a fire is with the help of fire extinguishers. However, these are classified by the type of fire on which they may be used.

Table 6.2 Types of Fire Extinguishers

Air Pressurized Water (APW)	APW Extinguishers are designed for class "A" (wood, paper, plastic, cloth) fires only.	
Carbon Dioxide (CO_2)	Carbon Dioxide extinguishers are filled with non-flammable carbon dioxide gas under extreme pressure. You can recognize a CO_2 extinguisher by its hard horn and lack of pressure gauge. CO_2 extinguishers are designed for class "B" (flammable liquid and gas) fires.	
Dry Chemical (DC)	Dry chemical extinguishers come in a variety. Dry chemical extinguishers are filled with a fine yellow powder. Nitrogen is used to pressurize the extinguishers. Multipurpose extinguishers are designed to extinguish all types of A, B, and C fires.	

Source: Enabling Communities to Live Responsibility with Disasters, FOCUS Humanitarian Assistance

How to use a Fire Extinguisher: Remember the word "P A S S"

Table 6.3 How to Use a Fire Extinguisher

P	Pull the pin	This will allow you to discharge the extinguisher	
A	Aim the nozzle at fire	Hit the fuel and not the flames	
S	Squeeze the lever/handle	This depresses a button that releases the pressurized extinguishing agent in the extinguisher	
S	Sweep from side to side until the fire is completely out	Stand at least 5-8 feet (2-3 m) back from the fire. Discharge the entire contents of the extinguisher.	

Source: Enabling Communities to Live Responsibility with Disasters, FOCUS Humanitarian Assistance

Table 6.4 Evacuation Tips in Case of Fire

In Case of Fire ● Raise the fire alarm or shout fire, fire, fire ● Telephone Fire Service on 16 ● Use an appropriate fire extinguisher, if it is safe to do so ● Immediately exit the house/building, using the stairs & closing the doors – DO NOT USE ELEVATORS ● Shut off utility valves – learn how to shutoff gas & electricity	 
If Trapped in a Room ● If you do not have a usable exit, close as many doors as possible between you and the fire to slow down its spread. ● Seal all doors and vents with duct tape or towels to prevent smoke from entering the room. ● Open a window at the top and bottom so fresh air can enter. Be ready to close the window immediately if it draws smoke into the room. ● Be prepared to signal to someone outside for help.	
If Forced to advance through Flames ● Hold your breath as much as possible. ● Breathe shallowly through nose and use a filter such as a shirt or towel. ● Cover your head and hair. ● Keep your head down and your eyes closed as much as possible. ● Drop to hands and knees and crawl towards a safe exit. ● Move quickly.	

Source: Enabling Communities to Live Responsibility with Disasters, FOCUS Humanitarian Assistance

If your clothing catches fire or if you are helping someone whose clothing is on fire, remember these three important words: **STOP, DROP, and ROLL**.

STOP! Do not run. Running will fan the flames and cause them to burn faster and hotter.

DROP! Cover your face with your hands, then drop to the ground and keep your head out of the fire. This protects your respiratory system, face, and eyes.

ROLL! Grab anything available, such as a blanket, coat, or rug, to smother flames and keep rolling in it. If nothing is available, keep rolling on a surface such as dirt, grass, vegetation, etc.

When Responding to a Fire Incident!

Use the following guidelines when approaching and suppressing a fire:

- Do not attempt to suppress a fire that is clearly too large for the equipment at hand. Save the equipment for where it will be effective.
- Use safety equipment (helmet, goggles, dust mask, all-leather work gloves, and heavy shoes).
- Work in a buddy system.
- Have a backup team when possible.
- Always have two ways to exit the fire area.
- Approach smoke-filled areas correctly.

(Feel closed doors with the back of the hand, working from the bottom of the door up. If the door is hot, DANGER! - There is fire behind it! DO NOT OPEN THE DOOR or you will risk the door hitting you, being sucked into the fire, the fire flashing out at you, or creating an explosion.)

- Confine the fire by keeping doors closed.
- Stay low to the ground.
- Always know a second escape route.
- Use natural ventilation techniques [when there is no risk of a fire flare-up] to clear smoke: Open windows if possible, and create cross-ventilation by channeling natural wind flow.
- Maintain a safe distance, remembering the effective extinguisher range.
- Move around the perimeter of the fire to maximize coverage of the extinguisher agent.
- Prevent rekindling of the fire:
- Locate hidden burning material.
- Extinguish and safely remove it.
- Remove heat by cooling.

FIRE RISK CONTROL

- Always store wood for woodstoves and fireplaces away from your home.
- Store all flammable liquids such as gasoline outside the home.
- Prepare a floor plan of your home showing at least two ways out of each room; primary and alternate escape routes.

- Most fires occur at night when people are sleeping. A smoke detector can alert you in time whenever there is a fire and save your life. Therefore, it is good to install smoke detectors on every level of your home and outside of sleeping areas.
- Store paints, thinners and other flammables in original containers, away from heat, sparks or flame.
- Check all electrical outlets and extension as well as appliance cords. Check for exposed wires, frayed or damaged cords, loose connections, and loose wall receptacles. If any damage is discovered, repair or replace the item.
- Never run electrical cords under a carpet or rug.
- Store matches and lighters out of the reach of small children.
- Extinguish all candles and gas heaters when leaving the room or going to sleep.
- Cooking is the leading cause of home fires; practice fire safety when cooking.
- Keep a portable fire extinguisher in the house, especially in the kitchen.
- Designate a meeting place outside the home where family members can gather for a head count.

Basic First Aid

The First Responder

As a first responder, any individual or community volunteer must understand his/her role. It is most important to understand that the first responder is not medical help. Having basic knowledge and skills as a first responder can save lives in case of a disaster. This section covers the basic first aid for disasters/emergencies. These skills can increase self-sufficiency in a disaster and enable the community to provide emergency assistance to their families and neighbors in the event of a disaster before external help arrives.

Role of Emergency First Responder

As the first person to arrive on the disaster scene, you will need to do a quick assessment and provide support to the people injured in the disaster. You would not only be required to administer first aid but also know the basic search and rescue techniques. This section provides basic information about both these roles.

First Aid

First aid is the immediate medical assistance given to an injured person, within the available resources before getting qualified medical help.

The Purpose of First Aid is to:

- Sustain life
- Prevent suffering
- Prevent secondary complications
- Promote speedy recovery

Role of First Aid Provider

If you are the first to arrive on the scene of an accident that results in an injury or serious illness, you may be the only link between a victim and emergency medical care.

Your role is to take action, whether by providing first aid, seeking medical help or calling 15 or 1122 (where this is available)

Your actions may improve the victim’s chance of recovery.

Responsibilities of a First Aid Provider

- To assess the situation quickly and safely, and call for appropriate help.
- To identify the level of injury or the nature of the illness affecting the casualty/victim.

- To give early and appropriate treatment in a sensible order of priority.
- To arrange for the safe removal of the casualty.
- To remain with the casualty and reassess his condition from time to time until handing it over to the care of a medical person.
- To make and file a report and give further help if required.

Assessment Procedures

All victims must undergo an assessment, even those that are awake.

- Verbal assessments: This is for those who are able to speak and consists of asking the person about any injuries, pain, bleeding, or other symptoms he/she is aware of and can express.
- Hands-on assessments consist of asking the person for permission to assess them if they are awake and coherent and paying close attention: Look, listen, and feel for anything unusual.
  - What to check: Perform the assessment always in the same order so that you will complete each assessment quickly and accurately, checking body parts from top to bottom. Treat victims as if they have a spinal injury until you are certain they do not. Examine the:
    - Head, Neck & Shoulders
    - Chest, Arms & Abdomen
    - Pelvis, Legs & Back
  - What to look for: Look for anything indicating an injury. Most common injuries include lacerations, fractures, and bruises, but anything out of the ordinary may be an indicator, such as changes in color, temperature and pulse.

Dos & Don’ts

- DOs
  - Before handling the casualty use
    - Mask
    - Gloves
    - Head cover
    - Apron
- DONTs: A First Aid Provider should never
  - Prescribe medicine
  - Declare death

Principles of First Aid (Four Cs)

- Call for help
- Calmly take charge

- Check the scene & the causality
- Carefully apply First Aid
- Courage

Action Plan

- Assess the situation
- Safety of yourself & the casualty
- Help- ask the by-standers to telephone
- Assess the casualty
- Treat the casualty

REMINDER: Remember to emphasize safety and the role of the first aid provider.

Wounds & Bleeding

Basic Information - WOUNDS

A wound is any break in soft tissue of the body that results in bleeding.

Types of Wounds

- Open Wound

  A break in the outer layer or skin that results in bleeding & allows microorganisms (germs) to enter the body.

- Closed Wound

  No break in the outer layer of skin.

Wound Care

Objectives of wound care are to control bleeding and prevent secondary infection. The following steps are necessary:

- Clean the wound by irrigating with water, flushing with a mild concentration of soap and water, then irrigating with water again. Do not scrub.
- Apply a dressing and bandage, after thoroughly cleaning the wound, to help keep the wound clean. (A dressing is applied directly to the wound. A bandage is used to hold the dressing in place.) Use the following rules for dressings and bandages:

- If the wound is still bleeding, apply the bandage with enough pressure to help control bleeding without interfering with circulation. Check for color, warmth, and sensation to determine if the bandage is too tight.
- If active bleeding continues (the dressing is soaked with blood) redress over the existing dressing and maintain pressure and elevation.

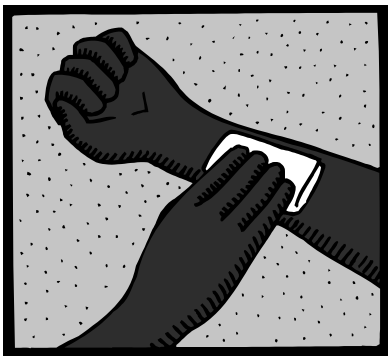
Basic Information - Bleeding

Bleeding is the escape of blood from injured vessels. Severe bleeding is called hemorrhage.

First Aid for Bleeding

The treatment for severe bleeding is:

- Put on disposable gloves.
- Apply direct pressure to the wound with a pad (e.g. a clean cloth) or fingers until a sterile dressing is available.
- Raise and support the injured limb. Take particular care if you suspect a bone has been broken.
- Lay the casualty down to treat for shock.
- Bandage the pad or dressing firmly to control bleeding, but not so tightly that it stops the circulation to fingers or toes. If bleeding seeps through the first bandage, cover with a second bandage. If bleeding continues to seep through the bandage, remove it and reapply.
- Treat for shock.



Fractures

Basic Information

A fracture is a broken or cracked bone. There are a number of signs and symptoms that can indicate that a person has a fracture:

- The injured part cannot be moved normally.
- The injured part may have an unnatural shape or position.
- There is swelling and sometimes bruising.
- There is loss of strength.
- There may be an irregularity or shortening of the affected limb.

First Aid for Fractures

- Treat severe bleeding and difficulty in breathing first.
- Treat on the spot. Avoid unnecessary movement.
- Immobilize the injured part; splint the joint above and the joint below the injury.

Amputation

Basic Information

Amputation is the loss of a finger, hand, arm, or leg and can be extremely dangerous. If you act quickly, you may be able to save the victim's life.

First Aid for Amputation

Control bleeding, watch for signs of shock, and treat for shock as necessary.

- Protect Body Parts:
  - ✧ Try to find the severed part of the body.
  - ✧ If found, save the tissue parts, wrap it in a plastic bag.
  - ✧ Put the bag on ice, but don't freeze.
  - ✧ Take the part with the victim to the hospital.
  - ✧ Write the name of the victim and time of the incident on the plastic bag.

Burns & Scalds

Basic Information

Burns: are injuries to the skin & other tissue caused by heat, radiation or chemicals.

Scalds: Burns caused by moist heat, such as hot liquids & steam.

Types of Burns

- Heat/Thermal Burns
- Corrosive/Chemical Burns
- Electrical Burns
- Radiation Burns

Degree of Burns

- 1st Degree

  Signs: Skin is red or bright pink but not broken and there are no blisters seen.

- 2nd Degree
  Signs: Skin is red, tender, swollen, and blistered.
- 3rd Degree
  Signs: Skin will look white and leathery or charred.

First Aid for Burns and Scalds

First-aid treatment for burns involves removing the source of the burn, cooling the burn, and covering it. To treat a burn victim, the following procedure may be applied:

- Remove the victim from the burn source. Put out any flames and remove smoldering clothing.
- Cool skin or clothing that is still hot by immersing in cool water for no longer than one minute or covering with clean compresses that have been wrung out in cool water. Water may be obtained from the bathroom, kitchen or garden hose.

- Use soaked towels, sheets, or other cloths. Use clean water. Do not apply water to third-degree burns except to put out flames. Treat all victims of third-degree burns for shock. WATCH FOR SIGNS OF HYPOTHERMIA. Cover loosely with dry, sterile dressings that keep air out, reduce pain, and prevent infection.
- Elevate burned extremities high above the victim's heart.
- Cool the burnt area with running water.
- If clothing sticks to the skin, leave it there and cut away the remaining fabric.

- Do not break blisters.
- Do not apply lotions, ointments or fat to the injured area.
- Cover the burnt area with a plastic bag.
- Cover the burn with a sterile bandage.
- Remove the chemical from the skin or eyes by flushing the area with large amounts of cool running water.

- CALL a doctor or emergency medical services (EMS).

BANDAGING

A bandage is a strip of material used mainly to support and immobilize a part of the body. It has several uses such as to:

- Support – fractured bone
- Immobilize – dislocated shoulder/jaw
- Apply pressure – stop bleeding & improve venous blood flow

- Secure a dressing in place
- Retain splints in place

Principles & Procedures for Applying Bandages

- Wash your hands and wherever necessary, wear gloves.
- Assist victim to assume a comfortable position on a bed or chair and support the body part to be bandaged.
- Always stand in front of the part/victim to be bandaged except when applying a bandage to the head, eye or ear.
- Be sure the bandage is rolled firmly.
- Make sure the body part to be bandaged is clean and dry.
- Assess the skin before applying the bandage for any breakdown.
- Observe circulation by noting the pulse, surface temperature, skin color and sense of touch of the body part to be wrapped.
- Always start bandaging from the inner to the outer aspect and from the far to the near end.
- When bandaging a joint, ensure flexibility of the joint (unless immobilization of the joint is required).
- Always start and end with two circular turns.
- Cover the area 5 centimeters above and 5 centimeters below the affected area (wound).
- Overlap turns and slightly stretch the bandage.
- Cover two thirds of the previous turn.
- Where possible, leave fingertips or toe tips exposed for observation (adequacy of blood circulation).
- End the bandage on the outer side of the body. Do not end a bandage on a wound or at the back of the body.

Methods of Applying Bandages

Bandages can be applied in the following methods.

- Circular
- Spiral
- Reverse Spiral
- Figure of Eight

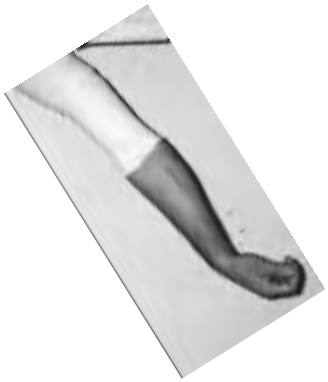
Circular Turn

Circular turns are used mainly to anchor bandages and to terminate bandages. You can apply circular turns by

- Applying the end of the bandage to the part of the body to be bandaged
- Encircle the body part a few times or as needed with each turn directly over the pervious turn.
- Secure the end of the bandage with tape, metal clips or a safety pin over an uninjured area.

Spiral Turn

Spiral turns are used to bandage cylindrical parts of the body that are fairly uniform in circumference, such as the upper arm and upper leg.

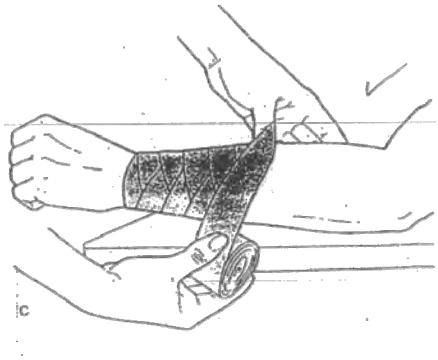


- Make two circular turns to begin the bandage.
- Continue spiral turns at about a 30-degree angle, each turn overlapping the preceding one by two-thirds the width of the bandage.
- Terminate the bandage with two circular turns, and secure the end as described for circular turns.

Spiral Reverse Turn

Spiral reverse turns are used to bandage cylindrical parts of the body that are not uniform in circumference, such as the lower leg or lower fore arm:

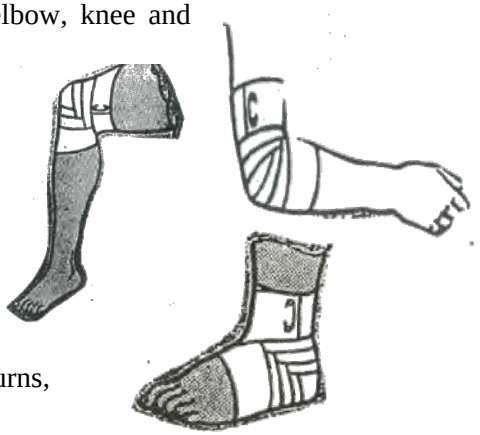
- Begin the bandage with two circular turns, and bring the bandage upward at about a 30-degree angle.
- Place the thumb of the free hand on the upper edge of the bandage.
- The thumb will hold the bandage while it is folded on it self.
- Unroll the bandage about 10-15 centimeters then turn the hand so that the bandage is folded down.
- Continue the bandage around the limb, overlapping each previous turn by two-thirds the width of the bandage.



- Make each bandage turn at the same position on the limb so that the turns of the bandage are aligned.
- Terminate the bandage with two circular turns, and secure the end as described for circular turns.

Figure of Eight Turn

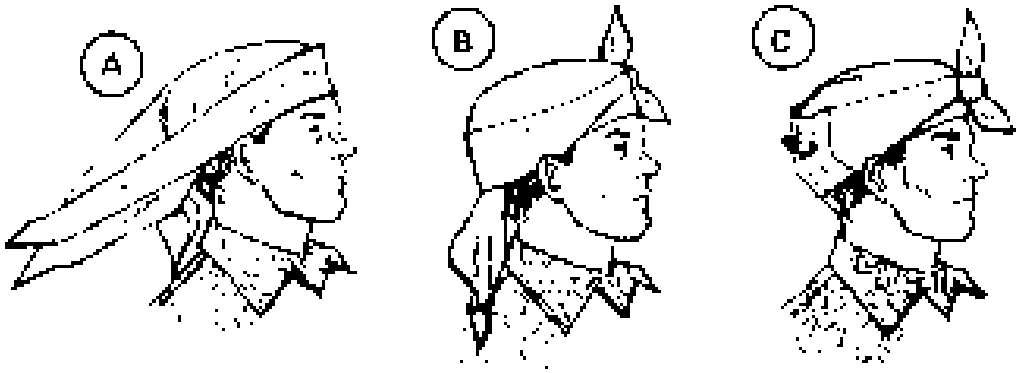
The figure-of-eight method of bandage permits flexibility of elbow, knee and ankle without disturbing the dressing.



- Begin the bandage with two circular turns.
- Carry the bandage above the joint, around it, and then below it, making a figure eight-continue above and below the joint, overlapping the previous turn by two-thirds of the width of the bandage.
- Terminate the bandage above the joint with two circular turns, and secure the ends appropriately.

Triangular Bandage to the Head

- Turn the base (longest side) of the bandage up and centre its base on the centre of the forehead, letting the point (apex) fall on the back of the neck.
- Take the ends behind the head and cross the ends over the apex.
- Take them over the forehead and tie them.
- Tuck the apex behind the crossed part of the bandage and/or secure it with a safety pin, if available.



Basic Search and Rescue

Basic Information

Natural and human-made disasters are increasing rapidly and likewise their intensity has also increased over the last century resulting in an increase in the risk to lives and properties.

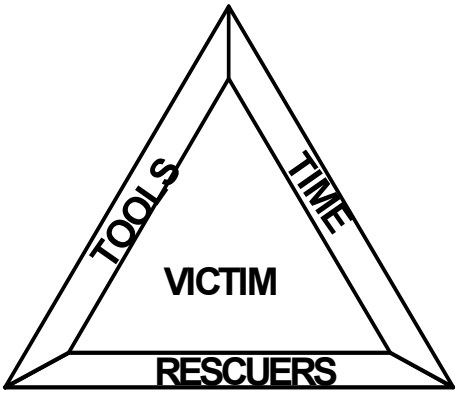
The first 12 hours of any disaster are regarded as the golden hours. This means that the sooner the search and rescue operations starts the better are the chances for survival. While specialized search and rescue teams may take some time to arrive at the scene of a disaster, some basic techniques of search and rescue can help the communities to start the search and rescue operations as soon as the disaster strikes. Understanding of these basic techniques and of how to handle a casualty can save lives.

Generally, search and rescue terms are used interchangeably. However and in reality, these are two separate functions as described below:

Search: This means to carefully look in order to find someone missing or lost. In a disaster scenario, it involves locating victims and documenting their locations.

Rescue: To free a trapped victim from confinement or from under the rubble during a disaster is called rescue. Search and rescue operations require and consist of three significant components:

- **Rescuers:** These include trained personnel and volunteers.
- **Tools:** These depend on availability and as per the needs of a particular situation. For example, storm or earthquake damage may require tools for lifting debris whereas flood damage may require boats, ropes, and life preservers.
- **Time** may be very limited for some victims. The first 24 hours after a disaster is called the "Golden Day" - the period during which injured or trapped victims have an 80 percent chance of survival if rescued appropriately and in time.



Survival Rates for Persons Trapped in a Collapsed Structure

- 30 Minutes: 91.0% Survival
- 1 Day: 81.0% Survival
- 2 Days: 36.7% Survival
- 3 Days: 33.7% Survival
- 4 Days: 19.0% Survival

- 5 Days: 7.4% Survival

Before undertaking search and rescue, it is important to set certain objectives. The foremost objectives of search and rescue are to:

- Safeguard the life of the rescuer – The most important person in a rescue attempt is the rescuer!
- Rescue and save the greatest number of people in the shortest amount of time.

Basic Principles of Search & Rescue

As mentioned above, the safety of the rescuer is the first priority. These basic principals will help the rescuer to carry out search and rescue in a safe way:

- Damaged buildings and facilities should only be approached from the least dangerous side
- While surveying indoor space in buildings, DO NOT use open fire (matches, kerosene lamps) for lighting
- When searching for casualties, DO NOT walk or stay near badly damaged and collapse-prone buildings
- DO NOT allow people to gather in one spot, in shafts, or floors.
- DO NOT go near collapse-prone walls or other constructions.
- Move very carefully over building ruins (only if it is absolutely necessary) as they are unstable heaps of fragments.
- When removing rubble from ruins, DO NOT permit abrupt jerks, shaking, or strong blows at the site.
- When clearing ruins, first drag away and extinguish any smoldering or burning objects.
- Open doors to burning rooms very cautiously. Beware of possible flames or hot gas ejection.
- In burning spaces move by bending low or on your knees. Try to stay near windows, making it possible to get quickly out of the danger zone if need be.
- If an electrical cable is discovered, suspend the operation in order to avoid further damage; DO NOT step on wires.

Search and rescue in a rural setting may be simpler as it usually does not involve multiple story buildings. Some of the following steps may be less relevant to the rural, but more and significantly relevant for the urban areas

Planning Search and Rescue

Search & Rescue Assessment

Assessment is a continuous analysis of facts that form the basis for decision-making and planning. It includes the following steps:

- Gathering of facts
- Assessment of damage to the building
- Identification of resources
- Establishment of the rescue priorities
- Development of a rescue plan
- Conducting the rescue
- Evaluating your progress

Each of the assessment steps will provide information that may be critical to search and rescue efforts

Gather Information:

External inspection of the affected building:

- Has anyone been reported missing?
- Is the building structure damaged?
- Identify the more difficult tasks.
- Identify the exit and entry routes and points.
- Locate the Main Utilities Switches.
- Does the building have a special importance/status?
- Number of people resident in the building.

Table 6.5 Gather Facts – Guidelines

Planning Factor	Questions
Time of Day/Week	• Does the time of day/week affect the number of people possibly trapped in the area? • Victims likely to be at home, work, in bed, on the road? • Is daylight available for search and rescue efforts or not? • How long would it be until sunrise? • Artificial lighting available and practical?
Occupancy Type	• Where are potential victims likely to be in the structure? • How many potential victims are likely to be trapped?
Construction Type	• Types of construction that have been affected? • What are the implications for search and rescue? • Is the age of construction significant?
Weather	• What is the current and forecast weather? • How would the weather affect rescue efforts? • How would it affect the victims? • How will it affect the rescuers?
Hazards	• What are the other or secondary hazards prevalent in the area, e.g. utilities, fire or hazardous materials? • What steps are necessary to mitigate these hazards? • How long would mitigation efforts take? • What effect might the delay have on the victims?

Assessing Damage to the Building

There are no established rules for assessing damage. However, the damage categories would serve as a reference point for defining the primary search and rescue mission.

Light Damage:

- Superficial or cosmetic damage
- Broken windows
- Fallen or cracked plaster
- Minor damage to the contents of the structure

Moderate Damage:

- Visible signs of damage
- Decorative work damage
- Many visible cracks in plaster
- Major damage to the contents of the structure

Heavy Damage:

- Obvious structural instability
- Partial or total collapse
- Titling
- Building off foundation

Assessing Resources

The very first step in search and rescue operations is to identify local resources available to assist in rescuing victims, which include personnel, equipment and tools.

Table 6.6 Planning Questions

Resource	Planning Questions
Personnel	• Who lives and/or works in the area? • During which hours are those people most likely to be available? • What skills or hobbies do they have that might be useful in search and rescue operations? • What might be the most effective means of mobilizing their efforts?
Equipment	• What equipment is available locally that might be useful for search and rescue? • Where is it located? • How can it be accessed? • On which structures (or types of structures) might it be most effective?
Tools	• What tools are available that might be useful for lifting, moving, or cutting disaster debris?

Rescue Operation

Once the decision is made to initiate search operations within a specific structure or area, Search and Rescue members must systematically inspect the place for searching and rescuing the victims: they must take care of the following:

- The safety of the Search & Rescue Team members
- The safety of the lives of the victims and others

- Use of search & rescue techniques appropriate to the operation
- Protection of the environment
- Formation of Teams
  - ✧ Make at-least two teams each with two or more members.
  - ✧ Be equipped with complete safety and rescue equipment.
  - ✧ Ensure proper distribution of responsibilities for collecting and carrying the equipment to the disaster site.
  - ✧ Distribution of responsibilities at the affected area.
  - ✧ Communication signals to be decided beforehand.

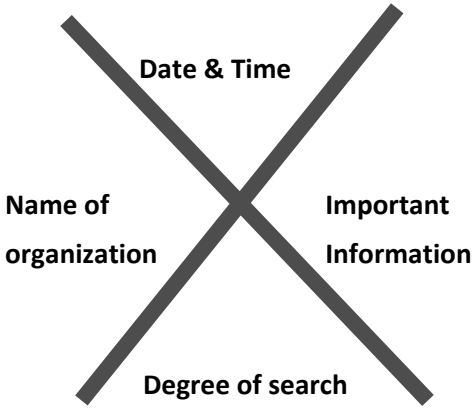
Search Methodology

- Gather at a safe location to assess the building.
- Shut off all the utilities going to the building.
- Mark the building with an "X" before entering it (see below).
- Use force if necessary to get to a victim.
- If you suspect a leakage of gas in the building, exit immediately & leave all doors open.
- Walk slowly and carefully at every step.
- Mark every primary unit you visited separately.
- Complete the search and try to get back to the X sign.

Marking of Search Area

BEFORE you enter MARK search areas with an "X".

- Write date & time of the search (in the top quadrant)
- Write the name of the responding agency (in left quadrant)
- Write number of victims rescued & those still inside (right quadrant)
- Write degree of search, full or partial (bottom quadrant).
- Use a zero "0" if no victim is found.
- Put a box around the "X" if it is not safe to conduct search and rescue efforts.



Search Strategy

- **Call Out:** Begin the search by shouting something like, "Can anyone can hear my voice?" If any victims respond, then give them further directions such as "Stay calm & wait".
- **Listen Carefully:** Stop frequently and just listen carefully for any tapping sounds, movements or voices.
- **Be Systematic:** Use a systematic search pattern to ensure that all areas of the building are covered.
- **Bottom-Up/Top-Down:** Searching from the bottom of the building up and/or from the top down is well suited to a multi-story building.
- **Right Wall/Left Wall:** Moving systematically from one side to the other is well suited to single-floor structures and avoids repetition.
- **The wall is the rescuer's lifeline:** If you or your partner become disoriented, reverse your steps, staying close to the wall until you get back to the doorway.
- **Throughout your search:** Maintain voice contact with your partner so you do not get separated.

Evaluate Progress

- This is the most important step from a safety standpoint.
- The rescuers must continually monitor the situation to prevent any harm to the rescuers.
- Also, they must determine if their plan is working, and if not, how it can be altered to make it work better.

Emergency Evacuation

Evacuation is the process of identifying a threat to public safety, warning people of the danger, instructing them on what action to take to ensure their safety, and moving all or part of the population in the affected area to a place of safety. Some evacuations involve a small number of people and some may involve a very large number. In the event an evacuation becomes necessary, use the following steps:

Table 6.7 Steps of Emergency Evacuation

Step	Action
1. Determine the need	Determine whether there is a need for total or partial evacuation.
2. Identify a relocation area	Select an area that is free of hazards and easily accessible.
3. Communicate	Communicate with everyone involved the need to evacuate and inform them of the location of the shelters.
4. Pre-designated routes	Designate the routes from the area to be evacuated to the area of relocation. Consider alternatives.
5. Report the evacuation	Be sure to inform emergency management personnel about the evacuation to avoid unnecessary duplication of effort and risk.

Victim Evacuation/Casualties Handling - Manual Techniques

Manual techniques for victim evacuation are required for the following purposes:

- It is necessary to evacuate an injured person from an emergency scene to a location of safety.
- Manual carrying could be tiring for the rescuer and involve the risk of increasing the severity of casualty's injury.
- Choose the evacuation techniques that would be least harmful, both to the rescuer and the victim.
- Causalities must be carried carefully and correctly handled, otherwise their injuries may become more serious or possibly fatal.
- The situation for evacuation of a causality should be organized and un-hurried.

- Each movement should be performed as deliberately and gently as possible.

Types of Drag and Carry Techniques

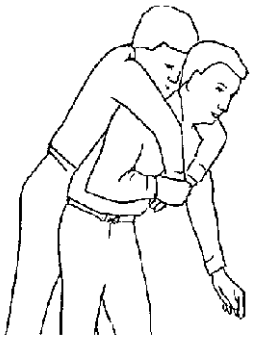
Tied-Hands Crawl

The tied-hands crawl may be used to drag an unconscious casualty for a short distance.

- It is particularly useful when you must crawl underneath a low structure, but it is the least desirable because the casualty's head is not supported.
- Use a triangular bandage, a torn shirt, etc to tie the casualty's hands together and place them around your neck. This way you can even move a person much heavier than yourself.

One Person Arm Carry

This involves a single rescuer lifting a victim safely in his arms. During this process, the rescuer holds the victim around the victim’s back and under the knees.



One Person Pack-Strap Carry

This method is more appropriate to carry a victim safely for longer distances.

- Place both the victim's arms over your shoulders.
- Cross the victim's arms, grasping the victim's opposite wrist.

- Pull the arms close to your chest.
- Squat slightly and drive your hips into the victim while bending slightly at the waist.
- Balance the load on your hips and support the victim with your legs.

Fireman Carry

This technique is used to carrying a victim for longer distances. It is very difficult to get the person up to this position from the ground. Getting the victim into position requires a very strong rescuer or an assistant.

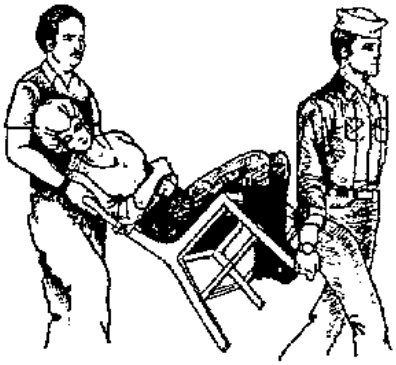
- The victim is carried over one shoulder.
- The rescuer's arm, on the side that the victim is being carried, is wrapped across the victim's legs and grasps the victim's opposite arm.

Two Person Carry (by arms & legs)

- Rescuer 1 squats behind the victim’s torso and grasps the victim from behind at the midsection.
- Rescuer 2 squats between the victim’s knees, grasping the outside of the knees.
- Both rescuers rise to a standing position.

Chair Carry

This is a good method for carrying victims up and down stairs or through narrow or uneven areas.



- Pick the victim up and place him or have him sit in a chair.
- The rescuer at the head grasps the chair from the sides of the back, with palms in.
- The rescuer at the head then tilts the chair back onto its rear legs.
- For short distances or stairwells, the second rescuer should face in and grasp the chair legs.
- For longer distances, the second rescuer should separate the victim's legs, back into the chair and on the command of the rescuer at the head, both rescuers stand using their legs.

Ankle Pull

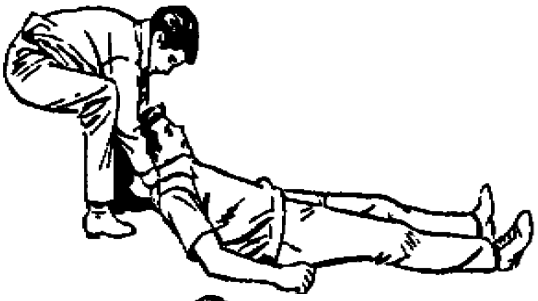
The ankle pull is the fastest method for moving a victim a short distance over a smooth surface. This is not a preferred method of patient movement. The following method is applied here:

- Grasp the victim by either ankles or pant cuffs.
- Pull with your legs, not your back.

- Keep your back as straight as possible.
- Try to keep the pull as straight and in-line as possible.
- Beware that the head is unsupported and may bounce over bumps and surface imperfections.

Shoulder Pull

The shoulder pull is preferred to the ankle pull. It supports the head of the victim. The drawback is that it requires the rescuer to bend over at the waist while pulling.

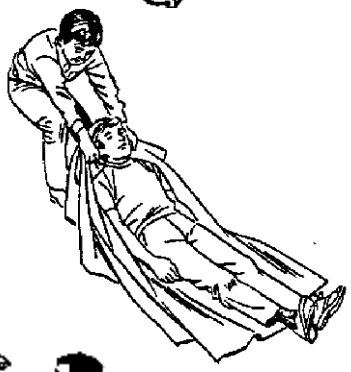


The following methodology is used here:

- Grasp the victim by the clothing under the shoulders.
- Keep your arms on both sides of the head.
- Support the head.
- Try to keep the pull as straight and in-line as possible.

Blanket Drag

This is the preferred method for dragging a victim from the confined area and is applied as follows:

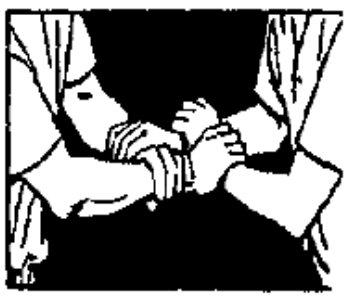


- Place the victim on the blanket by using the "logroll" or the three-person lift.
- The victim is placed with the head approx. 2 ft. (0.5 m) from one corner of the blanket.
- Wrap the blanket corners around the victim.
- Keep your back as straight as possible.
- Use your legs, not your back.
- Try to keep the pull as straight and in-line as possible.

Two Handed Seat

This technique is used for carrying a victim longer distances. This technique can also be used to support an unconscious victim and is applied as follows:

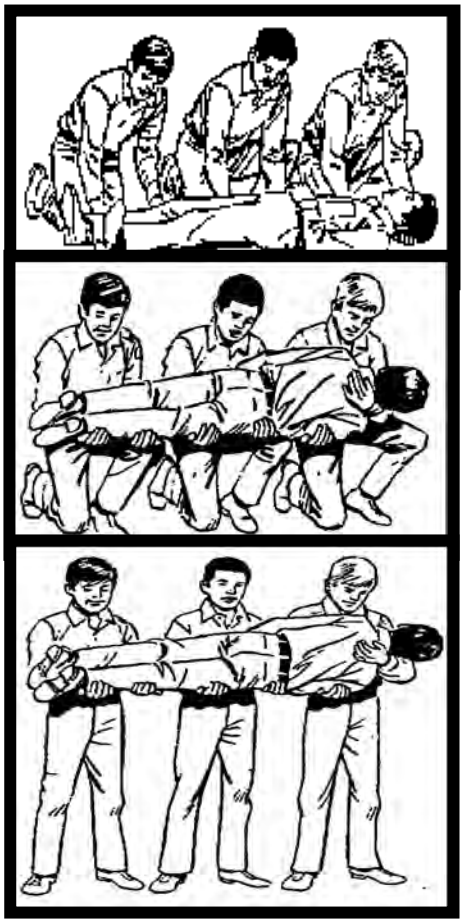
- Pick up the victim by having both rescuers squat down on either side of the victim.
- Reach under the victim's shoulders and under their knees.
- Grasp the other rescuer's wrists.
- From the squat, with good lifting technique, stand.
- Walk in the direction that the victim is facing.



Four Handed Seat

This technique is for carrying conscious and alert victims moderate distances. The victim must be able to stand unsupported and hold themselves upright during transportation. This is done as follows:

- Position the hands to make a seat as indicted in the graphic.
- Lower the seat and allow the victim to sit.
- Lower the seat using your legs, not your back.
- When the victim is in place, stand using your legs, keeping your back straight.



Three Person Carry

This technique is for lifting a patient onto a bed or a stretcher or for transporting him/her short distances. The methodology is as follows:

- Each person kneels on the knee nearest the victim's feet.
- On the command of the person at the head, the rescuers lift the victim up and rest the victim on their knees.
  - If the patient is being placed on a low stretcher or litter basket: **On the command of the person at the head, the patient is placed down on the litter/stretcher.**
  - If the victim is to be placed on a high gurney/bed or to be carried: **At this point, the rescuers will rotate the victim so that the victim is facing the rescuers, resting against the rescuers' chests.**
  - On the command of the person at the head, all the rescuers will stand.
  - To walk, all rescuers will start out on the same foot, walking in a line abreast.

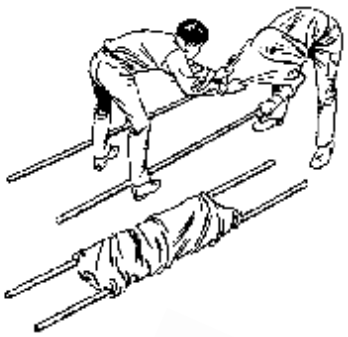
Removal of a Casualty over Stairs

Don't try this if you suspect head or spinal injuries or broken limbs. Use a mattress or rug under the person if one is available.

Improvised Stretcher

This technique requires two poles/pipes strong enough to support the victim's weight and at least two shirts.

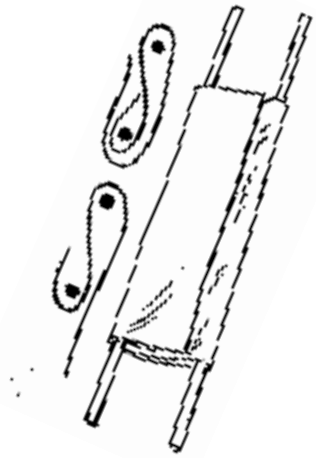
- While the first rescuer is grasping the litter poles, the second rescuer pulls the shirt off the head of rescuer one.
- All buttons should be buttoned up with the possible exception of the collar and cuffs.
- The rescuers then reverse this procedure and switch sides.



Blanket Stretcher

This technique requires two poles and a blanket and is done as follows.

- Place the blanket down on the ground.
- Place one pole approx. 1 foot (30 cm) from the middle of the blanket.
- Fold the short end of the blanket over the first pole.
- Place the second pole approx. 18 to 24 inches (45-60 cm) from the first (this distance may vary with victim or blanket size).
- Fold both halves of the blanket over the second pole.



Basic Search and Rescue

Flood Rescue

Flood may lead to drowning of people. If you see anyone drowning and if you make an attempt to rescue:

- Think of your own safety first and never put yourself in danger.
- Consider the potential hazards to both the rescuer and the victim.
- If the rescue is too dangerous, wait until the emergency services arrive.

Follow the following safety measures to rescue:

- Never place yourself close enough to be grabbed by a panicky victim.
- Always place distance and device between the rescuer and the victim.
- You may extend your reach with long objects such as a tree branch, pole or rope. Rescue tactics, in order from low risk to high risk are “Reach-Wade-Throw-Row”.

Reach

With a long stick, a scarf, clothes or anything else. Crouch or lie down to avoid being pulled in.

Wade

Test the depth with a long stick before wading in and then use the stick to reach out. Hold on to someone else or the bank.

Throw

A rope is best - you can then pull in the person. Otherwise throw something that will float - a ball, a plastic bottle, a lifebuoy...this will keep the person afloat until help arrives.

Row

Use a boat if there is one nearby and if you can use it safely. Do not try to pull the person on board in case they panic and capsize the boat.

Information Collection and Dissemination

During devastating disasters, communication systems may break down; thus, it will be difficult to gather necessary information. Local governments also need local information.

When citizens act according to uncertain information and rumors, it may cause panic. Therefore, it is important for the community based disaster risk management committees (CBDRMC) to understand the situations of the localities immediately and report the accurate information to the residents of the communities and relevant public authorities.

Regarding emergency information, there are two components: Information Collection and Information Dissemination. The leaders, sub-leaders and the group members need to be identified.

Information Collection

CBDRMC collect information on: 1) the number of evacuees and evacuation sites, 2) damage and losses (human, buildings, infrastructure such as roads, water, irrigation systems, dikes etc.) 3) fire incidents, 4) any information useful for survival. They must report it to the person in charge of Disaster Management at Union Council

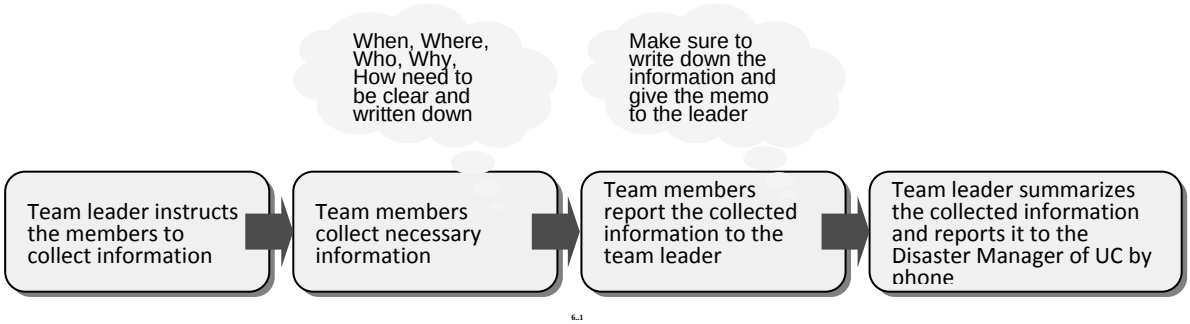


Figure 6.1 Flow of Information Collection

Types of Information to Be Collected

- Number of evacuees, evacuation places residents evacuated
- Damage (casualties, buildings, infrastructures such as roads, water, irrigation systems, dikes)
- Fire incidents, if any
- Information useful for survival

Tips

- Timely / periodical reporting

  The first information can only be an outline, but the reporting itself is important. Confirmed information can be reported in the second or further reporting occasions. No remarkable progresses/changes is also important information.

- Confirming the Information
  Information needs to be confirmed, since groundless rumors tend to spread.
- Unifying information
  The leader of the Information Collection and Dissemination needs to contact the person in charge of Disaster Management at UC.
- Familiarize yourself with the use of the communication system
  If communication systems such as wireless are introduced, practicing and familiarizing yourself with their use during ordinary times is necessary. Collaboration with amateur radio operators is useful.
- Report as briefly as possible
  In an emergency situation, reporting should be concise. Periodic drills are necessary.

Information Dissemination

Information from public authorities such as UCs, tehsils, districts, provinces, radio and television is disseminated to the residents.

- The local areas in which the information is to be disseminated need to be subdivided and assigned to persons who report to the team / task force
- Communication methods, such as sirens and mosque speakers need to be decided in advance
- Urgent messages such as evacuation orders or things related to local residents need to be prioritized

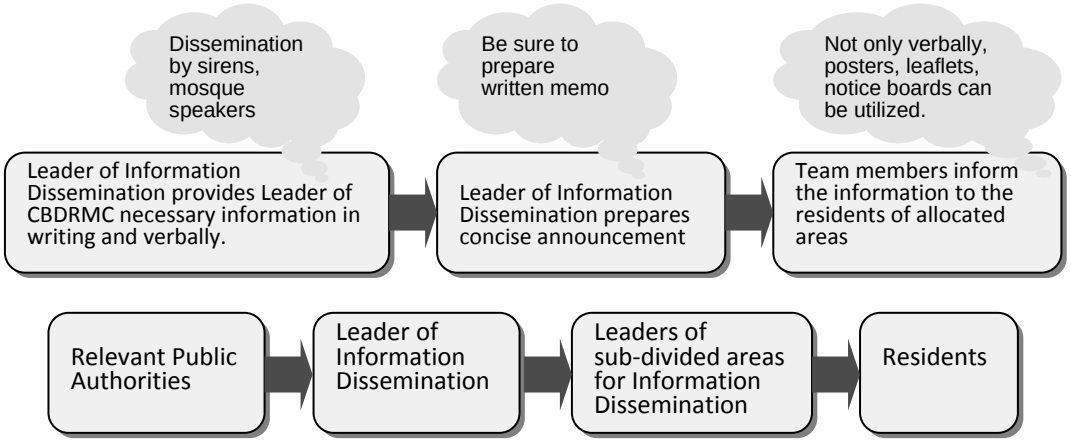


Figure 6.2 Flow of Information Dissemination

Tips

- Disseminate in simple words
- Not only verbally, written memos should be prepared
- To disseminate accurate information, information receivers are advised to repeat the information

- Take special care in disseminating numerical information
- To disseminate the information efficiently, dissemination routes need to be identified beforehand
- Take special care for those who have hearing difficulties, foreigners, etc.
- Regularly inspect the communication system.

References**:**

Enabling Communities to Live Responsibility with Disasters, FOCUS Humanitarian Assistance

Evacuation

During an emergency, if residents know the evacuation routes and evacuation sites, they can evacuate smoothly and safely. It is very important to learn how to assist those who have difficulties in evacuating by themselves. Especially for tsunami, the speed is extremely fast; thus, periodic practice will prevent people from being late for the evacuation. Simulation exercises during the night are also recommended.

Confirming the Evacuation Sites

- Confirming the evacuation routes and evacuation sites by all the family members is recommended
- Decide where to meet finally, in case all your family members are separated

Timing of Evacuation

When you are facing pressing dangers such as earthquakes and tsunami, the earliest possible evacuation is needed. Evacuate immediately in the following cases:

- When you think it is dangerous
- When there are instructions from public authorities such as police, Rescue 1122, Civil Defence, UC, Tehsil, district, etc.
- When there are instructions from a leader or members of CBDRMC

Procedures

Procedures for evacuation are as follows:

- The Information Team gives evacuation guidance to the residents.
- The Evacuation Team asks residents to evacuate.
- Determine the rough number of evacuees and the situation of those who have difficulties.
- Make pre-defined smaller groups for evacuation, and identify persons who will guide the evacuees.
- The leader of the Evacuation Team announces the appropriate evacuation routes and evacuation sites.
- Members of the Evacuation Team provide ropes for those who have difficulty in evacuation to hold, so that they can easily follow the group.
- Gather information from the radio during evacuation
- On reaching the evacuation sites, members of the Evacuation Team count the number of evacuees and make sure that all the evacuees have reached the evacuation site.

Points of Evacuation

Points of evacuation are described below.

- Set several evacuation routes in advance and decide the safest routes based on the situation, such as road blockages, wind, etc.
- If there are injured, patients, or physically challenged who cannot walk by themselves, the residents must cooperate and carry them using instant stretchers, chairs, etc.
- During evacuation in groups, keep the pace of the slowest one. The first person in the queue pays attention to the last person in the queue.
- During evacuation, be careful about the wind, sudden change of weather, fire, etc.
- Try to wear walking shoes with thick soles.
- Keep both your hands free by carrying back packs with emergency kit bags.

Supplying Food and Water

During devastating disasters, power failure, loss of water or gas supply, a shortage of food, water, and commodities is to be expected. If the affected areas are across a wide area, relief supply may not be adequate and slow in coming. It is advisable to keep stocks at home. It is advisable to train on community kitchens and food distribution within the community.

Tips

- Confirm the number of evacuees to equally distribute the supplies.
- Keep the access way and service space for water supply trucks open.
- At the very initial stage, items that do not require cooking can be distributed.
- Keep water for cooking.
- To prevent disease, make sure to wash and disinfect hands.
- While setting up an outside kitchen, try to eliminate obstacles on the ground which cause slipping and stumbling. Keep infants and small children away.
- Avoid keeping the relief goods in areas with moisture or bad drainage.

Procedures

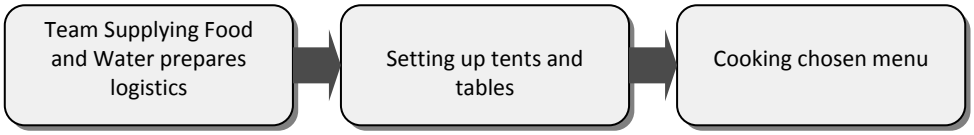


Figure 6.3 Procedures of Supplying Foods

Preparation

Cooking pans, gas cooking stoves, water, towels, rice, flour, vegetables, meat etc. are prepared.

Module 7 Conducting Simulation Drills

Necessity

To minimize the impact of disasters, calm and appropriate actions are important. To be able to take calm and appropriate actions, knowing how to react and practicing how to react is very important since most of the time, people cannot do something that they have never done before. By practicing practical training, capacity for emergency action is enhanced and the hazardous impact can be minimized.

Objectives

To be able to act appropriately, practical drills need to be conducted periodically among the different age groups of the residents, by coordinating with disaster management organizations and enterprises in the locality. The objectives of conducting drills are summarized below.

- Become familiar with the systematic emergency responses and disaster management procedures, responsibilities of different team members of CBDRMC among committee members and community members.
- Test the operability and efficiency of the disaster management plan in place.
- Enhance coordination of all stakeholders to implement existing disaster management plans.
- Generate preparedness and enhance confidence among residents and public officials concerned.

Things to Review in the Drills

Many participants can be expected in a drill; thus, it is a great opportunity to provide basic information and knowledge for the participants during drills. Following are the points of information/knowledge that can be reviewed and practiced. Such review and training needs to be conducted repeatedly.

- Basic and practical knowledge on different types of disasters
- Understanding vulnerabilities of the localities
- Conducting countermeasures for each stage of disasters
- Knowledge dissemination on disaster management equipment
- Understanding and practicing the responsibilities of each person
- Understanding evacuation sites

Planning the Drills

Be sure to make a plan for the drills. Plan the menu of the drills carefully so that many people can participate in different types of activities. Also plan the composition of the participants for the types of

activities. The activities need to be structured from easy to difficult activities. Conducting the activities repeatedly is recommended.

Drills can be combined with some amusement events such as movies or festivals. The drill can be organized as a sports festival.

- Plan what types of training are to be conducted
- The target groups and target number of participants
- Suitable date and time
- Venue
- Method of announcing the drill
- Preparing disaster management equipment

Instruction by Civil Defence, Rescue 1122, DDMA

It is advisable to coordinate with disaster management organizations, and if it is possible, the instructors can be sent from such professional organizations.

Conducting Reviewing Session

At the end of the drill, it is important to have a reviewing session among all the participants of the drill and feedback for the next drill.

Types of Drills

There are different types of drills, such as information collection and distribution, fire extinguishing, basic search and rescue, first aid, evacuation, supplying food and water, and a combination of these. Map maneuvers are also one of the drills but in this section, only practical on-site training is introduced.

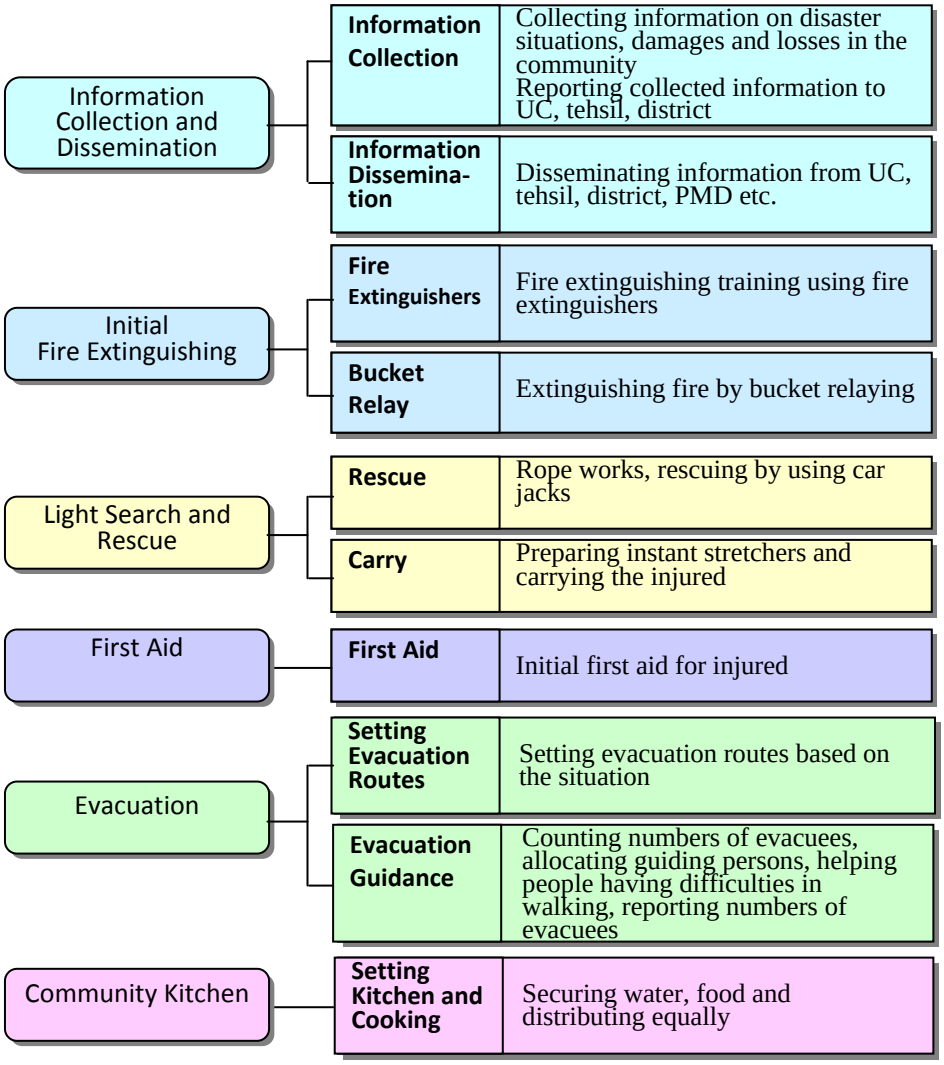


Figure 7.1 Types of Drills

Different Types of Drills considering Local Characteristics

Types of disasters in Pakistan are floods, flash floods, cyclones, landslides, debris flows, earthquakes, tsunamis, avalanches, etc. Types of drills to be conducted can be planned effectively by considering local characteristics and situations. The following table shows some examples.

Table 7.1 Contents of Drills

Characteristics of the Areas	Contents of Drills
Coastal Areas	**For tsunami and high tide** ・ Information dissemination regarding dangers and evacuation orders ・ Evacuation in shortest time ・ Evacuation announcement and guidance for tourists
Area adjacent to Steep Slopes	**For landslide, debris flow** ・ Information dissemination of dangers and evacuation order ・ Evacuation in shortest time
Congested Area	**For earthquake** ・ Initial fire extinguishing ・ Evacuation ・ Light Search and Rescue in a collapsed structure
Tourist Places	**For evacuation of tourists** ・ Information dissemination training (announcing dangers, evacuation order) ・ Emergency evacuation
Neighborhood of Special Facilities	**For collaborating kindergartens / schools** ・ Information dissemination training ・ Emergency evacuation of infants
Business cum Residential Area	**For collaborating residents and enterprises** ・ Evacuation training ・ Light search and rescue ・ Setting community kitchen and cooking

Response Type Drill

The drills can be conducted by setting different incidents such as flooding, fire, falling objects, road blockage, drowning persons, and injured in the different parts of the community. Each scenario is prepared by only a small number of organizers and participants are given instructions to react according to the given situations. This method provides a good opportunity to enhance the capacity of decision-making under an emergency situation.

Figure 7.2 Incident Settings

Scenario of the Drill

The drill scenario is developed considering a timeline, responsible persons, and necessary equipment. An example of a drill scenario is shown in Table 7.2.

Table 7.2 Example of Simple Drill Scenario

Activities	Necessary Equipment	Person in Charge Organization / Name	Time	Action by PARTICIPANTS
Instruction Regarding Drill for a Flood	Documents of explanation	UC / tehsil / district 1.Suleiman 2.Shanaaz	**09:00 - 09:15**	• Gather at one place and listen to the instruction
Flood Warning Siren	2 Hand Sirens 3 Mosque Speakers 1) XXX 2) YYY 3) ZZZ	School principal and Community leaders 1.School Principal 2.CBDRMC leader Mosque Speakers 1) XXX 2) YYY 3) ZZZ	**09:30**	• Self Safety Check
Second Siren for Evacuation	2 Hand Sirens 3 Mosque Speakers 1) XXX 2) YYY 3) ZZZ	School principal and Community leaders 1.School Principal 2.CBDRMC leader 3.CBDRMC Evacuation leader Mosque Speakers 1) XXX 2) YYY 3) ZZZ	**09:40**	• Shut down electric breakers, gas and fire sources. • Take emergency kit, bags, helmets, if any • Start evacuation to designated evacuation site nearby • Bring keys to the houses. • Be careful of heavy rain and strong wind. • Check your own safety, others missing, or injured, utilizing the name lists of the community • Respond to treatment of the injured.
Report to UC about the Damage and Evacuation	Mobile phones	1 CBDRMC leader	**09:50**	• Report to UC office about situation of the community by mobile phone; report situation, ask for assistance. NOTE: Need to mention that this is a DRILL at first loudly, then report.
Following **Incidents** are set 10 incident sign boards 1 signboard per site	<Production of Signboards for Incidents in advance> (Road Blockage(3), Bridge Impassable (3), Injured (4))	1. Road Blockage: 2. Road Blockage: 3. Road Blockage: 4. Bridge Impassable: 5. Bridge Impassable: 6. Bridge Impassable: 7. Injured: 8. Injured: 9. Injured: 10. Injured:	**09:00 - 09:30**	**NB:** Participants do not know the damage or injuries on the way to evacuation sites Residents / Students will respond to the incidents on the way to evacuation sites.

Activities	Necessary Equipment	Person in Charge Organization / Name	Time	Action by PARTICIPANTS
• **Road Blockages** Setting signboard at 3 places Volunteers hold the signboards	3 Signboards	Resident Volunteers 1.XXX 2.YYY 3.ZZZZ	**09:00 - 09:30**	Confronting a ***Road Blockage*** Find alternative route and Detour
• **Bridge Impassable** Setting signboard at 3 places	3 Signboards	Resident Volunteers 1.XXX 2.YYY 3.ZZZZ	**09:00 - 09:30**	Confronting a ***Bridge Impassable*** Find alternative route and Detour
• **Injured** Placing 4 Fake Injured Persons Place types of injuries on cards on fake injured persons (1) Fainted and unconscious:1 (2) Leg is broken:1 (3) Severe cuts on legs: 1 (4) Arm is broken:1 3 blankets are provided for 3 instant stretchers for injuries (1) (2) and (3)	4 Injured Volunteers (1 person x 4 types) 4 Small cards to write about the types of injuries Health Centre Staff Supervisors at 4 sites 3 Blankets and 6 bars for 3 instant stretchers	Residents/Volunteers 1. 2. 3. 4. Health Workers 1. 2. 3. 4.	**09:00 - 09:30**	Caring for the ***Injured:*** Apply first aid to the injured Evacuate with the injured or carry them to evacuation sites
Registration at Evacuation Sites 1.Setting up a registration desk 2.Assisting registration of evacuees	Registration sheets Pens (name, address, tel#, time of entry, remarks on food habit, physical difficulties) desks, chairs, tents	Members of Evacuation Team 1. XXX 2. YYY 3. ZZZ	**09:50 Onward**	Evacuees at evacuation site to register, using registration desks Evacuees are divided into **3 Groups (1, 2 3)** for different training and receive training tickets
3. Distribution of Biscuits, fruit juice, and bottles of water (200?)	Snacks, drinks 2 desks	Members Supplying food and water 1. XXX 2. YYY 3. ZZZ		
Training A: **Community Kitchen** 10 resident volunteers and 3 team members for supplying food and water and cook emergency meals for 200 people. Open tent is set.	Food Materials for 200 people (including 50 students, 25 observers) Cooking Utensils Meal Ingredients Tent	Team members for Supplying food and water 1. Saida 2. Ayesha 3. Amir Resident Volunteers 1. 2. 3. 4. 5. 6.	**10:00 - 10:40**	**Group A** 3 team members 10 volunteer residents

Activities	Necessary Equipment	Person in Charge Organization / Name	Time	Action by PARTICIPANTS
		7. 8. 9. 10.		
Distribution of Food/Water After cooking is done, distribute the food.		3 team members 10 residents	**13:00 - onward**	**Group A** 3 team members 10 volunteer residents
Training B: **Setting Tents** 3 tents are prepared for setting. **(After setting, to be used for)** **Tent 1: Community Kitchen** **Tent 2: Medical Post** **Tent 3: Registration**	3 tents 2 Instructors	Team members for supplying food and water, first aid, and evacuation 1. 2. 3.	**10:00 - 10:40**	**Group B (**30 residents) Setting 3 tents 10 residents* 3 tents =30residents
Training C: **First-aid training**	First Aid Kits 2 sets 2 Instructors per one set	Team members for first aid 1. 2. 3. 4. Health Workers 1. 2.	**10:00 - 10:40**	**Group C** (30 residents)
Training D: **Notice boarding**	2 boards 20 Pens 40 Note pads	Team members for Information Collection and Dissemination 1. 2. 3.	**10:00 - 10:40**	**Group E** (40 residents)
Reviewing	Microphones Questionnaire sheets for evaluation (150)	UC Tehsil District DRM expert	**10:40 - 11:00**	**All Participants**

Module 8 Monitoring and Evaluation

Steps

The steps of the Monitoring and Evaluations are summarized below.

1. Identifying what kinds of information need to be collected, considering available human and financial resources
2. Identifying how the information will be collected
3. Identifying who will collect, analyze, and use the information
4. Setting up the Monitoring and Evaluation system with a participatory approach
5. Collecting data and information
6. Analyzing and evaluating data
7. Documentation, communication and sharing findings

Monitoring

Monitoring is the process of reviewing the activities periodically and assessing how the progress and the planned schedules are progressing, and how many achievements have been realized. There are two types of monitoring: 1) process monitoring, and 2) effect monitoring. In the process monitoring, the implementing process is assessed; thus, if it is behind the planned schedule, more inputs/actions are added to catch up with the timeline. For process monitoring, indicators at key stages can be developed. In the case of effect monitoring, the impacts are assessed. If there are negative impacts, stakeholders are to take appropriate actions to stop the negative effects.

Method of Monitoring

- Direct observation by visiting the field
- Interviewing survey with the key persons
- Conducting review meetings among the stakeholders
- Monitoring with indicators, by reviewing the existing activity reports, progress

Evaluation

Evaluation is the assessment of achievements, results, and effects, usually conducted at the end of the project, but sometimes it can be done during the implementation phase. Evaluations are conducted to know: how many of the objectives are achieved, how successfully the project contributed to disaster risk reduction, what were the effects of the project to the community people, and accountabilities. If the set objectives are not achieved, additional inputs need to be considered.

It is also important to set indicators for evaluation at the beginning of the project. The result of the VCA can be baseline data to assess the changes before and after the project. If a baseline survey is conducted at

the early stage of the project, an end survey can be conducted to see the differences and know the effectiveness.

In the evaluation, it is also important to discuss among the stakeholders to identify the lessons learned and make documents to share among the concerned.

The process of monitoring and evaluation needs to be participatory, the stakeholders including beneficiaries, community members, disaster management experts at local governments, and project managers, take active roles in designing the process, developing the findings, conclusions, and recommendations. In the process, the stakeholders decide together and come to a common understanding and certain consensus that motivates the participants in the process of the project, and they also extract the lessons learnt for further activities to be improved at the end of the project.