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

MAIN REPORT

MARCH 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

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

PT
JR
13-001

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

MAIN REPORT

MARCH 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

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

The following foreign exchange rate is applied in the study:
US$ 1.00 = PKR 88.4

Preface

In response to a request from the Government of Pakistan, the Government of Japan decided to conduct "Project for National Disaster Management Plan" and entrusted to the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. KOBAYASHI Ichiro Oriental Consultants Co., Ltd. and consists of CTI Engineering International Co., Ltd. and OYO International Corporation between April 2010 and August 2012.

The team conducted field surveys at the study area, held discussions with the officials concerned of the Government of Pakistan and implemented seminars, workshops, and so on. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Pakistan for their close cooperation extended to the study.

March 2013

NISHIKATA Takatoshi
Chief Representative
JICA Pakistan Office

The composition of this Report is as follows.

1. Main Report
2. Executive Summary
3. National Disaster Management Plan
4. Human Resource Development Plan On Disaster Management
5. National Multi-hazard Early Warning System Plan
6. Instructor’s Guideline On Community Based Disaster Risk Management

Main Report

1. Background and Necessity of the Study

Pakistan is one of the most disaster prone and vulnerable countries in the world, and has suffered from numbers of disasters in the past. In recent years, it has experienced several catastrophic disasters such as the Earthquake in October 2005, Flood in June 2010 and Flood in September 2011. Heavy damages brought about by the earthquake has led Pakistan to initiate national efforts in developing the structure for Disaster Management focusing on prevention, mitigation and integration of responses, by conducting a radical review of the traditional disaster management system and policies on post-disaster and autonomous responses.

Systematizing the whole Disaster Risk Management is essential for the formulation and promotion of comprehensive and well-planned disaster management administration for the future. This study was conceived to illustrate the method on how to develop a disaster-resilient society for the long term by systematically implementing a comprehensive disaster management administration realizing that "self help, mutual help and public help" are the principle of disaster management in Pakistan.

Considering that the occurrence of natural disasters differs by country and by region, lessons gained from previous disasters should be explored and applied to disaster-resilient regions and communities. In light of the foregoing, the disaster management administration should be developed based on experiences gained from the occurrence of recurring disasters.

2. Objective of the Study and Target Area

The objective of the Study is to support the formulation of basic plans for disaster risk management at the national level. The goal is to be able to prepare mitigating measures against possible damage arising from the occurrence of natural calamity by developing the capacity of disaster management administrative agencies in Pakistan, through the formulation of plans and means/mode of supporting the implementation.

3. Target Area

Although the target area of the above-mentioned Plans shall be the whole of Pakistan, the JICA Study team shall survey in only Province of Punjab and Sindh for the security reason. The area where the Japanese experts cannot enter shall be surveyed by local consultants employed by JICA Study team.

4. Implementing Agency of Pakistan

Following are the implementing agencies on disaster management in Pakistan:

Main counterpart agencies

- National Disaster Management Authority (NDMA)
- Pakistan Meteorological Department (PMD)
- Federal Flood Commission (FFC)

Relevant Ministries

- Prime Minister's Secretariat
- Ministry of Water and Power (MWP)
- Provincial Disaster Management Authority (PDMA)
- District Disaster Management Authority (DDMA)

5. Study on existing conditions of disaster risk management in Pakistan

The drafts of the plans for disaster risk management at the national level were prepared to initiate the arrangement of existing statutory organizational framework and the state of activity affairs.

Identifying the occurrence of areas prone to hazards and risk of danger, organizing the chronology of disaster incidences and conducting of hazard assessment were essential for the formulation of the draft plans.

1) Legal framework for disaster management

The loss of life and property and the challenges that were faced in the aftermath of the October 2005 earthquake affecting Azad Jammu and Kashmir and the NWFP Province (currently KP) exhibited the need for establishing appropriate policy and institutional arrangements to reduce losses from disasters in the future. The earthquake tested the resilience and capacity of Pakistan and its people to overcome catastrophes.

Based on the aforementioned concerns, the Government of Pakistan has established policy and institutional mechanisms at the national, provincial and district levels. The National Disaster Management Ordinance (NDMO), which aimed at providing for the establishment of a National Disaster Management System for Pakistan was promulgated on 3 October 2006; and came into force on 17 August 2007. After the assent of the President on 8 December, 2010, the NDMO became the “National Disaster Management Act, 2010” (hereinafter referred to as “The Act, 2010”) on 11 December, 2010. The components of NDMO and The Act are the same except that the expression of “Nazim of the District” was changed to the “Head of the Local Council at the District Level” indicated in Clause 18. Promulgation of the ex-Ordinance and the Act become the great turning point of Pakistan in Disaster Management, and in order to implement the contents, a variety of relevant organizations have started to move build a safer country against variety of disasters.

2) Institutional Framework for Disaster Management

After the promulgation of the Act, 2010, based on its contents, disaster management authorities in each level of government have been established or are under the process of establishment. These Disaster Management Authorities are the main responsible institutions to plan, coordinate and implement disaster management efforts.

In the Federal and Provincial levels, Disaster Management Authorities with physical institutions had established, however, those below district level, including District Disaster Management Authorities (DDMAs) and Local Authorities (LAs) do not have physical institutions, and officials are combined with other posts, which makes it difficult to handle other tasks, especially on pre-disaster measures.

3) Responsibilities of Relevant Organizations and Stakeholders

In disaster management, there are multiple organizations and stakeholders concerned, and there is a need to clarify roles and responsibilities of each organization and stakeholder in order to achieve the maximum results from the efforts implemented. By utilizing the following documents, a list of relevant organizations and stakeholders was created and is shown in Chapter 2. The documents to be utilized are: National Disaster Management Act 2010, National Disaster Risk Management Framework, National Disaster Response Plan, and List of Ministries concerning “Mainstreaming DRR into Development.”

4) Government Policy on Disaster Management

The National Disaster Risk Management Framework (NDRMF), which was prepared with active participation of multiple stakeholders, serves as a vision document for leading the way towards a safer Pakistan in cooperation with UNDP. The Framework provides guidelines to coordinate the activities of numerous stakeholders.

It also sets out priorities for mobilization of resources from donors and development partners of Pakistan to implement strategic activities during the next five years. Nine priority areas are pointed out in NDRMF and those are in the process of implementation. The nine priority areas are as follows: 1) Institutional and legal arrangements of DRM, 2) Hazard and vulnerability assessment, 3) Training, education and awareness, 4) Disaster risk management planning, 5) Community and local level programming, 6) Multi-hazard early warning system, 7) Mainstreaming disaster risk reduction into development, 8) Emergency response system, and 9) Capacity development for post-disaster recovery.

5) Hazard and Risk Assessment

Disaster Situation in Pakistan

Pakistan is one of the most vulnerable countries to disasters in the world. The earthquake of 8 October 2005 highlighted Pakistan's vulnerability to disaster risks. This has been further evidenced by the recent tremendous tragedies of the Indus River Flood of 2010 and the 2011 Sindh Flood. Pakistan has been hampered by damages from a wide range of disasters in the past.

The profile of natural disasters in Pakistan compiled from the internal study of international database (EM-DAT). Among all types of natural disasters, earthquake is the second most frequent, next to flood, and the most deadly type. It is notable that earthquake ranks first in terms of losses per event.

The Methodology of Risk Assessment

According to NDMA, risk is defined as "The chances of losses (deaths, injures, property, livelihoods, economic activity disrupted or environmental damage) resulting from interactions between hazards and vulnerable social conditions. Risk is expressed as Risk=Hazards x vulnerability." Hazard risk assessment is a method to determine the nature and extent of risk by analyzing potential hazards and evaluating existing vulnerabilities that could pose a potential threat to people, property, livelihoods and the environment.

There are three steps to producing a hazard map, namely: 1) data collection, 2) calculation and selection of indices, and 3) creation of the hazard map. Further, a risk map is derived based on the formula "Risk = Hazard x Vulnerability" using the hazard map and the vulnerability indices (or possibly a map representing "Vulnerability"). Risk is composed of hazards and vulnerabilities. Hazards and vulnerabilities are represented by their respective indices. Each index is derived or calculated based on the basic data collected from various information sources. The indices used for creation of hazard maps and risk maps are shown in below. The hazards and vulnerabilities can be overlaid for the analysis of the risk with the use of GIS software.

6. Major Activities of the Project

1) Disaster Management Workshop

The objective of the Study is to support the formulation of basic plans for disaster risk management at the national level. The aim is to be able to prepare mitigating measures against possible damage arising from the occurrence of natural calamity by developing the capacity of disaster management administrative agencies in Pakistan, through the formulation of plans and means/mode of supporting the implementation.

Under the objectives, activities which were conducted by JICA Study team with respect to strengthening the capacities of relevant stakeholders are described as follows;

- 1st Disaster Management Workshop to share understanding on NDMP among concerned actors;
- 2nd Disaster Management Workshop to share EWS, hazard assessment and NDMP ;
- 3rd Disaster Management Workshop to present the current progress status of the project and NDMP;
- Counterpart trainings on comprehensive disaster management administration and EWS in Japan;
- Technical committee meeting regarding the progress of NDMP, HRDP and EW plan; and
- Consultative workshop to discuss with relevant stakeholders the draft of NDMP and the roles and responsibilities of relevant stakeholders.

2) Priority Activities for Human Resource Development

The activities of Human Resource Development Plan cover the implementation of highly-prioritized activities as a pilot this year and the "Disaster Risk Management Training for TMA Staff (DRM training for TMA Staff)". The priority activities which were conducted by JICA Study team are described as follows.

- TOT for DMR Training for TMA staff was held at NIDM lecture hall in respect to concept of DRM, roles and responsibilities of TMA staff and basic concept of CBDRM;
- TOT for DMR Training for TMA staff was held at each target district (total 5 districts, each training – 3days); and
- The action plans by TMA staff, which had been developed during the training were prepared.

3) Community Based Disaster Risk Management Activities

Target disasters for the CBDRM activities are 1) flood, 2) flash flood, 3) earthquake and tsunami, 4) drought, and 5) cyclone. In each pilot site, at least one primary disaster is identified to highlight during the CBDRM activities. For some areas, a few more disasters were identified, in addition to the primary target disaster. The CBDRM activities which were conducted by JICA Study team are described as follows.

- Criteria were set to select communities for the CBDRM activities to be conducted and with the criteria, the target communities were selected.
- A Forum was conducted in Islamabad in July, 2011 to share lessons learned from CBDRM activities; and
- CBDRM Instructor's Guidelines were prepared as draft materials and used for training of the CBDRM facilitators.

7. Lessons learned from past experience

The most important item for development of disaster risk management in the country is to learn from the past disaster experiences, because disasters differ from country by country such type of disaster, institutional set up, socio economic conditions etc. After a disaster has occurred, the cause of the disaster damageshould be clarified for all aspects: technical, institutional capacity, government response, level of preparedness, and delivery of goods and services. The lessons learned from past disasters should be fed back to strengthen the disaster management system in Pakistan. Those efforts are essential to establish an original disaster management system in Pakistan.

8. Conclusions and Recommendations

The drafts of various plans were formulated with continuous work activities such as finding solutions to issues of major concern through dialogues with concerned Pakistani officials and related institution and organizations. The process of preparing the various plans was initiated with the arrangement of existing statutory organizational framework and the state of activity affairs as well as identifying the occurrence of areas prone to hazards and risk of danger, organizing the chronology of disaster incidences and conducting of hazard assessment.

It is pointed out that the urban area in Pakistan has increased its vulnerability in many ways; high urban population growth, accumulation of urban infrastructure, accumulation of assets and weak linkage of community organization. The results of hazard and risk analysis show that Karachi is the area most vulnerable to natural hazard in Pakistan. The preparation of a disaster management plan in Karachi and its implementation should be the first priority in the country.

In the legal and institutional framework, after the assent of the President on 8 December, 2010, the NDMO became the "National Disaster Management Act, 2010". After the promulgation of the Act, 2010, based on its contents, disaster management authorities in each level of government have been established or are under the process of establishment.

To effectively function the disaster management system, capacities of NDMA should be enhanced. The NDMA should improve technical capability by accepting staff from infrastructure related ministries and mainstream disaster risk reduction into a development approach to reduce the risk level of the country.

At the central level, the National Institute of Disaster Management (NIDM) was established in 2010 at the UNDP building and it is expected to conduct capacity development activities for government staff. However, NIDM is still under development in terms of staffing, budgeting and building and it has not yet become functional. The construction of NIDM is an urgent matter to improve capacity of government officials in disaster management.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATION

AD	Assistant Director
ADB	Asian Development Bank
ADPC	Asian Disaster Preparedness Center
AFD	France's Development Assistance (Agence Française de Développement)
AJK	Azad Jammu and Kashmir
A/P	Administration and Procurement
APEC	Asia Pacific Economic Cooperation
APT	Automatic Picture Transmission
ATO	Assistant Town Officer
AWS	Automatic Weather Stations
AZRI	Arid Zone Research Institute
BoG	Board of Government
C&IM	Coordination and Information Management
C&W	Communication and Works
CAA	Civil Aviation Authority
CBDRM	Community Based Disaster Risk Management
CBDRR	Community Based Disaster Risk Reduction
CBOs	Community Based Organizations
CD	Capacity Development
CDG	City District Government
CDGR	City District Government Rawalpindi
CDH	Climate Discussion Hour
CDMC	Community Disaster Management Committee
CEA	Chief Engineering Adviser
CFFC	Chairman, Federal Flood Commission
CIDA	Canadian International Development Agency
CM	Centimeter
COS	Chief of Staff
COSPAS	Cosmicheskaya Sistema Poiska Avariynyh Sudov in Russian (Space System for the Search of Vessels in Distress): Name of Satellite
C/P	Counter part
CPI	Cumulative Precipitation Index
CPO	City Police Officer
CSO	Civil Society Organization
CTII	CTI engineering International
DC	Deputy Commissioner
DCO	District Coordination Officer
DD	Deputy Director
DDMA	District Disaster Management Authority
DDMP	District Disaster Management Plan
DDRMPs	District Disaster Risk Management Plans
DDO	Deputy District Officer
DDO	Drawing and Disbursing Office (in Figure 7.3.2 in Chapter 7)
DDRC	District Disaster Resource Centers
DERA	Drought Emergency Relief Assistance
DEWS	Disease Early Warning System
DEO	District Emergency Officer
DFCC	District Flood Control Centre
DF/R	Draft Final Report
DG	Director General
D.G. Khan	Dera Ghazi Khan
DHQ	District Head Quarter
DIG	Disaster Imagination Game
D.I. Khan	Dera Ismail Khan
DM	Disaster Management
DMA	Disaster Management Authority
DNA	Damage and Needs Assessment
DRAC	District Reconstruction Advisory Committee
DRM	Disaster Risk Management
DRMP	Disaster Risk Management Program
DRR	Disaster Risk Reduction
DRUs	District Reconstruction Units
D&SCC	Donors and Sponsors Coordination Cell
DTC	Diarrhea Treatment Center
EAD	Economic Affairs Division
ECNEC	Executive Committee on National Economic Council
ECSRC	Executive Committee of the Space Research Council
EDO	Executive District Officer
EEZ	Exclusive Economic Zone
EM-DAT	Electron Microscopy Data
ENERCON	National Energy Conservation Centre
EO	Evacuation order
EOC	Emergency Operations Centre
ERC	Emergency Relief Cell
ERRA	Earthquake Reconstruction and Rehabilitation Authority
ETo	Reference Crop Evapotranspiration
EWS	Early Warning System
FAO	Food and Agriculture Organization
FANA	Federally Administrated Northern Areas
FATA	Federally Administrated Tribal Areas
FAX	Facsimile
FDMA	FATA Disaster Management Authority
FEWS	Flood Early Warning System
FFC	Federal Flood Commission
FFD	Flood Forecasting Division
FFWMCC	Flood Forecasting and Warning Master Control Centre
FFWS	Flood Forecasting and Warning System
FGD	Focus Group Discussion
F/G/S/P	FATA/GB/State/Provincial
FHA	Focus Humanitarian Assistance
FIDC	Federal Irrigation and Drainage Cell
FM	Financial Management
FMIS	Financial Management Information System
FOCUS	FOCUS Humanitarian Assistance
FPSP	Flood Protection Sector Projects
F/S	Feasibility Study
FY	Fiscal Year
GB	Gilgit Baltistan
GBDMA	Gilgit Baltistan Disaster Management Authority
GDP	Gross Domestic Product
GFAS	Global Flood Alert System
GIS	Geographic Information System
GLOF	Glacial Lake Outburst Flood
GM	General Manager
GMDSS	Global Maritime Distress Safety System

GOP	Government of Pakistan
GPS	Global Positioning System
GPRS	General Packet Radio Service
GSHAP	Global Seismic Hazard Assessment Program
GSM	Global System for Mobile Communications
GSP	Geological Survey of Pakistan
GTS	Global Telecommunication System
GTZ	German Society for Technical Cooperation (Deutsche Gesellschaft fur Technische Zusammenarbeit)
HA	Hazard Assessment
HEPR	Health Emergency Preparedness and Response
H. F.	High Frequency
HFA	Hyogo Framework for Action 2005-2015
HH	Household
HLV	Hazard, Livelihood and Vulnerability
HR	Human Resource
HRDP	Humana Resource Development Plan
H.R.P.T.	High Resolution Digital Telemetry
H&WM	Hydrology and Water Management Organization
IBR	Institution-Based Rehabilitation
IBDR	International Bank for Reconstruction and Development
ICID	International Commission on Irrigation and Drainage
ICOLD	International Commission on large Dmas
ICT	Islamabad Capital Territory
IDB	Islamic Development Bank
IESCO	Islamabad Electrical Supply Company
IFAS	Integrated Flood Analysis System
IFRC	International Federation of Red Cross
IIEES	International Institute of Earthquake Engineering and Seismology
IIMI	International Irrigation Management Institute
INGOs	International Non-governmental Organizations
IPC	Inter-Provincial Coordination
IPCC	http://www.ipcc.ch/
IPP	Independent Power Producers
IRSA	Indus River System Authority
ISDR	International Strategy for Disaster Reduction
IT	Information Technology
IT/R	Interim Report
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JMA	Japan Meteorological Agency
JPs	Joint Programs
JPCs	Joint Program Components
KESC	Karachi Electricity Supply Corporation
KFW	Kreditanstalt für Wiederaufbau, (meaning Reconstruction Credit Institute (German government-owned development bank))
KP	Khyber Pakhtunkhwa
KMC	Knowledge Management Cell
K MGM	Knowledge Management
Las	Local Authorities
LFFFC	Local Flash Flood Forecasting Centres
LGRD	Local Government and Rural Development
MAC	Management Advisory Committee
MAF	Million Acre Feet
M&E	Monitoring and Evaluation
M&P	mitigation and preparedness
MBC	Mid East Broadcasting Center
MDMA	Municipal Disaster Management Authority
METI	Japan's Ministry of Economy, Trade, and Industry
MHEWP	Multi-Hazard Early Warning Plan
MIS	Management Information System
M/M	Man and Month
MMI	Modified Mercalli Intensity
MOA	Memorandum of Agreement
MOD	Ministry of Defence
MOHW	Ministry of Housing and Works
MOST	Ministry of Science and Technology,
MRDEA	Medical Rehabilitation for Persons with Disabilities in Earthquake Affected Areas
MSA	Maritime Security Agency
MTO	Mechanical Transport Officer
MWG	Ministerial Working Group
MWP	Ministry of Water and Power
NA	Northern Areas
NASA	U.S. National Aeronautics and Space Administration
NCA	National Command Authority
NDMA	National Disaster Management Authority
NDMC	National Disaster Management Commission
NDMO	National Disaster Management Ordinance
NDMF	National Disaster Management Fund
NDMP	National Disaster Management Plan
NDRF	National Disaster Management Force
NDRMF	National Disaster Risk Management Framework
NDRP	National Disaster Response Plan
NEC	National Economic Council
NEOC	National Emergency Operations Centre
NESPAK	National Engineering Services of Pakistan
NESPC	National Engineering Services Pakistan
NFPP	National Flood Protection Plans
NGDC	National Geographical Data Center
NGOs	Non-governmental Organizations
NHA	National Housing Authority
NIDM	National Institute of Disaster Management
NIO	National Institute of Oceanography
NLC	National Logistics Cell
NPO	Nonprofit Organization
NSC	National Steering Committee
NSMC	National Seismic Monitoring Centre
NSPP	National School of Public Policy
NWFC	National Weather Forecast Centre
NWFP	North West Frontier Province
NWP	Numerical Weather Prediction
OC	Oriental Consultants Co., Ltd.
ODA	Official Development Assistance
OIC	OYO International
Ops	Operations
PAEC	Pakistan Atomic Energy Commission
PARC	Pakistan Agriculture Research Council
PC&WD	Provincial Communication and Works Department

PCATAP	Pakistan Council of Architects and Town Planners
PCIW	Pakistan Commissioner for Indus Waters
PCRWR	Pakistan Council of Research in Water Resources
PDMA	Provincial Disaster Management
P&D	Planning and Development Authority
PDMC	Provincial Disaster Management Commission
PEC	Pakistan Engineering Council
PEER	Program for Enhancement of Emergency Response
PEMRA	Pakistan Electronic Media Regulation Authority
PEOC	Provincial Emergency Operations Centre
PEPAC	Pakistan Environmental Planning and Architectural Consultants Limited
PEPCO	Pakistan Electric Power Company
PERRA	Provincial Earthquake Reconstruction and Rehabilitation Agency
PICU	Project Implementation Coordination Unit
PID	Provincial Irrigation and Power Department
PIDA	Provincial Irrigation and Drainage Authority
P&Imp	Planning and Implementation
PIPD	Provincial Irrigation and Power Department
PM	Prime Minister
PMD	Pakistan Meteorological Department
PMF	Probable Maximum Flood
PRCS	Pakistan Red Crescent Society
PSO	Personal Staff Officer
PSPM	Principal Secretary to the Prime Minister
PTA	Pakistan Telecommunication Authority
PTCL	Pakistan Telecommunication Company Limited
PWDs	Persons with Disabilities
QPM	Quantitative Precipitation Measurement
R&D	Research and Development
R&R	Roles & Responsibilities
RBC	Reinforced Brick Concrete
RCC	Reinforced Cement Concrete
RDFF	Routine Daily Flood Forecast
RDMC	Regional Drought Monitoring Center
REDIM	Regional Drought Identification Model
RFFWC	Regional Flood Forecasting and Warning Centres
SARSAT	Search And Rescue Satellite-Aided Tracking
S&S	Support and Services
SCARP	Salinity Control and Reclamation Project
SERRA	State Earthquake Reconstruction and Rehabilitation Agency
SDMA	State Disaster Management Authority
SLMP	Sustainable Land Management Project
SMA	Senior Management Advisor
SMRFC	Specialized Medium Range Forecasting Centre
SO	Section Officer
SOE	Standard Operating Environment
SOPs	Standard Operating Procedures
SPC	Special Projects Cell
SPI	Standard Precipitation Index
SPU	Strategic Planning Unit
SRC	Space Research Council
SRS	Satellite Remote Sensing
SSPM	Special Secretary to the Prime Minister
SUPARCO	Space and Upper Atmospheric Research Corporation
TC	Tropical Cyclone
TCMC	Tropical Cyclone Monitoring Centre
TCP/IP	Transmission Control Protocol/Internet Protocol
TCWC	Tropical Cyclone Warning Centre
TDF	Tarbela Development Fund
TMA	Tehsil Municipal Administration
TMO	Tehsil Municipal Officer
TOT	Training of Trainers
TRC	Transnational Relief Cell
TS	Technical Services
TV	Television
UAN	Universal Access Number
UC	Union Council
UCDMC	Union Council Disaster Management Committee
UCERT	Union Council Emergency Response Team
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UTC	Universal Time, Coordinated
VCA	Vulnerability and Capacity Assessment
WAPDA	Water and Power Development Authority
WASA	Water and Sanitation Agency
WASH	Water, Sanitation and Hygiene
WB	World Bank
WCAP	Water Sector Capacity Building and Advisory Services Project.
WCDR	World Conference on Disaster Reduction
WEC	World Engineering Council
WFP	World Food Plan
WMO	World Meteorological Organization
XEN	Executive Engineer

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 is 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 mud flows.

Hazard
potentially damaging physical event or phenomenon that may ca use 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.

CHAPTER 1 OUTLINE OF THE STUDY

1.1 Background and Necessity of the Study

This report is prepared in accordance with the Scope of Work agreed upon between the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 11 December 2009.

1.1.1 Formulation of Disaster Management Structure in Pakistan

Pakistan is prone to various natural disasters including earthquakes, floods, landslides, cyclones, and other calamities. The latest earthquake occurred in October 2005 that brought deaths and injuries to more than 75,000 people in the northern area of Pakistan.

Heavy damages brought about by the earthquake has led Pakistan to initiate national efforts in developing the structure for Disaster Management focusing on prevention, mitigation and integration of responses, by conducting a radical review of the traditional disaster management system and policies on post-disaster and autonomous responses.

In view of the foregoing, the National Disaster Management Ordinance (NDMO; currently National Disaster Management Act 2010) was promulgated in 2006 with the Cabinet Office as the Implementing Agency in 2007. The ordinance was converted into an Act of Parliament in 2010. The Agency consists of the National Disaster Management Commission (NDMC) headed by the Prime Minister and the National Disaster Management Authority (NDMA) as secretariat of NDMC. Subsequent to the establishment of NDMA, Provincial Disaster Management Authorities (PDMAs) of four provinces were established in addition to the State Disaster Management Authority (SDMA) in AJ&K, FATA Disaster Management Authority (FDMA) in FATA and Gilgit Baltistan Disaster Management Authority (GBDMA). Also district disaster management authorities (DDMAs) were established by the respective F/G/S/PDMAs in their respective districts.

1.1.2 Formulation of structural disaster management administration

Systematizing the whole Disaster Risk Management is essential for the formulation and promotion of comprehensive and well-planned disaster management administration for the future.

Pakistan's National Disaster Management Ordinance (currently National Disaster Management Act 2010) involves the following: 1) clarification of responsibilities for disaster management, 2) improvement of administrative organization for disaster management, and 3) the types of organizations for formulating the disaster management plan. This shows that the framework of the national disaster management administration of Pakistan has already been instituted.

1.1.3 Formulation of disaster-resilient society

This study was conceived to illustrate the method on how to develop a disaster-resilient society for the long term by systematically implementing a comprehensive disaster management administration realizing that "self help, mutual help and public help" are the principle of disaster management in Pakistan.

Considering that the occurrence of natural disasters differs by country and by region, lessons gained from previous disasters should be explored and applied to disaster-resilient regions and communities. In light of the foregoing, the disaster management administration should be developed based on experiences gained from the occurrence of recurring disasters.

1.2 Objective of the Study and Target Area

1.2.1 Objective of the Study

The objective of the Study is to support the formulation of basic plans for disaster risk management at the national level. The goal is to be able to prepare mitigating measures against possible damage arising from the occurrence of natural calamity by developing the capacity of disaster management administrative agencies in Pakistan, through the formulation of plans and means/mode of supporting the implementation.

In order to achieve the objectives of the Study, the following will be undertaken:

- Formulation of National Disaster Management Plan (final draft);
- Formulation of Human Resource Development Plan for Disaster Management (final draft) and launching of human resource development training program based on the foregoing plan;
- Formulation of an Early Warning Plan (final draft) responding to major disasters. The Plan will identify high priority activities to be undertaken during the Plan period (2012-2021);
- Implementation of Community Based Disaster Risk Management Pilot Projects in cooperation with the community and local government;
- Development of the cooperative system/skill of relevant organizations, and enhancement of the capacity of the staff members based on the above process; and
- Preparation of a draft PC-I/PC-II.

1.2.2 Target Area

Although the target area of the above-mentioned Plans shall be the whole of Pakistan, the JICA Study team shall survey in only Province of Punjab and Sindh for the security reason. The area where the Japanese experts cannot enter shall be surveyed by local consultants employed by JICA Study team.

1.2.3 Implementing Agency of Pakistan

Following are the implementing agencies on disaster management in Pakistan:

Main counterpart agencies

- National Disaster Management Authority (NDMA)
- Pakistan Meteorological Department (PMD)
- Federal Flood Commission (FFC)

Relevant Ministries

- Prime Minister's Secretariat
- Ministry of Water and Power (MWP)
- FATA/GB/State/Provincial Disaster Management Authority (F/G/S/P/DMA)
- District Disaster Management Authority (DDMA)

Figure 1.2.1 Study Area Location Map

1.3 Implementation Organization

The Study was carried out through the joint efforts of the JICA Study Team and Pakistani counterpart personnel, who formed the study implementing body. The JICA Study Team was comprised of members from Oriental Consultants (OC), CTI engineering International (CTII) and OYO International (OIC). The Pakistani counterparts were delegated from NDMA PMD and FFC.

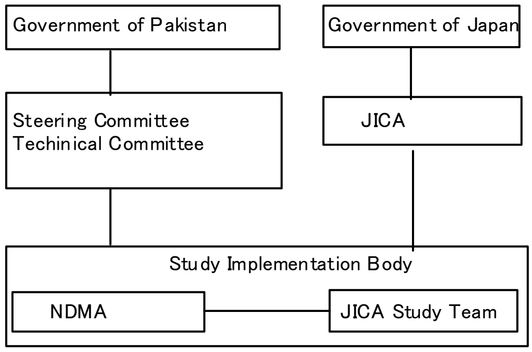


Figure 1.3.1 Study Organization

Table 1.3.1 Member Lists of the Japanese Side Study Organizations

JICA Pakistan Office

Mr. Toshiya Sato	Senior Representative	JICA, Pakistan Office
Mr. Tomohiro Kozono	Representative	JICA, Pakistan Office
Mr. Mahmood A Jilani	Staff	Deputy Resident Representative/Chief Program Officer

Study Team

Mr. Ichiro Kobayashi	Team Leader
Dr. Yoshihiro Asano	Deputy Team Leader / Comprehensive Disaster Management Plan
Mr. Kazuto Suzuki	Deputy Team Leader / Early Warning System
Mr. Noboru Ikenishi	Institutional Management
Mr. Ryoji Takahashi	Institutional Management
Mr. Keigo Ito	Flood and Sediment Disaster Management
Dr. Akihiro Furuta	GIS/Data Base
Mr. Eric R. Lopez	GIS/Data Base
Ms. Tomoko Shaw	Community Based Disaster Risk Management
Mr. Taichi Ogino	Social Survey / Public Involvement
Ms. Harumi Tsukahara	Disaster Education/ Human Resource Development (2)
Mr. Masamichi Sunada	Capacity Building
Mr. Hajime Tanaka	Meteorology/ Hydrology
Dr. Ryo Matsumaru	Human resource Development (1)
Mr. Nobutaka Noguchi	IT System Planning
Mr. Kenji Mori	Equipment Planning (weather monitoring)
Mr. Toshihide Endo	Equipment Planning (telecommunication)
Ms. Azusa Matsui	Coordinator/ Priority Program Management

Table 1.3.2 Member Lists of Counter Part

Mr. Ahemed Kamal	NDMA Member DRR and Project Director
Syed Sibt-e-Abbas Zaidi	NDMA Director of DRRII
Mr. Amir Mohyuddin	NDMA Director DRR I (April 2010- December 2010)
Mr. Arshad Nawaz Chhenna	NDMA, Assistant Director DRR (April 2010- December 2010)
Mr.Jan Mohammad Khan	PMD Director of Planning
Qazi Tallat Mehmood Siddiqui	Superintending Engineer (Floods)

CHAPTER 2 LEGAL AND INSTITUTIONAL FRAMEWORK

Pakistan is one of the most disaster prone and vulnerable countries in the world, and has suffered from numbers of disasters in the past. In recent years, it has experienced several catastrophic disasters such as the Earthquake in October 2005, Flood in June 2010 and Flood in September 2011. The earthquake in October 2005 occurred within a year after the World Conference on Disaster Reduction (hereinafter referred to as "WCDR) held in Kobe, Japan in January 2005, and every signing country had started their efforts on mitigation of damages from disasters, which emphasized implementation of countermeasures that ranged from response oriented efforts to preparedness and mitigation oriented efforts. The Federal Government of Pakistan also realized the importance of implementing activities decided in WCDR as a form of HFA 2005 and therefore, a legal framework together with institutional setup have been achieved in the field of disaster management.

This section describes the efforts made to establish the legal and institutional framework which is under transition for enforcement and improvement in Pakistan.

2.1 Legal Framework for Disaster Management

Enactment of relevant laws and regulations in disaster management is the first step to improve, strengthen, and enforce the institutional framework and relevant activities to deal with disaster management to mitigate damages from disasters. This section describes the legal framework available in Pakistan.

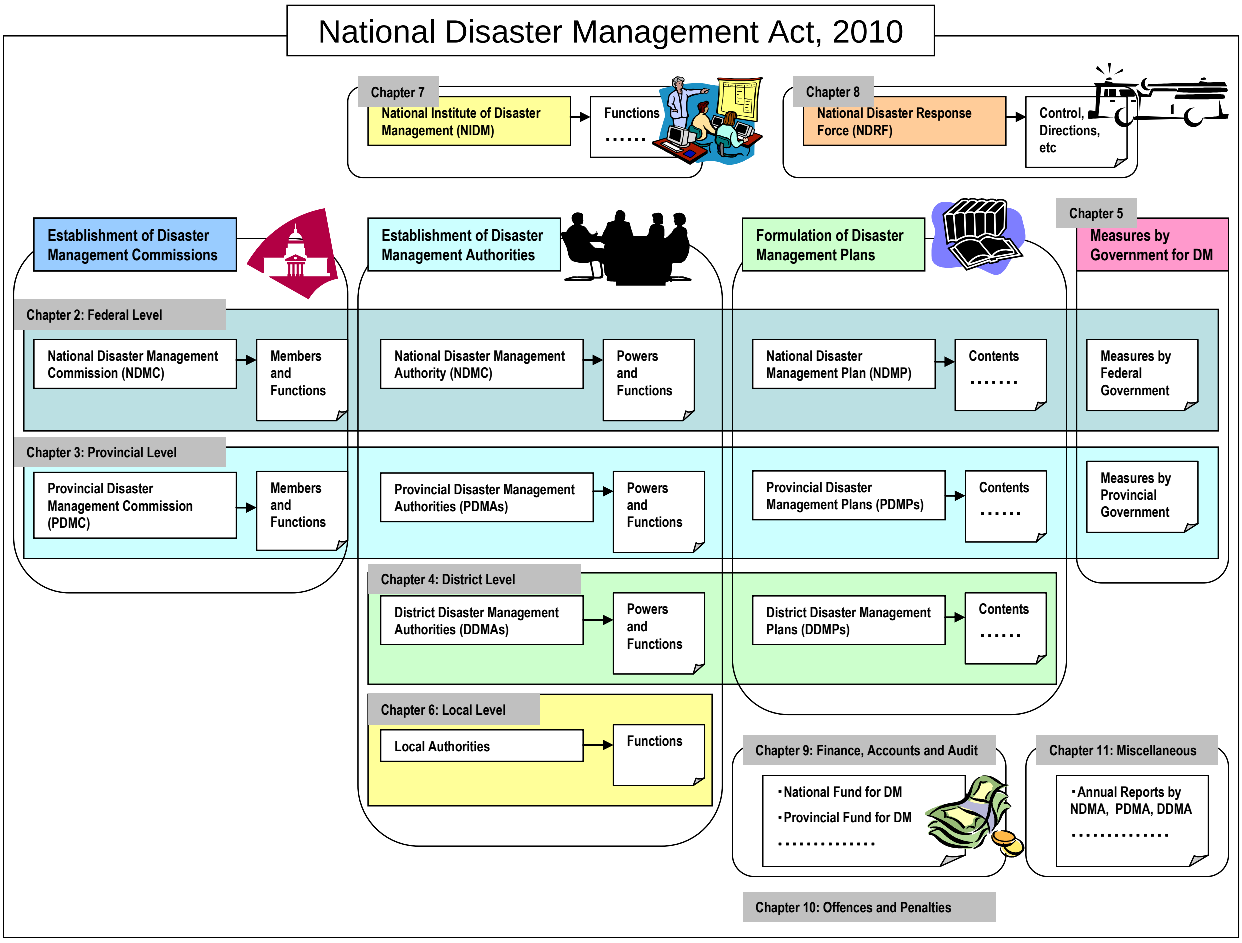
2.1.1 National Disaster Management Act, 2010

The loss of life and property and the challenges that were faced in the aftermath of the October 2005 earthquake affecting Azad Jammu and Kashmir and the NWFP Province (currently Khyber Pakhtunkhwa: KP) exhibited the need for establishing appropriate policy and institutional arrangements to reduce losses from disasters in the future. The earthquake tested the resilience and capacity of Pakistan and its people to overcome catastrophes.

Based on the aforementioned concerns, the Government of Pakistan has established policy and institutional mechanisms at the national, provincial and district levels. The National Disaster Management Ordinance (NDMO), which aimed at providing for the establishment of a National Disaster Management System for Pakistan was promulgated on 3 October 2006; and came into force on 17 August 2007. After the assent of the President on 8 December, 2010, the NDMO became the "National Disaster Management Act, 2010" (hereinafter referred to as "The Act, 2010") on 11 December, 2010. The components of NDMO and The Act are the same except that the expression of “Nazim of the District” was changed to the “Head of the Local Council at the District Level” indicated in Clause 18. Promulgation of the ex-Ordinance and the Act become the great turning point of Pakistan in Disaster Management, and in order to implement the contents, a variety of relevant organizations have started to move build a safer country against variety of disasters.

The salient features of the Act are as follows. The first feature is establishment of the National Disaster Commission. The members of the Commission included all the key ministers at federal level, all the chief ministers, leaders of the House and the Opposition, governors of NWFP (currently KP) and FATA, prime minister of AJK, chairman of the Joint Chiefs of Staff and civil society representatives. The second is establishment of Disaster Management Authorities at national and provincial levels; thirdly, preparation of policies and plans of disaster management at various levels; fourth, arrangement and supervision of funding for the disaster management in the country; fifth, arrangement of technical support from regional and international institutions and other countries; sixth, presentation of detailed descriptions of the National Disaster Management Authority, Provincial Disaster Management Authorities and the District Management Authorities in terms of functions and duties; seventh, presentation of detailed descriptions of the National Disaster Management Plan, Provincial Disaster Management Plans and the District Disaster Management Plans to be prepared by the relevant and respective authorities; eighth, explanation of the measures to be taken by the federal, provincial and district governments to facilitate and ensure the disaster management arrangements; ninth, establishment of the National Institute for Disaster Management (a significant requirement made in NIDM); and finally, provision of the financial backbone of disaster management to be regulated by the National Fund for Disaster Management.

Figure 2.1.1 illustrates the composition of the National Disaster Management Act, 2010.



Source: Illustrated by JICA Expert Team, 2011

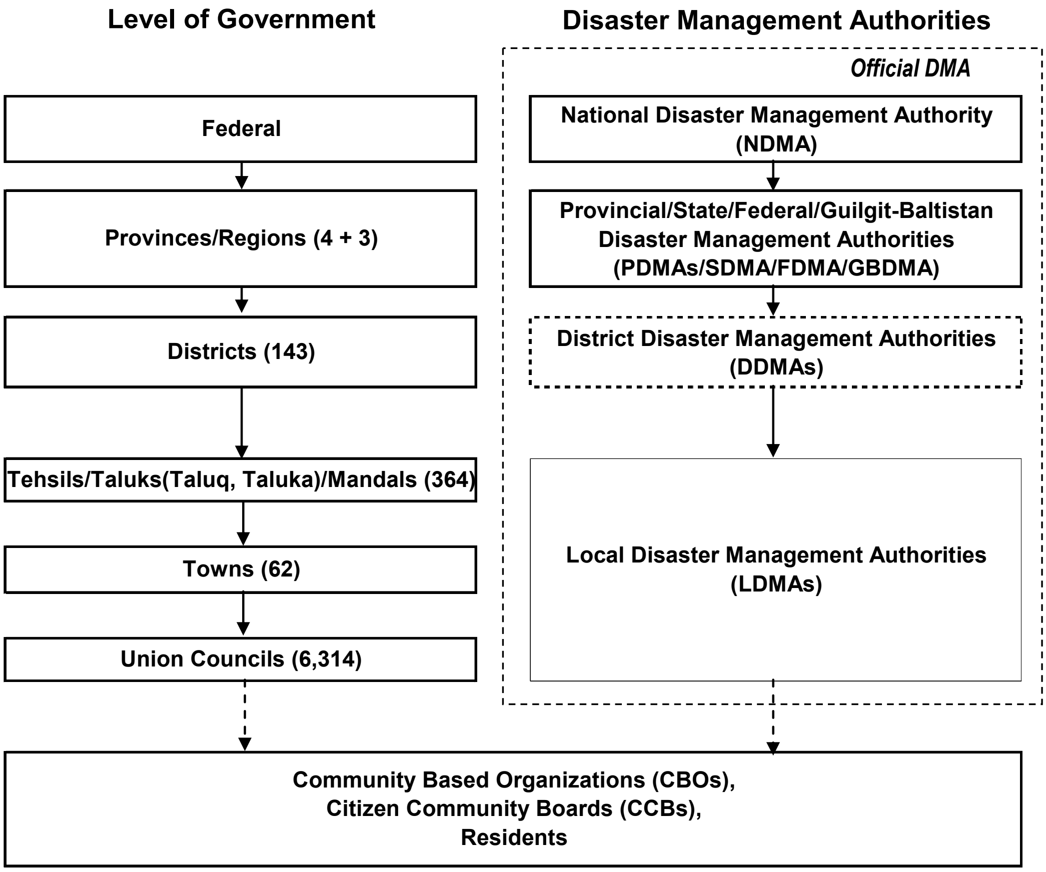
Figure 2.1.1 Composition of National Disaster Management Act, 2010

This Act is the main and only law indicating necessary institutional framework and planning. The Act clearly indicates 1) Establishment of Disaster Management Committees at National and Provincial levels, 2) Establishment of Disaster Management Authorities at National, Provincial, District levels, and 3) Formulation of Disaster Management Plans at National, Provincial, and District levels, as illustrated in Figure 2.1.1. However, this Act is the superior law on disaster management and does not contain detail roles and responsibilities of each ministry, department, agency and other stakeholders concerned. Therefore, specific roles and responsibilities can not be determined, which is the fundamental aspect to be decided for formulation of Disaster Management Plans. There are no other laws or regulations regarding disaster management, and there is a need to formulate relevant regulations which can deepen the necessary contents for enhancement of Disaster Management Capacity in Pakistan.

2.2 Institutional Framework for Disaster Management

After the promulgation of the Act, 2010, based on its contents, disaster management authorities in each level of government have been established or are under the process of establishment. These Disaster Management Authorities are the main responsible institutions to plan, coordinate and implement disaster management efforts.

Figure 2.2.1 shows the relationship between levels of governments and Disaster Management Agencies concerned in Pakistan. In the Federal and Provincial levels, Disaster Management Authorities with physical institutions had established, however, those below district level, including District Disaster Management Authorities (DDMAs) and Local Authorities (LAs) do not have physical institutions, and officials are combined with other posts, which makes it difficult to handle other tasks, especially on pre-disaster measures.



Note: 1) DDMAs and LAs are covered with dotted line, since DDMAs and LAs have no physical body with dedicated staffs only handling DM, 2) ( ) indicates number of government bodies, 3) Not all Tehsils have Towns 4) For Number of District, include Agency (7) and Frontier Region (7) of FATA

Source: Number of Government bodies: www.sindh.gov.pk/23 districts, www.balochistan.gov.pk/index.php?option=content...30districts, www.ajk.gov.pk/10districts, www.gilgitbaltistan.gov.pk/07 districts, pportal.punjab.gov.pk/portal/36 districts, www.khyberpakhtunkhwa.gov.pk/24 districts, www.nrb.gove.pk/lg=election/lge_03.asp, www.fata.gov.pk, Illustrated by JICA Expert Team based on existing condition

Figure 2.2.1 Structure of Government and Disaster Management Authorities in Pakistan

2.2.1 Transition of Institutional Framework for Disaster Management

This section describes briefly the transition of the institutional framework for disaster management, which compares the situation before and after promulgation of the National Disaster Management Ordinance (Act), since promulgation of NDMO was an important milestone event for disaster management in Pakistan; therefore, the institutional arrangements for disaster management can be divided in two phases, as follows:

1) Pre-Ordinance (Act) Institutional Framework

Until the promulgation of the NDMO, 2006, disaster management is not well operated in Pakistan and lack of coordination was the main issue. The West Pakistan National Calamities Act promulgated in 1958 provided for the maintenance and restoration of order in areas affected by calamities and relief against such calamities and focuses on emergency response. The following mandates were given to relevant organizations.

Civil Defense Department existed since 1952 in Pakistan and remained active until the mid seventies but afterwards was lying mostly dormant for various reasons.

Emergency Relief Cell was created within the Cabinet Division in 1971 and is responsible for disaster relief at the national level. It provides assistance in cash and kind to supplement the resources of the Provincial Government and administers the Prime Minister's Flood Relief Fund.

Civil Administration the Police at the provincial and local levels have always been an important organ to help people in cases of emergency and calamity. Fire Fighting is another important facility that has been working under the civil administration. The bomb Disposal Squad provides extremely specialized services within the civil administration.

Pakistan Army has been traditionally and historically the most important institution for disaster management in Pakistan. It has the most extensive network and capability to meet challenges of any magnitude, scale and nature.

Federal Flood Commission has been highest apex level federal institution in Pakistan dealing with comprehensive flood management on a country-wide basis since 1977 (i.e; after the disastrous floods of 1976).

In order to meet emergencies in case of cyclones and tsunamis in the Arabian Sea, the *Pakistan Coast Guard* and *Pakistan Navy* have always played important roles as effective institutional support.

Pakistan Red Crescent Society is one of the long established institutions that have dealt with recue operations in case of disasters in Pakistan.

Earthquake Recovery & Reconstruction Authority (ERRA) was established soon after the South Asia earthquake of October-2005 and since then has been an important component of the disaster management framework in Pakistan. A similar arrangement was made in AJK called the State Earthquake Reconstruction and Rehabilitation Agency (SERRA).

National Engineering Services of Pakistan (NESPAK) is a semi-government company providing high quality engineering consulting services since 1972 and has made historic contributions in cases of disaster management in Pakistan.

Civil Society Organizations at the community level have been working for the welfare of communities with dedication and great deal of spirit and dedication.

2) Post Ordinance (Act) Institutional Framework

The latest devastating earthquake occurred in October 2005 and brought death and injury to more than 75,000 people in the northern areas of Pakistan. The heavy damages brought about by the earthquake have led Pakistan to initiate national efforts in developing a structure for Disaster Management focusing on prevention, mitigation and integration of responses by conducting a review of traditional disaster management systems and policies on emergency response.

NDMO was promulgated in 2006 (later changed to Act in 2010) and the National Disaster Management Commission (NDMC) headed by the prime minister was established to expedite the formulation of overall policies on the national level. The National Disaster Management Authority (NDMA) is the focal point in charge of disaster management at the federal level. NDMA provides technical guidelines to national and provincial level organizations about formulation of plans, strategies and programs for disaster management. NDMC formulates the policies, decisions and advice of NDMA and the Chairman of NDMA acts as secretary of NDMC.

Pakistan has three levels of governance: national, provincial and district levels. At the provincial level, the Provincial Disaster Management Authorities (PDMAs) are the focal point of the disaster management; at the district level, it is the District Disaster Management Authorities (DDMAs) but priority is given to hazard prone areas. Similar to the national level, the Provincial Disaster Management Commission (PDMC) is headed by the chief minister of the respective province who acts as chairman.

3) Change of Institutional Framework after Devolution of Relevant Ministries

In order to promote decentralization of administration power from federal ministries to province level, 18^{th} Amendment to the Constitution of Pakistan 1973 regarding Devolution of Federal Ministries was enacted and this will affect on disaster management institutional framework, since there will be difficulty of coordination between Federal Ministries which remained in Federal level and Ministries which devolved to provincial level. After completion of devolution of relevant ministries involving disaster management shall smoothly transfer their tasks to provincial ministries.

Following ten (10) Ministries were devolved in December, 2010, and April, 2011: Ministry of Culture, Ministry of Education, Ministry of Livestock and Dairy Development, Ministry of Local Government and Rural Development, Ministry of Population Welfare, Ministry of Religious Affairs, Ministry of Social Welfare and Special Education, Ministry of Special Initiatives, Ministry of Tourism, and Ministry of Youth Affairs.

And additional seven (7) Ministries were devolved in June, 2011: Ministry of Environment, Ministry of Food and Agriculture, Ministry of Health, Ministry of Labor and Manpower, Ministry of Minorities, Ministry of Sports, and Ministry of Women Development.

In October 2011, four (4) ministries, namely Ministry of National Heritage and Integration, Ministry of Disaster Management, Ministry of National Regulations and Services and Ministry of Food Security and Research, were constituted in accordance with the notification of the Cabinet Office. The functions of Ministry of Disaster Management are as follow:

Table 2.2.1 Function of Ministry of Disaster Management

Ministry	: Ministry of Disaster Management	
Division	: National Disaster Management Division	
No.	Functions	Previous Allocation
1	National Disaster Management Authority	PM Secretariat
2	Pakistan Environmental Protection Council	IPC Division
3	Pakistan Environmental Protection Agency	Capital A&D Division
4	Pakistan Environmental Planning and Architectural Consultants Limited (PEPAC)	Planning and Development Division
5	Global Environmental Impact Study Centre, Islamabad	Planning and Development Division
6	Policy, Legislation, plans, strategies and programs with related to Disaster Management including Environmental Protection and Preservation	-
7	Coordination, Monitoring and Implementation of Environmental Agreements with other countries, International Agencies and Forums	Economic Affair Division

2.3 Responsibilities of Relevant Organizations and Stakeholders

In disaster management, there are multiple organizations and stakeholders concerned, and there is a need to clarify roles and responsibilities of each organization and stakeholder in order to achieve the maximum results from the efforts implemented. By utilizing the following documents, a list of relevant organizations and stakeholders was created and is shown in Figure 2.3.1. The documents to be utilized are: National Disaster Management Act 2010, National Disaster Risk Management Framework, National Disaster Response Plan, and List of Ministries concerning "Mainstreaming DRR into Development."

In order to clarify the groups of organizations and stakeholders involved in disaster management, they are categorized into the following 7 groups.

1) Federal DM Coordinating Body

   Federal Disaster Management Coordination Body is represented by NDMA, under Ministry of National Disaster Management, and they have power and responsibility in handling disaster management.

2) Federal DM Ministries

   Federal Disaster Management Ministries are represented by all relevant ministries involved in disaster management.

3) Federal DM Departments and Authorities

   Federal Disaster Management Departments and Authorities are represented by all relevant Departments and Authorities involved in disaster management such as ERRA, FFC, PMD, WAPDA, and many others. They are mostly governmental organizations under respective ministries.

4) Federal DM Public Companies and Stakeholders

   Federal Disaster Management Public Companies and Stakeholders are represented by all public companies and stakeholders involved in disaster management. In this category, stakeholders are public companies for infrastructure and utility services such as Airline companies, Ambulance Services, lifeline companies (water, sewage, gas, electricity, telecommunications), as well as Media, Red Crescent Society, and many others. They are not governmental organizations but giving important roles in disaster management.

5) International DM Supporting Organizations

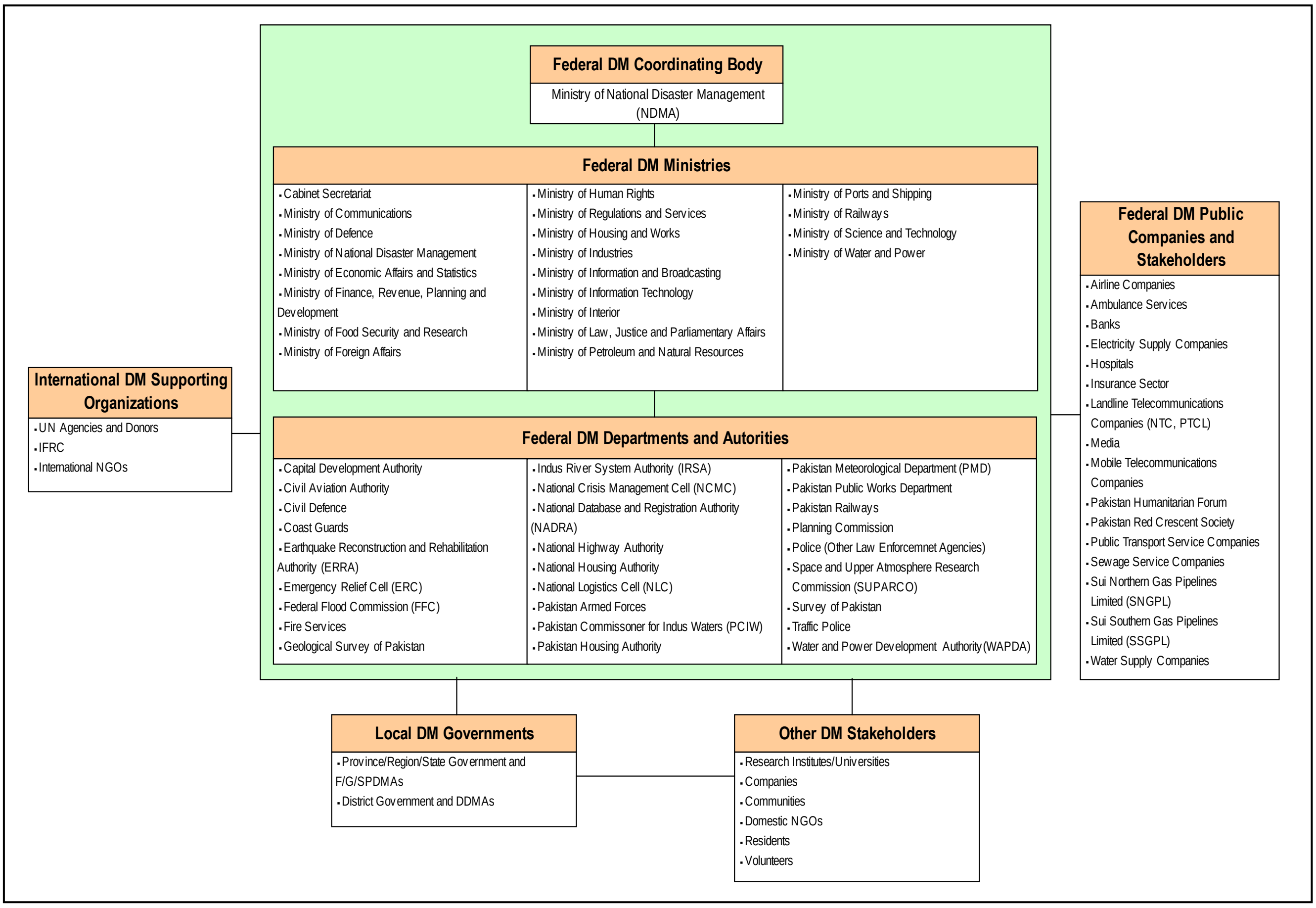
   International Disaster Management Supporting Organizations are represented by International Organizations such as UN Agencies, Donors, and International NGOs. They play important roles in disaster management to support varieties of activities including all disaster management cycle phases.

6) Local DM Governments

Local Disaster Governments are represented by F/G/S/PDMAs, DDMAs, and Provincial Ministries. They play main roles in disaster management in local level.

7) Other DM Stakeholders

Other Disaster Management Stakeholders represented by all other stakeholders does not contain above disaster management stakeholder groups, such as Research Institutes/Universities, Companies, Communities, Local NGOs, Residents, and Volunteers. Especially in community level, they play important roles to improve capacities in disaster management.



Source: JICA Study Team, 2012

Figure 2.3.1 Relevant Disaster Management Organizations and Stakeholders in Pakistan

2.4 Government Policy on Disaster Management

2.4.1 National Policy

The National Disaster Risk Management Framework (NDRMF) is the main national policy document for DRM. It was approved by NDMC on 1 March 2007 and provides national policy guidelines for DRM. Nine priority areas are pointed out in NDRMF as follows: 1) Institutional and legal arrangements of DRM, 2) Hazard and vulnerability assessment, 3) Training, education and awareness, 4) Disaster risk management planning, 5) Community and local level programming, 6) Multi-hazard EWS, 7) Mainstreaming disaster risk reduction into development, 8) Emergency response system, and 9) Capacity development for post-disaster recovery.

2.4.2 Recent Implementation of National Policy

NDMA is mandated to implement the national policies and strategies.

In the Medium-Term Plan for Strengthening Disaster Risk Management Systems in Pakistan (2011-2015) achievements made by NDMA and relevant organizations are indicated in nine priority areas mentioned in NDRMF.

1) Institutional and legal arrangements

Achievements made in this area are as follows.

- Promulgation of National Disaster Management Ordinance (2006)/National Disaster Management Act (2010)
- Development and approval of the National Disaster Risk Management Framework (NDRMF)
- The implementation of a number of DRM activities are being guided by NDRMF
- Provincial Disaster Management Authorities (PDMAs) have been established in all provinces including AJK, FATA, and Gilgit-Baltistan
- District Disaster Management Authorities (DDMAs) have also been notified throughout Pakistan and efforts are being made to make them fully functional

Human resource development for disaster management is also an urgent matter for Pakistan. Newly established organizations always lack experts, professionals and budget. Enhancement of NDMA capacity is the first priority for the disaster management in Pakistan.

Development of planning guidelines and procedures, and improvement of the legal system should be pursued to promote a more effective disaster management system.

2) National Hazard and Vulnerability Assessment

Achievements made in this area are as follows.

- National Hazard and Risk Assessment shall be the priority to serve as a key baseline document for DRR-sensitive planning at national , provincial and local levels
- As a pilot project, a Hazard, Livelihood and Vulnerability (HLV) Baseline Assessment has been completed in 10 districts
- Earthquake Risk Assessments have been completed in Muzaffarabad, Mansehra, Murree, Quetta and Chitral. This exercise is aimed at integrating earthquake vulnerability reduction into development plans and schemes
- Risk Assessment of Glacial Lake Outburst Flooding (GLOF) has been completed in Gilgit district of Gilgit-Baltistan

Development and accumulation of disaster data, hazard inventory, map data and necessary system development will be the first step for promotion of effective assessment on disaster risk. Based on scientific data analysis, priority areas and subjects for capital investment will be focused on. The National Risk Assessment and Emergency Operation System Project has been planned using World Bank budget. In this project, an integrated database will be constructed and nationwide risk mapping will be conducted. As a result of the project, 1) National Multi-Hazard Risk Atlas, 2) Viewer of geo-database, and 3) Disaster management training and workshops for local municipality will be achieved.

3) Training, Education and Awareness

Achievements made in this area are as follows.

- Specialized training courses were organized on Flood Mitigation, Earthquake Mitigation, Drought Mitigation, Coastal Hazards Mitigation, DRR Mainstreaming, and Disaster Risk Communication. Total number of Beneficiaries of the capacity building activities goes well beyond 7,000
- Training for professionals for earthquake esistant housing has been conducted

The following knowledge products/training manuals have been developed and disseminated: Guidelines for Earthquake Resistant Construction, Seismic Retrofitting Manual for Buildings, Seismic Hazard Assessment, Disaster Reporting Manual, Earthquake Mitigation Manual, Drought Mitigation Manual, Flood Mitigation Manual, Cyclone Mitigation Manual, DRR Mainstreaming Manual, Disaster Risk Management Manual, and School Safety IEC material on DRM.

Training and education for staff members related to disaster management at all levels and fields such as preparedness, emergency response, rehabilitation and restoration are required.

NDMA and PDMA have five main subjects to tackle, namely: staff training for disaster affected areas, promotion of disaster management through media and community disaster management, preparation of disaster management dissemination material, integration of disaster education systems, and disaster management education in schools by the Ministry of Education.

4) Promoting Disaster Risk Management Planning

Achievements made in this area are as follows.

- NDMA has so far developed 5 Provincial/State, National Disaster Response Plans and 30 district DRM plans. Similarly, a draft of the Tsunami Contingency Plan is ready for consultations and contingency plans have also been developed on the topics of monsoon, winter, marine, industrial and chemical disasters, and cyclone
- In the project supported by JICA, a Draft National Disaster Management Plan was approved by NDMA in June 2012 .

5) Community and Local Level Risk Reduction Programming

Community level disaster management is the most important subject for district management. Disaster directly hits a community; therefore, the community is the smallest unit for disaster management. Information dissemination, education, training and disaster management drills for communities will be necessary to promote community and local level risk reduction.

NDMA has provided technical human resources to all the PDMAs and DRM Coordinators to the 29 most vulnerable DDMAs

Some of the key CBDRM activities include DRM Network of volunteers for disaster response formulated in 11 districts, a total of 7 Tsunami Evacuation Drills in Coastal areas of Baluchistan and Sindh provinces organized, draft Action Plan for School Safety for Sindh and Baluchistan developed, and Union Council-level DRM Plans for 5 UCs developed.

6) Multi-Hazard Early Warning System

Implementation of the multi-hazard early warning system has been discussed in NDMA including improvement of equipment for data collection, processing and dissemination. More practical discussion and analysis will be necessary for implementation of the EWS such as disaster type, coverage area and main operator. So far the following efforts have been made in Pakistan. First, Disease Early Warning System (DEWS) was established in 48 districts. Second, Tsunami Early Warning System was established, 3 tide gauges was installed, and training for seismic data collection and tide gauge maintenance was also imparted. Third, Drought Early Warning System and mitigation project was implemented in Tharparkar District. And fourth, Indigenous knowledge based early warning indicators for drought was developed.

Flood Forecasting System for NWFP (currently KP) and Balochistan

Development and improvement of a flood forecasting and warning system for the northern part of Pakistan and Balochistan have been discussed. Installation of weather radars, hydrographic telemetric system and related equipment will enhance warning capacity for flood and dam control in upper Punjab.

Other warning system development has been discussed including Tropical Cyclone Warning Center, Drought Monitoring and Warning System, Tsunami Early Warning System, Earthquake Research Capacity, and Disease Early Warning System.

7) Mainstreaming Disaster Risk Reduction into Development

Coordination between development planning and disaster risk reduction is an important subject in regional development. This subject needs more comprehensive discussion to promote integrated regional development including environmental improvement and adaptation to the effects of climate change.

NDMA organized a national/ministerial working group on this subject for information exchange. The initial work is currently on-going in following 10 ministries: Ministry of Planning and Development, Ministry of Housing and Works, Ministry of Water and Power, Ministry of Industries and Production, Ministry of Defense, Ministry of Education, Ministry of Communications, Ministry of Environment, Ministry of Health, and Ministry of Food and Agriculture.

A chapter on DRR is being prepared by the Planning Commission of Pakistan. The proposed chapter will be made part of the 5-year development plan after consensus by provincial authorities. Under this component, guidelines on DRR for preparation of development project proposals (Infrastructure, Social and Production Sectors) have been prepared and circulated. Similarly, seismic concerns have been mainstreamed into the curricula of the Civil Engineering Diploma.

8) Emergency Response System

Achievements made in this area are as follows.

- Three Urban Search and Rescue teams have been formed, one each for the Capital Development Authority, City District Government Karachi and Pakistan Army
- Two relatively small teams are planned to be raised for Chitral and Gilgit-Baltistan
- A Program for Enhancement of Emergency Response (PEER) has been started
- A total of 26 District Disaster Resource Centers (DDRCs) have been established in the most vulnerable districts
- DRM training has been given to 24 doctors and paramedical staff in flood-prone district Jhang

9) Capacity Development for Post-Disaster Recovery

The Strategic Planning Unit (SPU) of NDMA provided technical backstopping to all clusters involved in post-flood early recovery activities during 2010-2011. In addition to regular engagements with clusters and provincial and district authorities on the on-going flood recovery process, SPUs Sectoral experts have produced the following documents: Pakistan Flood Early Recovery Framework; and Sectoral Strategies on Agriculture, Community Restoration, Water, Sanitation and Hygiene (WASH), Shelter, Education, Health and Information Management and Monitoring.

CHAPTER 3 DISASTER MANAGEMENT ORGANIZATIONS AND THEIR ACTIVITIES

3.1 National Disaster Management Authority (NDMA)

3.1.1 Introduction

The National Disaster Management Authority (NDMA) is the lead agency at the Federal level to deal with whole spectrum of disaster management (DM) activities. And currently from October, 2012, NDMA merged to Ministry of National Disaster Management, and one of the authorities under the Ministry. It is the executive arm of the National Disaster Management Commission (NDMC), which has been established under the Chairmanship of the Prime Minister, as the apex policymaking body in this field. In the event of a disaster, all stakeholders including government ministries/ departments/ organizations, Armed Forces, International NGOs, NGOs, UN Agencies, and International Donors work through and form part of the NDMA to conduct one-window operations. NDMA aims to develop sustainable operational capacity and professional competence to undertake the following tasks:[1]

- Coordinate the complete spectrum of disaster risk management at the national level;
- Act as Secretariat of NDMC to facilitate implementation of disaster risk management (DRM) strategies;
- Map all hazards in the country and conduct risk analysis on a regular basis;
- Develop guidelines and standards for national and provincial stakeholders regarding their roles in DRM;
- Ensure establishment of DM Authorities and Emergency Operations Centres at provincial, district and municipal levels in hazard-prone areas;
- Provide technical assistance to federal ministries, departments and provincial DM authorities for DRM initiatives;
- Organize training and awareness raising activities for capacity development of stakeholders, particularly in hazard-prone areas;
- Collect, analyze, process, and disseminate inter-sectoral information required in an all hazards management approach;
- Ensure appropriate regulations are framed to develop disaster response volunteer teams;
- Create the requisite environment for participation of media in DRM activities;
- Serve as the lead agency for NGOs to ensure their performance matches accepted international standards, e.g., the SPHERE standards;

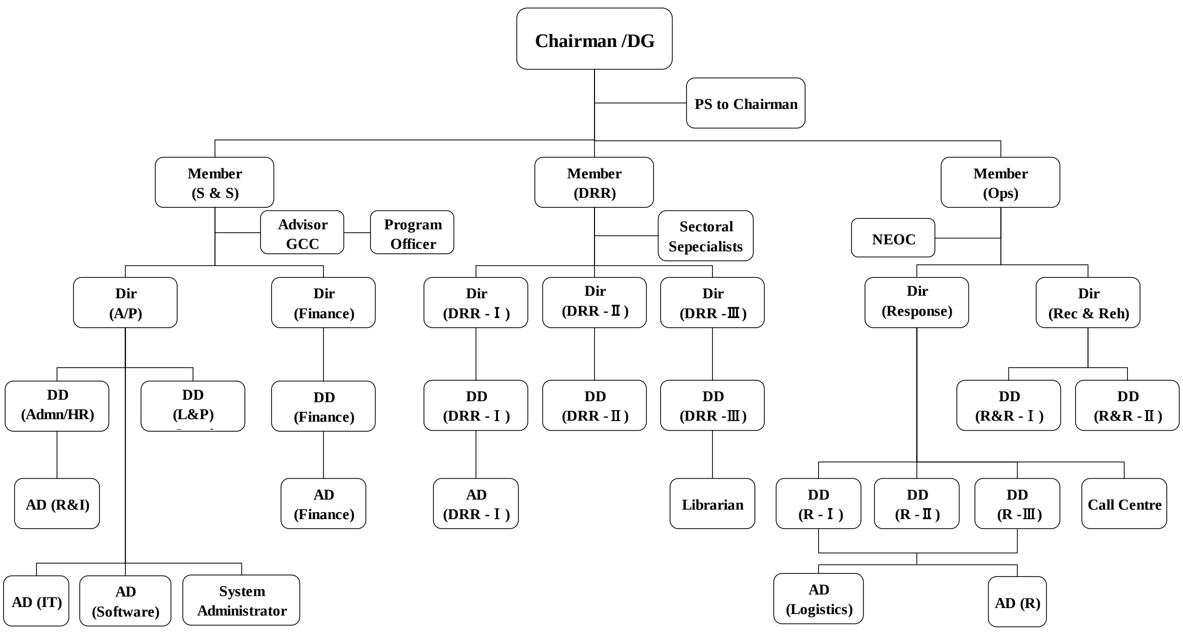
[1] Quoted from http://ndma.gov.pk/AboutNDMA.html
These tasks have been mandated in the NDM Act 2010.

- Serve as the lead agency for international cooperation in DRM. This will particularly include information sharing, early warning, surveillance, joint training, and common standards and protocols required for regional and international cooperation;
- Coordinate emergency response of the federal government in the event of a national level disaster through the National Emergency Operations Centre (NEOC); and
- Require any government department or agency to make available such men or resources as are available for the purpose of emergency response, rescue and relief.

In the National Disaster Management Act, 2010, NDMA is expected to play an effective role in the implementation of disaster risk management policies, strategies and programs chalked out by NDMC with a view to ensure reduction in disaster risks, and to enable the country to tackle any further disasters in an organized and efficient manner. For this purpose, NDMA should maintain close liaison with all government departments at federal and provincial levels.

3.1.2 General Organization of NDMA

The National Disaster Management Authority consists of such number of members as may be prescribed and includes as its Chairperson the Director General. There is a Chairman/Director General of the National Authority, appointed by the Federal Government on such terms and conditions as may be prescribed. The latest organization chart of NDMA under Ministry of National Disaster Management is shown in Figure 3.1.1.



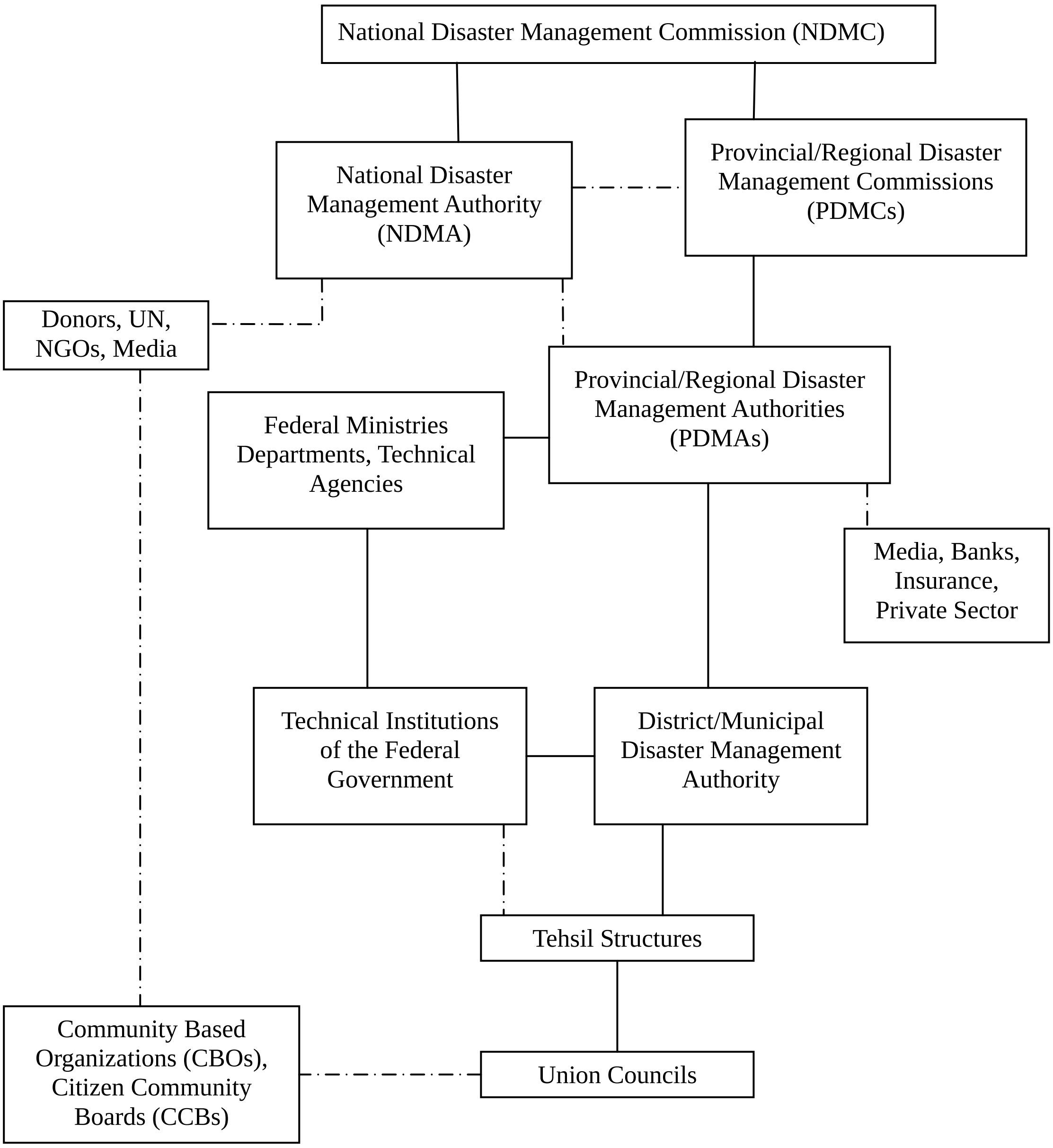
Source: NDMA, as of Feb. 2012

Figure 3.1.1 Organization Chart of NDMA

3.1.3 Relevant Documents and Plans

1) National Disaster Risk Management Framework (NDRMF)

The National Disaster Risk Management Framework (NDRMF), which was prepared with active participation of multiple stakeholders, serves as a vision document for leading the way towards a safer Pakistan in cooperation with UNDP. The Framework provides guidelines to coordinate the activities of numerous stakeholders. It also sets out priorities for mobilization of resources from donors and development partners of Pakistan to implement strategic activities during the next five years.



Source: National Disaster Risk Management Framework Pakistan 2007
Quoted from the Preface of the Framework

Figure 3.1.2 Structure for Disaster Risk Management

2) SOPs 2008

As NDMA is entrusted with the mandate of saving lives and property, and of providing relief to people in distress in the event of a natural/ man-made disaster, all NDMA officials are expected to exhibit a high standard of professional excellence during routine office functioning which shall enable them to meet the challenges in any disaster situation.

In this regard, separate Standard Operating Procedures (SOPs) for major routine aspects of NDMA functions have been prepared and compiled after due consultations since 2008. All officials of NDMA are required to acquaint themselves well with these SOPs in order to ensure their implementation in letter and spirit.

In addition, NDMA has prepared the Job Descriptions to clarify the official responsibilities of each officer.

3) National Disaster Response Plan (NDRP)

The National Disaster Response Plan (NDRP) has evolved in pursuance of the National Disaster Management Act, 2010, stipulating formulation of sound strategies and practicable plans for managing DM activities in cooperation with UNDP. The purpose of NDRP is to enhance the country's ability to manage all disasters using a comprehensive national approach. To achieve this, NDRP incorporates all disaster management activities from preparedness to response. NDRP presents a framework for emergency response at different levels of government structures; identifies the roles and responsibilities of various stakeholders; and lays down coordination mechanisms for activities with the UN, International NGOs, civil society, the news media, public and private sectors, and local philanthropists to bring together a full range of national capabilities to manage any disaster.

NDRP classifies different types of hazards, levels of vulnerabilities and their causes, as well as the structure, functions, and coordination methodology of NDMA, DMAs (and their sister organizations in Northern Areas, AJK and FATA) and DDMAs, concerned ministries, departments, International NGOs, the UN, media, charities/foundations, and CBOs at all levels of governance. It focuses on the existing relief system in Pakistan, the procedure of declaring calamity-hit areas, EWSs and the information flow from national to provincial, provincial to district, and district to community levels in the case of different hazards. It also identifies different relief management functions, lead agencies, relief functions, and SOPs.

4) One UN Programmes

The One UN Programmes in Pakistan consists of a set of UN joint programmatic interventions firstly planned for the period 2008 to 2010, the initial period of "delivering as one" in Pakistan and implements One UN DRM program in collaboration with NDMA, planned until December

2012. During the period 2008 to 2010, it was expected that about 80% of the resources available with the UN family will be devoted to joint programs in collaboration with NDMA. The Programmes comprises the five Joint Programs (JPs) and Joint Program Components (JPCs) through which the Participating UN Organizations have contributed to Pakistan's socio-economic development since the commencement of the Program. The five JPs and their constituent JPCs have been conducted in a highly participatory manner that involved key stakeholders; including relevant governmental authorities at the federal and provincial levels, as well as the donors and civil society organizations. These Joint Programs include: agriculture rural development and poverty reduction; education; health and population; environment; and disaster risk management. The JPs of the One UN Programmes itself have been implemented since 2009 by 16 UN development agencies and operated in the country in close collaboration with their national counterparts, and benefiting from the financial support of the donor partners.

The features and outlines of the JP for Disaster Risk Management (DRM) are as follows:

a. Background

Since the devastating earthquake in 2005, there is a growing realization that Pakistan is exposed to a variety of hazards reflecting the diverse geo-physical and climatic conditions of the country. Pakistan is endowed with mountains in the north; arid and semi-arid plain areas (comprising irrigated/rain-fed agriculture and deserts) and coastal areas in the South. From the situation analysis, four high-disaster risk typologies emerge: earthquake risk, particularly, for selected primary and secondary cities/towns; floods in deltaic and mid-river basins (affecting large areas); cyclones and associated flood risk in coastal areas; and drought in arid and semi-arid areas. In addition, the Northern mountainous regions are threatened by high-frequency but localized-impact events such as landslides, flash floods and avalanches.

b. Objectives

The Joint Program for DRM assists the Government of Pakistan in developing national capacities and systems for disaster risk management (DRM) on a sustainable basis at federal and provincial levels. The Joint Program outcomes aim to minimize losses from natural hazards and enhance coping capacities in high-risk communities. A three-pronged approach has been deployed to reinforce disaster risk management systems and capabilities. Firstly, there has been a strengthening of institutional capacities at federal, provincial and local levels to prioritize DRM in the policy making, planning and development process. Secondly, the Joint program has enhanced the understanding and knowledge/information management systems on major hazards, vulnerabilities and associated risks. And, finally, the Joint Program aimed to promote community based DRM, develop guidelines, tools and mechanisms for Community Based DRM and provide feedback to the national policy-making process.

c. Budget and Summary of Sub-Components of the Joint Program for DRM

For the implementation of the Joint Program for DRM, about USD 70 million were allocated into sub-components for the expected 4 Outcomes. These sub-components, their outcomes and project performance as of Feb 2012 are summarized below.

Table 3.1.1 Outcomes and Targets of the Joint Program for DRM

<table>
<tr><th>Component</th><th>Outcomes/Targets</th><th>Expected Target(s)</th><th>Project Performance</th></tr>
<tr><td>JP
Component 1</td><td colspan="3">Disaster Risk Management (DRM)
UNDAF Outcome:
By 2010, National capacities and systems in disaster risk management strengthened through One UN Programmes to reduce the impact of disasters on the poor and most vulnerable.</td></tr>
<tr><td>JP 1.1</td><td><u>Outcome-1</u>:
Strengthened policies, norms (gender/rights based), institutional and coordination mechanisms (UN, CSO forum) for disaster risk management with particular emphasis upon preparedness and response</td><td>• 1000 copies of vision document distributed widely among all stakeholders for sharing of common vision
• 500 copies of each policy paper made available to policy makers at national, province and local levels
• At least 2 legislations reviewed
• Documents of Ministries of Environment, Culture, Education, Housing and Works and Planning Commission, Local Government and Rural Development (LGRD) reviewed</td><td>NIDM provided
• 5-Day training course on 'Climate Risk Management' at Islamabad
• 2-Day training workshop on 'Disaster Risk Management' for Karakorum University's teachers, Students and Admin Staff at Karachi</td></tr>
<tr><td>JP 1.2</td><td><u>Outcome-2</u>:
Reliable integrated multi-sectoral knowledge, information and communication system for disaster risk management that reaches out to the grassroots level developed</td><td colspan="2">• Achieve the goal of establishing a comprehensive information system for all major disasters.</td></tr>
<tr><td>JP 1.3</td><td><u>Outcome-3</u>:
Capacities of key educational and training institutions and professional bodies enhanced for development of human resources for Disaster Risk Reduction and Response</td><td colspan="2">• Availability of action plans, revised curricula and reference materials for the inclusion of Disaster Risk Reduction and Response issues in key educational and training institutions and professional bodies</td></tr>
<tr><td>JP 1.4</td><td><u>Outcome-4</u>:
Communities, vulnerable groups, grassroots organizations and local authorities in high-risk areas empowered with resources and capacities to prepare for, respond to and recover from disasters</td><td>• Improve resources and capacity of high priority local communities in 20 districts to prepare for, respond to and recover from disasters</td><td>• CBDRM and contingency planning training were conducted at 10 UCs in Muzaffargarh</td></tr>
</table>

d. Expected Direct Outputs of the Joint Program for DRM

Prior to the commencement of the Program, the outputs of each sub-component and targets (activities) which should be executed to attain the outputs have been set up and prepared. Their expected outputs have included all the enhancements and strengthening of the system and capacity in the DRM in Pakistan. To achieve the outputs, the Program has encompassed a wide variety of activities, such as making policies, plans and guidelines, providing manuals, databases and SOPs with their practices and adoptions through trainings and setting up systems for early warnings, recoveries and responses, with national, provincial and district levels as targets for the outputs. Concerning the activities at the local level, 29 districts of Pakistan have been selected in terms of vulnerabilities to disasters. As for the establishment of an EWS, it is conducted mainly for major hydro metrological and geophysical disasters by district-based activities, such as tsunamis and tropical cyclones along coastal areas, floods along riparian areas of rivers/nullahs in Indus and earthquakes and landslides in high risk zones including considerations for communicable diseases-related hazards for some concerned districts with Implementation of Hazard Risk and Vulnerability Assessment.

3.1.4 Disaster Management Fund

1) National Disaster Management Fund

In March, 2007, the National Disaster Management Commission (NDMC), in its first meeting held at the Prime Minister's House under the chairmanship of the Prime Minister approved constitution of the National Disaster Management Fund to cope with any natural disaster such as flood, earthquake, and others to tackle it in a collective and comprehensive way. The funds are collected through a local currency account (Rupees) and Foreign Currency Account (US Dollar) as indicated in the homepage of NDMA.

Pakistan received donations of Rs. 700 million in response to the October 2005 Earthquake, which occurred before the official constitution of the National Disaster Management Fund, however, those funds were subsequently deposited in the National Disaster Management Fund. Recently, for the Flood Disaster in 2010, Rs. 50 billion has been allocated for rehabilitating flood survivors and the government was utilizing all possible resources.

In the NDM Act 2010, constitution of National Fund for Disaster Management is officially stated and, this fund shall be financed from the following sources;

- Grants made by the Federal Government;
- Loans, Aid and Donations from the National or International Agencies; and
- Donations received from any other sources;

Also, after the commencement of the Act, following funds became part of the National Disaster Management Fund;

- Prime Minister's Disaster Relief Fund; and
- Any other Fund relatable to natural calamities established at Federal level as the Federal Government may determine

The Fund shall be kept in one or more accounts maintained by the NDMA, in local or foreign currency, in any scheduled bank in Pakistan and shall be operated in accordance with the directions of the National Authority.

And the Fund shall be administered by NDMA towards meeting the expenses for emergency preparedness, response, mitigation, relief and reconstruction.

2) Provincial Disaster Management Fund

In the NDM Act, 2010, establishment of Provincial Disaster Management Fund is officially stated and the Fund shall be financed from following sources,

- Grants made by the Federal Government or Provincial Governments; and
- Loans, Aid and Donations from the National or International Agencies provided in accordance with prescribed procedure.

The Provincial Disaster Management Fund shall be kept in one or more accounts maintained by the Provincial Authority, in local or foreign currency, in any scheduled bank in Pakistan and shall be operated in accordance with the directions of the Provincial Authority.

And the Provincial Disaster Management Fund shall be administered by the Provincial Authority towards meeting the expenses for emergency preparedness, response, mitigation, relief and reconstruction in the Province.

3.2 Provincial Disaster Management Authorities (represented also FATA / Gilgit-Baltistan / State Disaster Management Authority)

3.2.1 Introduction

"An institution at Provincial level, mandated to effectively set up a system to look after disasters and calamities whether natural, man induced or accidents."

The National Disaster Management Ordinance (NDMO; currently NDM Act 2010) provided the establishment of a Provincial Disaster Management Commission (F/G/S/PDMC) as well as Authority (F/G/S/PDMA) to cope with the challenges of Disaster Management in a professional and efficient manner. Both the Organizations have been mandated to effectively set up a system to look after disasters and calamities whether natural, man induced or accidents. Most of the

Provinces established PDMC and F/G/S/PDMA in 2008, to promote disaster preparedness and management within the province. The establishment of F/G/S/PDMC and F/G/S/PDMA is based on the NDMO (currently NDM Act 2010) of 23 December 2006 which forms the legal basis for the implementation of the National Disaster Management Fame work (NDMF) provided by the National Disaster Management Authority (NDMA).

Previously the Provincial Relief Commissionerate had been responsible for the relief, compensation and rehabilitation of people affected by natural disasters. With the establishment of F/G/S/PDMA, the functions of the Relief Commissionerate have been incorporated into the new Organization.

3.2.2 Powers and Functions of Provincial Authority

F/G/S/PDMA has the following mandates:

- Formulate the provincial disaster management policy obtaining the approval of the Provincial Commission;
- Coordinate and monitor the implementation of the National Policy, National Plan and Provincial Plan;
- Examine the vulnerability of different parts of the province to different disasters and specify prevention or mitigation measures;
- Lay down guidelines to be followed for preparation of disaster management plans by the Provincial Department and District Authorities;
- Evaluate preparedness at all governmental or non-governmental levels to respond to disaster and enhance preparedness;
- Coordinate response in the event of disaster;
- Give directions to any Provincial department or authority regarding actions to be taken in response to disaster;
- Promote general education, awareness and community training in this regard;
- Provide necessary technical assistance or give advice to the district authority and local authorities for carrying out their functions effectively;
- Advise the Provincial Government regarding all financial matters in relation to disaster management;
- Examine the construction in the area and if it is of the opinion that the standards laid down have not been followed it may direct the responsible party to secure compliance with such standards;
- Ensure that communication systems are in order and disaster management drills are being carried out regularly; and
- Perform such other functions as may be assigned to it by the National or Provincial Authority.

The provincial authority will have responsibility for the following:

- Coordinate complete spectrum of disasters in the province;
- Formulate provincial disaster risk management plan;
- Continuously monitor hazards, risks and vulnerable conditions within the province;
- Develop guidelines and standards for provincial and local stakeholders regarding their roles in disaster risk management;
- Ensure preparation of disaster risk management plans by all districts;
- Coordinate implementation of provincial disaster risk management plan in accordance with the National Framework;
- Promote education, awareness and training on disaster risk reduction and response; and

Provide necessary technical assistance and advice to local authorities for carrying out their functions effectively.

3.2.3 General Organization of F/G/S/PDMA

F/G/S/PDMA is headed by a Provincial Director General with the status and powers of a Secretary. The DG is appointed by the Provincial Government. The Authority serves as secretariat of the Provincial Commission. It works on development, implementation and monitoring and evaluation of disaster risk reduction activities in vulnerable areas and sectors in the province.

The F/G/S/PDMA will ensure the creation of a Provincial Platform for Disaster Risk Management. The Platform will be a coordinating body that brings together technical staff of development practitioners, NGOs and government departments involved in Disaster Risk Management to meet on a regular basis and exchange information, debate options and decisions on activities formulated for referral to the Government, donors, NGOs and other actors. It will be an open forum of high level technical staff representing a broad grouping of organizations at the provincial level with interest in disaster risk management and building the resilience of communities against potential hazards.

The platform will be responsible for addressing disaster risk and development issues in the province, for building trust and understanding, as well as maintaining institutional memory of the key provincial actors.

The platform will meet once a month, or as need may dictate and will be chaired by the Secretary (or his representative) of the F/G/S/PDMA. The Committee will share approaches and guidelines on methods and approaches for the coordination of both information and appropriate response measures on disaster risks.

The platform will promote, strengthen and support the multi-agency approach to disaster risk management. Specifically, the Terms of Reference will be:

- Develop and implement mechanisms to coordinate the flow of disaster risk management and information in the province, and develop procedures to ensure appropriate dissemination and access to the information among the stakeholders
- Coordinate the effective management of information and reporting among stakeholders and, when necessary, shift the focus of such meetings from information sharing to action planning and response coordination
- Develop coordinated response mechanisms to be adopted by all relevant stakeholders. Such guidelines should promote mitigation and early response activities
- Develop and manage a geographical targeting and distribution system for food and non-food responses to affected areas faced with stress conditions with the primary objective being to avoid parallel structures and improve efficiency and impact
- Provide technical advice and guidance to all relevant bodies on matters of disaster risk reduction and management as appropriate
- Thematic Working Groups for various needs and disaster risk management

The organization differs for each F/G/S/PDMA, however, Figure 3.2.1 shows the organization structure of KP PDMA.

Source: PDMA, Khyber Pakhtunkhwa, as of Mar. 2011

Figure 3.2.1 Organization Chart of F/G/S/PDMA

3.2.4 Current Status of F/G/S/PDMAs

Based on the interviews with each Provincial and Regional DMA, current status of F/G/S/PDMAs is clarified as shown in Table 3.2.1. All F/G/S/PDMAs are established and in operation, however, status of F/G/S/PDMAs differs from each other and operational capacity is still under progress and in need of institutional capacity development.

Table 3.2.1 Current Status of F/G/S/PDMAs

Province or Region	Establishment	Office Status	Number of staff	Budget (Mil Rupee) (FY2010)
AJK	Established and started operation in 2008	Permanent Government Building	43	90
Balochistan	Established in 2007, and started operation in October 2008	Individual office building	43	No Info
FATA	Established in Oct 2008, and started operation in June 2010	Rented Building	41	25
Gilgit -Baltistan	Established in March 2007, and started operation in August 2010.	Individual office building	5	Nil
Khyber Pakhtunkhwa	Established in 2008, and started operation in 2009	Individual office building	48	3,479
Punjab	Established in 2010 and started operation in 2011	Rented building	95	3,889
Sindh	Established in 2007, and not operational until 2009.	Rented building, has requested individual building	17	No Info

Source: JICA Study Team, 2012, created based on Interview implemented in between October to December, 2010, and revised in Feb. 2012.

3.2.5 Provincial Disaster Risk Management Plan (represented also FATA / Gilgit-Baltistan / State Disaster Management Authority)

In order to start the actual activities and efforts to be prepared for future disaster, there is a need to develop Provincial Disaster Risk Management Plans, which should define priorities and provide guidelines for disaster risk management in the provinces. The plans in respective provinces have been prepared and institutional enforcement is under progress supported by NDMA and UNDP. The planning is important from two aspects, 1). Output, and 2). Process. The output of the planning is the Provincial Disaster Risk Management Plan. This plan should provide strategic guidelines for disaster risk management and define resources and SOPs emergency response by the provincial government. However, the process of planning is more important, because this will raise awareness of stakeholders about disaster risks and risk management. It is extremely important that extensive consultations are undertaken with stakeholders for development of the plan. A plan that is developed without stakeholder consultation or through cosmetic consultations would not be effective and realistic. Similarly, dissemination of the Plan amongst all stakeholders would be essential for their information and maintenance of interest.

NDMA supported by UNDP has developed the guidelines on the planning process and outcome. There are several International Organizations supported for formulation of Disaster Management Plan in Provincial level, such as UNDP, GIZ and WFP. All provinces except KP and FATA have formulated the Plan with their own or by the support of UNDP. And KP is under formulation with support of GIZ and FATA with support of WFP.

1) Purpose of the Plan

The purposes of this Plan are: firstly, to develop a plan of action for the Provincial Disaster Management Authority and provincial stakeholders covering strategies and priorities for risk reduction, response and recovery; secondly, to define the roles of various provincial stakeholders in disaster risk management; and finally, to raise awareness of provincial stakeholders about disaster risks and the requirements for disaster risk management.

2) Stakeholders

F/G/S/PDMAs should consult the following stakeholders for the development of the Provincial Disaster Risk Management Plan:

- All provincial ministries;
- Provincial departments (e.g. fire services, police, arid zone research institutions, WAPDA, civil defense, Irrigation & Power Department (PID), Provincial Irrigation & Drainage Authorities (PIDAs), Health Dept, Agriculture & Livestock Dept, Social Welfare Dett, Special Education Dept, Communication & Works Dept & Revenue Department and etc);
- Universities and research institutions;
- Pakistan Red Crescent Society;
- Provincial NGOs working on disaster management;
- Media (TV, Radio, newspapers, magazines);
- Political parties and leadership (government and opposition, if possible);

3) Contents of Plan

Typical contents of Provincial Disaster Risk Management Plan indicated in the guideline are as follows.

<u>Part1</u>

- Preface
- Overview of the Province
- Disaster Risks in the Province
- Challenge and Opportunities for Disaster Risk Management
- Vision, Mission and Objectives
- Priority Strategies for Disaster Risk Management
- Structure for Disaster Risk Management and Key Stakeholders

<u>Part 2</u>

- SOPs Regarding Involvement of Various Stakeholders in Disaster Response

- Inventory of Resources Available with Stakeholders for Disaster Response
- Simulations and Drills
- Annexes

3.3 District Disaster Management Authorities

3.3.1 Introduction

Notifications for establishment of the District Disaster Management Authorities (DDMAs) have been issued by all provincial and state governments as of 30 April 2007 in accordance with the National Disaster Management Ordinance 2007. The broad terms of reference of the DDMAs have been described in the National Disaster Management Ordinance. Important next steps in preparing the DDMAs for operation are: 1). Organizing the launching meeting in each district, 2). Training the DDMA members; and 3). Developing Disaster Risk Management Plan for the district.

In order to demarcate roles and responsibilities in disaster management, DDMAs are the most frontline organizations to deal with disasters in disaster management and response. If the scale of disaster is limited, DDMA need to handle everything by themselves, however, if the scale of disaster gets larger and several districts are affected at once, F/G/S/PDMA needs to coordinate their activities. However, DDMAs are the most forefront organizations so that enhancement of their organization is one of the most important activities to be implemented at the earliest possible time.

3.3.2 Powers and Functions of District Authority

DDMA has following mandates:

- prepare a disaster management plan including district response plan for the district;
- coordinate and monitor the implementation of the National Policy, Provincial Policy, National Plan, Provincial Plan and District Plan;
- ensure that the areas in the district vulnerable to disasters are identified and measures for the prevention of disasters and the mitigation of its effects are undertaken by the departments of the Government at the district level as well as by the local authorities;
- ensure that the guidelines for prevention, mitigation, preparedness and response measures as laid down by the National Authority and the Provincial Authority are followed by all departments of the Government at the district level and the local authorities in the district;
- give directions to different authorities at the district level and local authorities to take such other measures for the prevention or mitigation of disasters as may be necessary;

- lay down guidelines for preparation of disaster management plans by the departments of the Government at the district level and local authorities in the district;
- monitor the implementation of disaster management plans prepared by the Departments of the government at the district level;
- lay down guidelines to be followed by the Departments of the Government at the district level;
- organize and coordinate specialized training programs for different levels of officers, employees and voluntary rescue workers in the district;
- facilitate community training and awareness programs for prevention of disaster or mitigation with the support of local authorities, governmental and non-governmental organizations;
- set up, maintain, review and upgrade the mechanism for early warnings and dissemination of proper information to the public;
- prepare, review and update district level response plan and guidelines;
- coordinate with, and give guidelines to, local authorities in the district to ensure that pre-disaster and post-disaster management activities in the district are carried out promptly and effectively;
- review development plans prepared by the Departments of the Government at the district level, statutory authorities or local authorities with a view to make necessary provisions therein for prevention of disaster or mitigation;
- identify buildings and places which could, in the event of disaster situation be used as relief centres or camps and make arrangements for water supply and sanitation in such buildings or places;
- establish stockpiles of relief and rescue materials or ensure preparedness to make such materials available at a short notice;
- provide information to the Provincial Authority relating to different aspects of disaster management;
- encourage the involvement of non-governmental organizations and voluntary social-welfare institutions working at the grassroots level in the district for disaster management;
- ensure communication systems are in order, and disaster management drills are carried out periodically; and
- perform such other functions as the Provincial Government or Provincial authority may assign to it or as it deems necessary for disaster management in the District

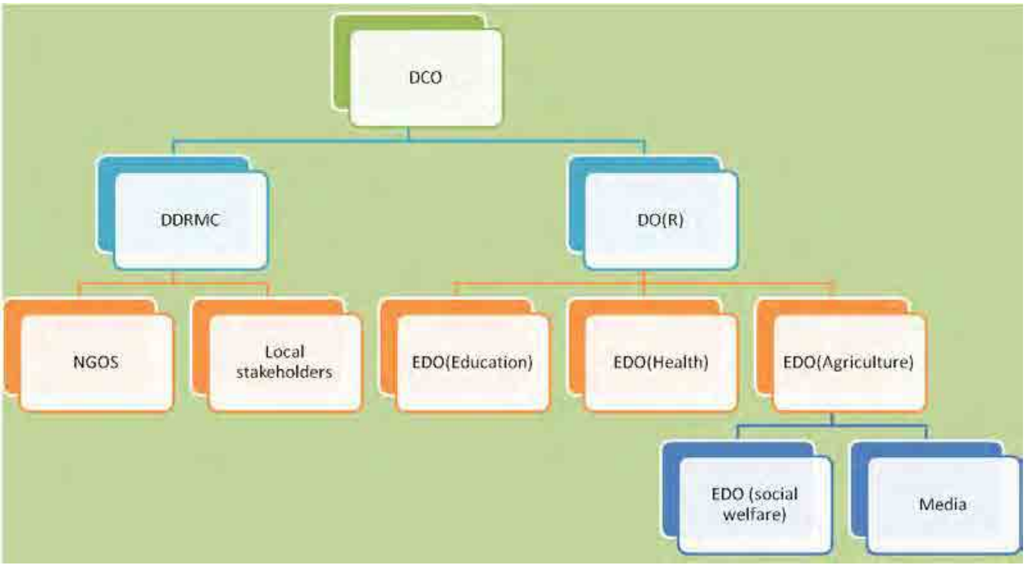
For the purpose of assisting, protecting or providing relief to the community in response to any disaster, the District Authority has additional mandates as follows:

- give directions for the release and use of resources available with any department of the Government and the local authority in the district;
- control and restrict vehicular traffic to, from and within, the vulnerable or affected area;
- control and restrict the entry of any person into, his movement within a disaster area;
- remove debris, conduct searches and carry out rescue operations;
- provide shelter, food, drinking water and essential provisions, healthcare and services;
- establish emergency communication systems in the affected area;
- make arrangements for the disposal of the unclaimed dead bodies;
- direct any Department of the Government of the Province any authority or body under that Government at the district level to take such measures as are necessary in its opinion;
- require experts and consultants in the relevant fields to advise and assist as it may deem necessary;
- procure exclusive or preferential use of amenities from any authority or person;
- construct temporary bridges or other necessary structures and demolish structures which may be hazardous to the public or aggravate the effects of the disaster;
- ensure that the non-governmental organizations carry out their activities in an equitable and non-discriminatory manner; and
- take such other steps as may be required or warranted to be taken in such a situation.

3.3.3 General Organization of DDMA

DDMA is headed by a District Coordination Officer, and consists of the following members: the District Police Officer, the Executive District Officer Health, and other district level officers, to be appointed by the District Government.

Organization differs from each DDMA, however, Figure 3.3.1 shows the typical organization structure of Sialkot DDMA in Punjab Province.



Source: DDMA, Sialkot District, Punjab Province, as of July. 2010

Figure 3.3.1 Organization Chart of DDMA

3.3.4 Current Status of DDMAs

Based on the survey conducted by questionnaires to 50 priority Districts, 32 Districts responded to the questionnaire, and current status of DDMAs are clarified as shown in Table 3.3.1. Still, the number of DDMAs established is limited and even in Districts where DDMAs have already been established, they do not function well due to lack of knowledge in each district. Necessary capacity enhancement is expected to be implemented by NIDM in the near future.

Table 3.3.1 Current Status of DDMAs

Province or Region	District	Establishment	Office Space status	No of DDMA Members	Composition of DDMA members	Head of DDMA	Total Budget for FY 2010	Recent Disaster in the District		DDRMPs	
								Disaster	Month	Availability	Type of disaster
KP	Dir Lower	DDMA does not exist in this District	-	-	-	DCO	-	Flood	Jul-10	No plan	No plan
	Swat	DDMA does not exist in this District	-	-	-	DCO	-	Flood	Jul-10	No plan	No plan
	Peshwar	DDMA does not exist in this District	-	-	-	DCO	-	Flood	Jul-10	No plan	No plan
	Swabi	DDMA does not exist in this District	-	-	-	DCO	Budget is Not allocated	Flood	Jul-10	No plan	No plan
	Mardan	DDMA does not exist in this District	-	-	-	DCO	Budget is Not allocated	Flood	Jul-10	No plan	No plan
	Mansehra	30-4-2007(Physically December 008)	Office & Duty Room, Yes Two shelters in DCO Office	3 members	All EDO,s & DDO's	Assistant Coordination Officer	Budget is Not available	Earth Quake	Oct-05	Yes	3 CNG Fire,1 flood and one land side

Province or Region	District	Establishment	Office Space status	No of DDMA Members	Composition of DDMA members	Head of DDMA	Total Budget for FY 2010	Recent Disaster in the District		DDRMPs	
								Disaster	Month	Availability	Type of disaster
Balochistan	Pishin	DDMA does not exist in this District	-	-	-	DC	Budget is Not allocated	N/A	N/A	No plan	No plan
	Jaffarabad	DDMA does not exist in this District	-	-	-	DC	Budget is Not allocated	N/A	N/A	No plan	No plan
	Quetta	DDMA does not exist in this District	-	-	-	Director PDMA	Budget is Not allocated	N/A	N/A	No plan	No plan
	Qila Abdullah	DDMA does not exist in this District	-	-	-	DC	Budget is Not allocated	N/A	N/A	No plan	No plan
	Kech	DDMA does not exist in this District	-	-	-	DC	Budget is Not allocated	N/A	N/A	No plan	No plan
	Khuzdar	DDMA does not exist in this District	-	-	-	DC	Budget is Not allocated	N/A	N/A	No plan	No plan
AJK	Muzafarabad	DDMA does not exist in this District	-	-	-	DC	Budget not shared	Earth Quake	Oct-05	No plan	No plan
	Punch	DDMA does not exist in this District	-	-	-	DC	Budget not shared	Earth Quake	Oct-05	No plan	No plan
	Bagh	DDMA does not exist in this District	-	-	-	DC	Budget not shared	Earth Quake	Oct-05	No plan	No plan
	Kotly	DDMA does not exist in this District	-	-	-	Assistant Commissioner of each Tehsil	Budget not shared	N/A	N/A	No plan	No plan
Gilgit-Baltistan	Skardu	DDMA does not exist in this District	-	-	-	DC	Budget not shared	No answer	No answer	Yes	Floods
	Ghizer	Still on Paper only	No	19 as per GBDMA	All departmental Heads of the District	DC	Budget not shared	Landslide	From December 2009 to date	Yes	Land Slide & Floods
	Gilgit	Established in August 2008 and physically established in August 2009 one DD, DDMA at DC office Gilgit.	Yes	Only three when there is not a disaster	DC,AC.	DC and DD, DDMA	Budget not shared	Blockage of Road and River	January to May, 2010	Yes	Attaabad
	Dimar	Still on Paper only	No	19 as per GBDMA	All departmental Heads of the District	DC	Budget not shared	Ataabad outburust threat	January-July 2010	Yes	Floods
Punjab	Faisalabad	Established in 2007	1 room in Rescue Central Station	1	District Officer (Fire)	District Officer (Fire)	Budget not shared	N/A	N/A	No plan	No plan
	Gujranwala	DDMA does not exist in this District	No	DCO and concerned DDO (Rev.)	DCO and all heads of the departments in the District	DCO Gujranwala and DDO (R) City	Budget not shared	N/A	N/A	Yes	Floods
	Rawalpindi	Established in 14 August 2007	Yes. At Central Rescue Station	18	Rescue 1122, Civil Defence, Fire brigade, Revenue officers	Mr. Zubair, EDO (Revenue)	Budget not shared	Terrorist Activities. Flood	N/A	Yes	All types

(continues to the next page)

Province or Region	District	Establishment	Office Space status	No of DDMA Members	Composition of DDMA members	Head of DDMA	Total Budget for FY 2010	Recent Disaster in the District		DDRMPs	
								Disaster	Month	Availability	Type of disaster
	Sialkot	Established in 2009	1 room in Civil Defence Building	1	Rescue 1122, Civil Defence, Fire brigade, Revenue officers	Civil Defense Office	Budget not shared	N/A	N/A	No plan	No plan
	Muzaffargarh	DDMA does not exist in this District	-	-	Rescue 1122, Civil Defence, Fire brigade, Revenue officers	District Emergency Officer	Budget not shared	Flood	Aug-10	No plan	No plan
	Lahore	DDMA does not exist in this District	-	-	Rescue 1122, Civil Defence, Fire brigade, Revenue officers	District Emergency Officer	Budget not shared	No disaster but some terrorist attacks	N/A	No plan	No plan
Sindh	Hyderabad	Still on Paper only	No	6	DCO, EDO (Revenue), D. O (Social Welfare), EDO (work & service), EDO (Health) and D. O (Revenue).	Sy. Barkat Rizvi, E. D. O Revenue.	1.5 million	Rainfall	Aug, Sep.	Yes	Rainfall
	Mirpur Khas	Established in September 2007	No.: Under jurisdiction of DCO.	-	-	D. O Revenue.	No answer	Flood/Rain	Aug, Sep	Yes	Flood
	Sanghar	Established	Revenue office is used	Staff is not available	There is no specific staff	D.O Revenue	No answer	Rainfall	July, Aug	Yes	Rainfall
	Larkana	Established in July 2010	Civil Defense office	50 Members	Chairman DCO, Deputy Controller Civil Defense and D. O Revenue EDO Health.	Deputy Controller of Civil Defense	1.2 million	Flood	Aug	Yes	Flood and Rainfall
	Dadu	August 2010.	Individual	15 including NGOs & INGOs	They include district officers.	D.O Revenue	No answer	No answer	No answer	Yes	Flood and Drought
	Karachi	2006-2007	No individual Office space	No answer	Disposal of solid waste, Fire & Rescue Service, Storm Water Drainage, Community Police, Municipal Public Health, Air, Noise, Water & Soil pollution.	EDO Municipal Services	No answer	No answer	No answer	Yes	Heavy Rain

Source: JICA Study Team, 2011, created based on questionnaires distributed between October to December, 2010.

3.3.5 District Disaster Risk Management Plan

In order to start the actual activities and efforts to be prepared for future disaster, there is a need to develop District Disaster Risk Management Plans (DDRMPs), which should define priorities and provide guidelines for disaster risk management in the districts. Some of the districts were selected and they have formulated District Disaster Risk Management Plans supported by NDMA, F/G/S/PDMA, and UNDP. In reality, most of DDMAs do not have physical institutions established, but plans are prepared based on the ideal structure of DDMAs, therefore, there is large gap between reality and plans. This gap needs to be filled in the future. Also, there are 143 districts in Pakistan, and most of the districts need to formulate DDRMPs by themselves, however, considering the recent condition, strong support from F/G/S/PDMA is needed to complete formation of DDRMP in all districts in Pakistan.

1) Purpose of the Plan

The purposes of this Plan are: firstly, to develop a plan of action for the District Disaster Management Authority and other district stakeholders to set priorities and provide directions for disaster risk management; secondly, to define the roles of various stakeholders in disaster risk management; and finally, to raise awareness of stakeholders about disaster risks and the requirements for disaster risk management.

2) Stakeholders

DDMAs should consult the following stakeholders for development of the District Disaster Risk Management Plan:

- All line departments; e.g. agriculture, civil defense, fire services, revenue, irrigation, works
- and communications, health, social welfare and special education, local army units etc;
- Universities and research institutions located in the district;
- District branch of the Pakistan Red Crescent Society;
- NGOs working on disaster risk management in the district;
- Local media (TV, radio, newspapers, magazines);
- Local business companies and groups;
- Political parties and leadership (government and opposition, if possible), District Council; and
- Any other key stakeholders.

3) Contents of Plan

Typical contents of DDRMPs indicated in the guideline are as follows.

Part1

- Preface
- Overview of the District
- Disaster Risks in the District
- Vision, Mission and Objectives
- Priority Strategies for Disaster Risk Management

- Structure for Disaster Risk Management and Key Stakeholders
- SOPs Regarding Involvement of Various Stakeholders in Disaster Response
- Inventory of Resources Available with Stakeholders for Disaster Response
- Simulations and Drills
- Annexes

3.4 Earthquake Rehabilitation and Reconstruction Authority (ERRA)

3.4.1 Introduction

Nature has blessed Pakistan's northern regions and Kashmir valley with striking landscapes of lofty snow clad peaks, sparkling glaciers, lush green meadows, breathtaking valleys, roaring rivers, silvery lakes, scenic waterfalls, thickly wooded forests, flowers of unbelievable hues and awe-inspiring mountain passes. All these combined make the north of Pakistan a paradise on earth. It was in the morning of October 8, 2005 when the fury of nature shook the calmness and tranquility of the serene north of Pakistan, and brought anguish and woe to the lives of over 3.5 million souls. The earthquake caused massive loss of precious lives and livelihood to the victims, while reducing all essential facilities and infrastructure to dust and debris. The Government and people of Pakistan as well as the international community responded in an unprecedented manner to this tragic calamity. The relief activity began right after the rescue efforts, wherein the government and people of Pakistan, humanitarian organizations and the international community participated enthusiastically to restore life in the affected areas. In a mere six months time, by 31 March 2006, the relentless efforts of the nation and international community culminated in a successful completion of the relief and recovery phase. This was followed by reconstruction and rehabilitation activities, which are still going on.

The Government of Pakistan established the Earthquake Reconstruction and Rehabilitation Authority (ERRA) on 24 October 2005 to take up the mammoth task of rebuilding in the earthquake affected regions spread over 30,000 square kilometers in nine districts of NWFP (currently KP) and AJK. The nucleus staff of ERRA comprises a hybrid of civil servants, armed forces personnel and international consultants. ERRA's prime task is to strategize and approve projects together with the provision of funds to SERRA[2] and PERRA[3] to undertake the reconstruction and rehabilitation works in their respective areas. The idea behind the creation of ERRA was to bring all efforts and activities pertaining to post-disaster damage assessment, reconstruction and rehabilitation in the affected areas under one umbrella, with a view to providing fast track and seismically safe reconstruction regimes and solutions.

[2] SERRA: State Earthquake Reconstruction and Rehabilitation Agency
[3] PERRA: Provincial Earthquake Reconstruction and Rehabilitation Agency

Recently, under the ERRA Act 2011 passed by the parliament in March, 2011, ERRA has given the status of permanent body.

3.4.2 Functions and Organization of ERRA

1) Mission

ERRA's mission is to "Convert this Adversity into an Opportunity" by reconstructing the lost and destroyed facilities, while following highest standards of reconstruction and rehabilitation with the obligation to "Build Back Better".

2) Mandate and Role

The main role of ERRA is macro planning, developing sectoral strategies, financing, project approval and monitoring and evaluation. Additionally, it ensures the required coordination and provides facilitation to implementing partners, whereas physical implementation of the projects is the responsibility of respective governments.

3) Earthquake Reconstruction and Rehabilitation Authority Ordinance (ERRA's ACT)

To cope with the peculiar circumstances arising from the devastating earthquake of 8 October 2005, the Government of Pakistan established ERRA on 24 October 2005 as described above, under an Ordinance (Currently ERRA's ACT). The ACT of Majlis-e-Shoora (parliament) received the assent of the President on the 9th March, 2011. The Authority is responsible for all reconstruction, rehabilitation, early recovery programs and projects in the affected areas, and towards this end, it is assigned to perform the following functions:

- To conduct surveys to assess damage and carry out future planning in the affected areas;
- To formulate a comprehensive umbrella development program to provide for:
  - Reconstruction of the government buildings and offices, utilities and services, infrastructure, roads, subways and bridges, potable water, drainage systems, health and education facilities, tourism, irrigation and agricultural facilities in the affected areas;
  - Environmental protection and rehabilitation; and
  - Restoration of economic activities and livelihood;
- To prepare a resettlement and rehabilitation plan for the affected population in consultation with the respective governments of the affected areas;
- To approve projects, programs and schemes, identified, prepared and submitted by the respective governments of the affected areas;
- To take steps for monitoring and evaluation of the approved projects, programs and schemes;

- To prescribe cost effective technologies, building codes or construction guidelines, architectural designs, specifications and construction materials for housing and other buildings in the affected areas to safeguard against future seismic threats;
- To facilitate the establishment of the reconstruction related industry and businesses in the affected areas in consultation with the respective governments;
- To perform such other functions supplemental, incidental or consequential to the purposes and functions aforesaid and any other function assigned to it by the Federal Government in accordance with the purposes of this ACT; and
- To keep the two Houses of Majis-e-Shoora (Parliament) informed of its activities through six monthly reports of its performance for discussion.

To perform these functions the Authority is empowered to undertake any work, incur any expenditure, procure plants, machinery, services, equipment, vehicles and any other moveable or immovable property and stores required for the implementation of approved development projects, programs and schemes. It is authorized to seek and obtain from any department or agency (including the armed forces) advice and assistance to discharge its functions.

a. ERRA Council

The general directions in all matters of policy and administration of the Authority and its affairs are vested in the Council, which is headed by the Prime Minister of Pakistan, with the following composition:

Table 3.4.1 Members of the ERRA Council

ERRA Council Members	Role
Prime Minister of Pakistan	Chairperson
Prime Minister of AJK	Member
Chief Minister of KP	Member
Minister for Kashmir	Member
Affairs & Northern Areas	Member
Finance Minister	Member
Chairman of ERRA	Member
Deputy Chairman of Planning Commission	Member
Deputy Chairman of ERRA	Member/Secretary

Source: JICA Study Team

b. ERRA Board

Under the provisions of this Ordinance, the ERRA Board is created for the implementation of the approved policy decisions, plans, programs, projects and schemes, with such administrative and financial powers as provided in the Ordinance or delegated by the Council. The Board is composed of the following table.

Table 3.4.2 Members of the ERRA Board

ERRA Board Members	Role
Chairman of ERRA	Chairperson
Deputy Chairman of Planning Commission	Member/Secretary
Chief Secretary of KP	Member
Chief Secretary of AJK	Member
Additional Finance Secretary	Member (Expenditure)
Additional Secretary of Planning Division	Member
Additional Secretary of Economic Affairs Division (EAD)	Member
Six Representatives from Civil Society	Member

Source: JICA Study Team

The Chairman of the ERRA Board, appointed by the Federal Government, is responsible for the policy matters, performs such functions, and carries out such responsibilities as delegated to him by the Council or the Board. The Deputy Chairman provides strategic guidance, executes programs, carries out operational management, and exercises financial and administrative powers delegated to him by the Council or the Board, including the powers of the Principal Accounting Officer.

c. Policy Planning

A comprehensive consultative process is followed while formulating the policies. All the major donor organizations, whose funds are involved in the reconstruction programs, are consulted before conceiving a policy. The draft policies are discussed with the representatives of both the governments, i.e., the Governments of AJK and KP, and subsequently placed before the ERRA Board and/or ERRA Council for the final decision.

d. Policy Role of Provincial and State Governments

Besides policy formulation, ERRA has restricted its role to developing sectoral strategies, project approval, financing, coordinating, monitoring and evaluating the reconstruction activities in the affected areas. The implementation of the approved strategies is governed through a devolved mechanism with maximum powers resting with the Provincial/State and District governments. At the Province and State levels, both governments have created the Provincial Earthquake Reconstruction and Rehabilitation Agency (PERRA) and the State Earthquake Reconstruction and Rehabilitation Agency (SERRA), respectively. They act as Secretariats for the Provincial/State Steering Committees. These committees are headed by the respective Chief Secretaries with representation of secretaries of all the relevant line departments and a representative of the Planning Wing of ERRA. They have the mandate to approve the Annual Work Plans of their respective governments received by them from each of the affected districts. They have the financial powers to approve any reconstruction project costing up to Rs.250

million. The basic mandate of implementation of all reconstruction projects rests with these organizations.

e. Role of District Governments

The Provincial and State Governments have created District Reconstruction Units (DRUs) in each of the affected districts. These DRUs act as Secretariat to the District Reconstruction Advisory Committee (DRAC), which is headed by the DCO/District Nazim in each district of KP and the Deputy Commissioner in AJK with representation of all the relevant line departments of the district and elected representatives. Each DRAC has the powers to approve projects up to Rs.100 million and prioritize the reconstruction activities as per their needs and requirements. They develop the Annual Work Plan and submit the same to PERRA/ SERRA, as the case may be.

4) Earthquake Reconstruction and Rehabilitation Authority Act, 2010

Originally ERRA was established with limited period of 5 years after the establishment, since ERRA was established for rehabilitation and reconstruction from specific earthquake disaster occurred in 2005. At the stage of dissolving ERRA, Earthquake Reconstruction and Rehabilitation Authority Act, 2010 was enacted in 2010 to make ERRA permanent organization to give full responsibilities in rehabilitation and reconstruction from earthquake disaster. At this stage, new ERRA is under formulation and information of new organization could not be collected, therefore, this section will be revised in the course of the project. However, in this Act, relationship between NDMA and ERRA is not mentioned, and to avoid unnecessary confusion and for better coordination, roles and responsibilities between these organizations need to be clarified at the earliest stage.

a. Function of Authority

The Authority shall be responsible for all reconstruction, rehabilitation and early recovery programs and projects in the affected areas and, towards this end, may perform the following functions.

- To conduct surveys to assess damage and carry out future planning in the affected areas,
- To formulate a comprehensive umbrella development program to provide for:
  - (i) Reconstruction of the government buildings and offices, utilities and services, infrastructure, roads, subways and bridges, potable water, drainage system, health and education facilitates, tourism, irrigation and agriculture facilities in the affected areas;
  - (ii) Environmental protection and rehabilitation; and
  - (iii) Restoration of economics activities and livelihoods;

- To prepare resettlement and rehabilitation plan for the affected population in consultation with the respective Governments of the affected areas;
- To approve projects, programs and schemes identified, prepared and submitted by the respective Governments of the affected areas;
- To take steps for monitoring and evaluation of the approved projects programs and schemes;
- To prescribe cost-effective technology, building codes or construction guidelines, architectural designs, specifications, and construction materials for housing and other buildings in the affected areas to safeguard against future seismic threats;
- To facilitate the establishment of the reconstruction-related industry and businesses in the affected areas in consultation with the respective Governments;
- To perform such other functions supplemental, incidental or consequential to the purposes and functions aforesaid and any other function assigned to it by the Federal Government in accordance with the purposes of this Act; and
- To keep the two Houses of Majlis-e-Shoora (Parliament) informed of its activities through six monthly reports of its performance for discussion.

b. Power of the Authority

To perform its functions, the Authority may:

- Undertake any work, incur any expenditure, procure plant, machinery, services, equipment, vehicles and any other moveable and immoveable property, and procure stores required for the implementation of approved development projects, programs and schemes;
- Dispose off such plant, machinery, equipment, vehicles property and stores as are no longer required in the manner as prescribed by rules;
- Seek or call for any information from any person or any institution, department or agency, as may be required for carrying out its purposes;
- Seek, and obtain from any department or agency (including the armed forces) advice and assistance to discharge its functions and for execution of its approved projects, programs and schemes;
- Approve individual projects, programs and schemes, within the scope of the approved umbrella program;
- Transfer any project on its completion to any department or agency of the Federal Government or respective Governments of the affected areas; and
- Re-appropriate funds from one project, program scheme etc. to another project, program or scheme.

c. The Council of the Authority

The Council of the Authority consists of the following members:

- Prime Minister of Pakistan as a Chairperson;
- Prime Minister of Azad Jammu and Kashmir, as a Member;
- Chief Ministers of Punjab, Khyber Pakhtun Khwa, Sindh, and Balochistan, as Members;
- Chief Minister, Gilgit-Baltistan, as a Member;
- The Federal Minister for Finance or Advisor to the Prime Minister on Finance, as the case may be, as a Member; and
- Two members each from National Assembly and the Senate to be nominated by the Speaker and Chairman respectively in consultation with the Leaders of the House and Leaders of the Opposition in the two Houses, as Members.

The Council may co-opt such other members as it deems necessary for the conduct of its business.

d. The Board of the Authority

A Board which shall be responsible for the implementation of the approved policy decisions, plans, programs, projects and schemes and shall have such administrative and financial powers as may be delegated to it by the Council.

The Board consists of the following members:

- Chairman of the Authority, as a Chairman;
- Deputy Chairman of the Authority, as a Member;
- Additional Finance Secretary, as a Member;
- Additional Secretary Defense, as a Member;
- Additional Secretary, Planning Division, as a Member;
- Additional Secretary, EAD, as a Member;
- Chief Secretaries of four Provinces and Gilgit-Baltistan, as Members;
- Chief Secretary, AJK, as a Member;
- Four representatives of civil society to be nominated by the Federal Government, as Members; and
- A representative of civil society to be nominated by the Government of an affected area, as a Member.

e. ERRA Fund

There shall be established a fund for reconstruction and rehabilitation to be known as the ERRA Fund which shall vest in and be utilized by the Authority to meet the expenses and carry out the objectives of the Act.

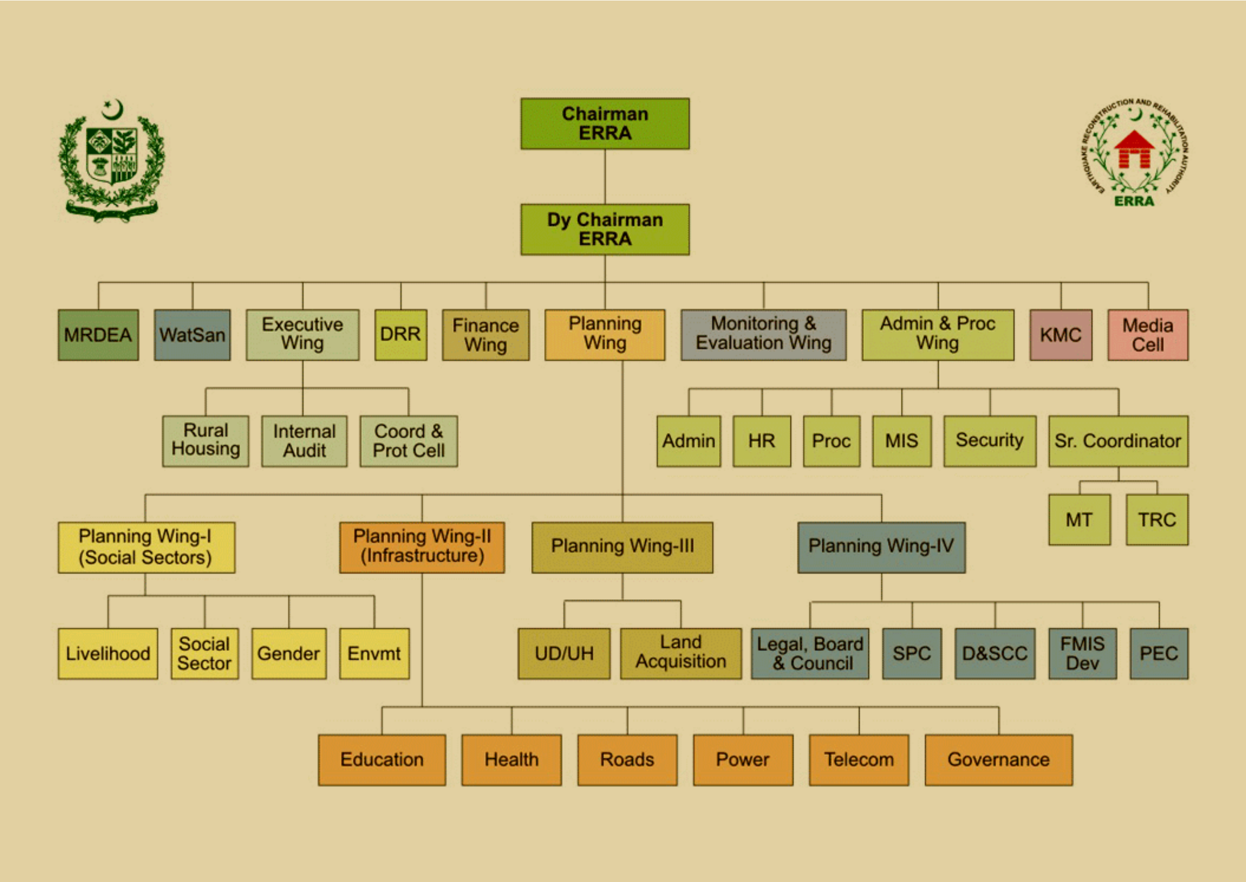
The Fund shall consist of:

- Such sums as the Federal Government may, from time to time, allocation to it; and

- All other sums or properties which may in any manner become payable to, or vest in, Authority.

5) Organization of ERRA

The organization chart of ERRA is shown in the figure below.



Source: http://www.erra.pk/aboutus/organogram.asp

Figure 3.4.1 Organization of ERRA

The roles and responsibilities of each main wing are described below.

a. Executive Wing

The Executive Wing, the Secretariat of the Deputy Chairman of ERRA, is managed by the Chief of Staff (COS). Since its creation, ERRA has passed through certain organizational changes with a view to enhancing its overall efficiency, output and functioning. Most recently, the Executive Wing has been re-organized, and it now consists of different offices which operate under the overall direction and guidance of COS. The Rural Housing, Internal Audit, and Coordination Cells, and Project Implementation Coordination Unit (PICU) report directly to COS.

i) Rural Housing Reconstruction Programe

ERRA's flagship programe of Rural Housing Reconstruction[4], after running full steam, is nearing completion and is expected to achieve the best ever completion rate of over 90% in similar contemporary post-disaster programs. After having nearly accomplished the assigned task, the Rural Housing Sector is functioning under a Program Manager, who is responsible to COS.

ii) Internal Audit Cell

The Internal Audit Cell has been created with the objective of examining and evaluating whether ERRA's framework of risk management, control and governance processes is adequate and functioning properly. It is also mandated to ensure financial and operational transparency, to safeguard assets, and to ensure compliance to rules and regulations. The Cell is responsible for maintaining all records and information of ERRA offices, preparing and issuing periodic audit reports to the management, assisting the external auditors to perform their duties in a manner that facilitates independent, impartial and effective professional judgments and recommendations, and performing internal audit of ERRA on a regular basis.

iii) Coordination Cell

The Coordination Cell is a part of the Executive Wing. It consists of one Director and two Deputy Directors. It coordinates all internal and external official engagements, and meetings of the Chairman/Deputy Chairman with the concerned stakeholders. It documents minutes of the meetings to maintain a record of actions on the decisions taken in such meetings.

b. Administration and Procurement Wing

Headed by the Director of General Administration, the Wing has been recently restructured to deal with Administrative and Procurement matters, Security, Management Information System (MIS), and Intern and Volunteer Programs. The Administration Wing looks after overall administrative issues of the Authority including budget, accounts, transport and procurement of all types of equipment and human resources. The Wing also caters to the communication needs of the Authority through the Management Information System Cell.

[4] This program was one of the largest programs looking after the seismic resistant reconstruction of 611,000 houses spread in 30,000 sq km of area. The program marked first time ever the implementation of across the board owner driven reconstruction with assisted and inspected construction regime, whereby ERRA was providing the housing subsidy and training to the people for seismic resistant reconstruction of their Rural Houses. It went to the credit of this program that all the major International Donors such as World Bank, Asian Development Bank, Islamic Development Bank, French Development Agency and the UN are partnering with ERRA and the entire program is fully donor funded which reflects on donor’s confidence in this program. (quoted from www.recoveryplatform.org)

c. Finance Wing

The Finance Wing, headed by a Director General, acts as Financial Advisor to ERRA along with rendering advice on payment of salaries to ERRA employees and payment of funds to ERRA affiliates, i.e., SERRA and PERRA. It acts as a compiler of accounts, with the following tasks:

- Payment of personnel and third party claims within the regulatory framework;
- Reconciliation of accounts with (i) respective DDO, (ii) federal treasury, (iii) banks, and (iv) AGPR;
- Coordination with statutory audit authorities;
- Making proposals for re-appropriation of funds;
- Scrutiny of non-development and development estimates; and
- Submission of budget proposals to the ERRA Board and ERRA Council for obtaining approval thereof.

d. Senior Management Advisor Finance (SMA (FM))

SMA (FM) supervises the work of the Project Evaluation Cell (PEC), which examines all PC-Is of ERRA projects/schemes to ensure compliance with instructions/ guidelines of the Planning Commission. In addition, he oversees and coordinates the development of the new Financial Management Information System (FMIS) in ERRA. Moreover, he also supervises the MRDEA project in addition to rendering advice on broad management and institutional issues as and when required by the ERRA management.

i) FMIS

Keeping in view the challenges, ERRA's Finance Department has introduced an off-the-shelf Financial Management Information System (FMIS). This system is capable of processing transactions on a real time basis at different locations and has the facility to provide on-line financial reports to strategic management for decision-making purposes. The system has been configured and tested, and training has been imparted to various system users. The system is being upgraded by introducing modules for Fixed Assets Management.

ii) MRDEA

The Medical Rehabilitation of Persons with Disabilities in the Earthquake Affected Areas (MRDEA) is an Rs.742.41 million project of ERRA, the biggest project of its kind in Pakistan. It is specifically designed to provide comprehensive rehabilitation services to persons with disabilities (PWDs) in the earthquake affected areas. Through this project, ERRA attempts to create and build capacity of PWDs, their families, and the community at large. This project is a combination of Community-Based Rehabilitation (CBR) and Institution-Based Rehabilitation (IBR). In view of the problems existing in the affected areas, the scope of the project includes infrastructure, training and capacity building both in terms of human resources and the equipment that has been designed to cater to the needs of the PWDs and facilitate their mainstreaming into the society.

iii) Project Evaluation Cell (PEC)

The Project Evaluation Cell (PEC) has been entrusted with the task of scrutiny and clearance of all projects of all the sectors of ERRA. In addition, a number of projects of Social Protection, Environmental Protection and Gender Mainstreaming have also been included in the responsibilities of PEC. All PC-Is, whether falling in the sanctioning competency of DRAC, PERRA/SERRA, ERRA Board or ECNEC, are scrutinized in the PEC.

e. Monitoring and Evaluation (M&E) Wing

Headed by the Director General for Monitoring and Evaluation, the M&E Wing provides real time evaluation and monitoring of ongoing projects and assists in filling gaps by providing technical monitoring inputs.

The M&E Wing is required to support the monitoring and evaluation of ERRA efforts and to provide a set of independent information and analysis on overall progress and effectiveness of the reconstruction and rehabilitation processes including the social impact.

This wing provides harmonized and robust monitoring and evaluation cover for all stakeholders focusing on results and impacts along with budgets. This not only provides input for mid-course corrections but is also an important tool for accountability.

Performance measurement and reporting systems enhance information to all stakeholders, ensuring quality service delivery and successful implementation of strategies. The M&E Wing is not a stand-alone activity; it also serves as a decision-making tool at all levels.

f. Knowledge Management Cell (KMC)

KMC, headed by an Advisor, manages knowledge by systematic processing and documentation of information, experiences, lessons learned and events as part of historical evidence. This Cell also works directly under the Deputy Chairman. It identifies and highlights accomplishments and challenges faced by ERRA, and the perceptions of stakeholders. It disseminates knowledge by developing a range of products for diverse audiences in the form of Monthly News Bulletin, Quarterly Newsletter, Annual Review, and preparing Sectoral Case Studies. KMC also initiates linkages with research and educational organizations/ institutions both at national and international levels, and ensures knowledge sharing and dissemination with partner organizations using an electronic database and the ERRA Website as a knowledge portal.

g. Media Cell

The Media Cell, headed by an Advisor, was created to make the populous aware of the achievements of ERRA, and to handle the press issues on a daily basis. The main responsibilities of the Media Cell, which works directly under the Deputy Chairman and also has a direct linkage with the Chairman, are publicity and reporting information of ERRA's performance, monitoring of print and electronic media in the form of press conferences, interviews of the Chairman, Deputy Chairman and other officials, and the visits of media in the field.

h. Legal, Board, and Council Wing

The Legal Wing is headed by a Director General, who acts as Legal Advisor to ERRA. The Wing performs two important functions. The first includes vetting legal documents and coordination with ERRA offices as well as SERRA and PERRA (ERRA’s on-the-ground implementing partners in the earthquake affected districts of AJK and KP, respectively) on matters relevant to law and court cases.

Its second function is to serve as the focal office in ERRA which oversees the Board and Council matters. The Board and Council Cell acts as a secretariat to the supreme policy-making forums of ERRA, i.e., ERRA Council and ERRA Board. It ensures implementation of decisions made in the ERRA Council and Board meetings. It is responsible for handling parliamentary business, including preparation of responses and coordination with the Minister-in-Charge of the PM Secretariat on questions, resolutions and motions tabled by the members of the National Assembly and Senate, with regards to the activities and functions of ERRA. It also coordinates briefings on ERRA’s strategies and activities to various Standing Committees of the Senate and National Assembly.

i. Special Projects Cell

The Special Projects Cell manages donor-funded mega projects, which are multi-sectoral in nature and do not fall under a single sector. Such large donor- funded projects require planning, withdrawal and reporting procedures that require a specialized management unit. SPC is at the moment handling the following:

- Saudi Fund for Development Grant for Health, Education and Governance Sectors;
- Islamic Development Bank-funded Integrated Development Project for Shangla & Kohistan;
- Kuwait Fund for Development Grant for reconstruction of colleges in AJK; and
- Japan Bank for International Cooperation (JBIC)-funded projects.

j. Donors and Sponsors Cell

Working as a part of P-IV, D&SCC provides a facilitating platform for donors and sponsors, foreign embassies, and NGOs, that are desirous of participating in reconstruction and rehabilitation works in earthquake affected areas. This cell handles donors/sponsors requests, and approves and allocates projects to the interested donors/sponsors, after evaluation. Issuance of the endorsement letter on completion of work is also D&SCC's responsibility. It maintains a detailed database of sponsored projects and, in coordination with the State and Provincial Governments, makes arrangements for inaugurations and visits of foreign delegations to the earthquake affected areas.

6) Budget/Expenditure and Attainment

a. Expenditures

Since the establishment of ERRA, the following amounts have been expended during the fiscal years 2005 to 2008.

Table 3.4.3 Budget of ERRA

Year	Item of Expenditure (Fund Base)	Cost (Rs. in Million)
2005-2006	Expenditure	36,023
	Total	36,023
2006-2007	World Bank	1,913
	ADB - Loan	943
	ADB - Grant	46
	IDB	3,104
	French (AFD)	1,953
		24,919
2007-2008	GOP PLD A/C	3,111
	GOP AA A/C	16,915
	World Bank	4,990
	ADB - G 0029	206
	ADB - G 0037	32
	ADB - Loan	971
	French (AFD)	2,777
	IDB	3,095
	Total	32,097

Source: ERRA

After given the status of permanent body in 2011, in the Federal budget 2011-2012, an amount of Rs. 10 Billion has been allocated to ERRA in the PSDP 2011-12.

b. Achievements in DRR/DRM

Being one of the crosscutting themes, the Disaster Risk Reduction (DRR) Program of ERRA aims at making earthquake-affected communities relatively safer from future hazard events in the area by developing their skills, response and institutional capacities. The important components of the program include preparing district hazard indication maps, mainstreaming disaster risk reduction, and enhancing response capacity of communities at district and union council levels. The main achievements in DRR/DRM by ERRA are as follows:

i) Activities for Mainstreaming DRR

The objective of mainstreaming DRR into rehabilitation and reconstruction is to protect development from future events like earthquakes, floods, landslides, avalanches, etc.

ERRA is essentially a development agency, implementing numerous spatially relevant activities in the earthquake-affected areas. The activities are not only focusing on pure recovery but to “build back better”, that is, to set new standards in the development of the affected areas and to include disaster risk reduction where appropriate. In this regard, the introduction of DRR into development and planning has to focus on the mainstreaming of the subject at the district level development planning process. This should help to ensure a sustainability of the project by investment at the right location at the right time.

ii) Preparation of Maps

ERRA’s Disaster Risk Management Program (DRMP) aims at providing decision support tools (e.g., hazard and risk maps) to government planning institutions, and skills development of community volunteers and government officials in basic disaster risk management and adoption of disaster risk reduction in development. These maps are the indispensable tools for multi-sectors to ensure risk-conscious development. These maps provide information regarding the most common and frequent hazards and exposures (built environment) in all the pilot districts.

The hazard maps prepared for DRR by ERRA are as follows.

Table 3.4.4 Hazard Maps Prepared for DRM by ERRA

Attainment	Objective Disaster	Targeted Areas
Preliminary Earthquake Affected Area Seismic Zoning Maps (2 sheets)	Earthquake (500 year return period and 2500 year return period)	Mansehra, Muzaffarabad, Islamabad, Abottabad, Haripur, Batagram, Kohistan (Districts)
Seismic Hazard Microzonation Maps (2 sheets)	Earthquake	Balakot Town Muzaffarabad City
Earthquake Affected Area General Fault Map	Earthquake	Mansehra, Muzaffarabad, Islamabad, Abottabad, Haripur, Batagram, Kohistan, Shangla, Swat (Districts)
Union Council Wise Damaged Houses Map	Earthquake	Abottabad District
No. of Houses Destroyed By Tehsil	Earthquake	Mansehra, Muzaffarabad, Ogai, Allai, Abottabad, Haripur, Batagram, Kohistan (Districts)
No. of Houses Retrofitable By Tehsil		
Status of Partner Organizations		
Rural Housing Reconstruction		
Preliminary Susceptibility Hazard Map	Debris Flow	Mansehra & Muzaffarabad (Districts)
	Snow Avalanche	Mansehra & Muzaffarabad (Districts)
Preliminary Locations Map	Possible Valley Blockage	Mansehra & Muzaffarabad (Districts)
Preliminary Slope Instability Map	Landslide	Balakot Town

Source: ERRA

iii) Activities of Community Based Disaster Risk Management (CBDRM)

The CBDRM component focuses on introducing a culture of safety through establishing a local-based response mechanism by involving government line departments and participation of the community as stakeholders. The CBDRM component of the program aims to:

- Improve disaster preparedness at the community level and in the relevant government departments as well as NGOs and other key stakeholders through distilling best practices and strengthening information dissemination;
- Strengthen community-based disaster risk reduction in a gendered approach. This will result in enhanced community participation through community sensitization, mobilization and organization; and
- As such, the program supports safe lives and livelihoods of local communities and contributes to the reduction of the negative impact of disasters in the area.

To attain these objectives, the DRM program has established community-based organizations, namely, the Union Council Disaster Management Committee (UCDMC) as a governing body, and the Union Council Emergency Response Team (UCERT) as a response force.

These local groups/ institutions are trained in respective fields of disaster risk management and response such as search and rescue, first aid, and fire fighting. The CBDRM course provides an opportunity for the participants to acquire essential skills and knowledge in community-based disaster risk management and also promotes a "culture of safety". In this connection, about 5,272 members of UCDMC from 303 union councils have been trained. Of these, 4,369 are male and 903 are female members. Similarly, the capacity of 13,954 members of UCERT representing 303 union councils has been built up to respond to natural catastrophes at the union level. These consist of 11,137 male and 2,817 female members. This indicates that the capacity of a total of 19,226 volunteers (male and female) in two program districts has been enhanced to effectively respond to emergency/ natural disasters in the future. The overall progress of UCDMC and UCERT stands at 100% in all the nine earthquake affected districts. This project has been completed on 31st May, 2011.

3.5 Pakistan Meteorological Department (PMD)

3.5.1 Introduction

The Pakistan Meteorological Department is both a scientific and a service department, and functions under the Ministry of Defense. It is responsible for providing meteorological services throughout Pakistan to a wide variety of interests and for numerous public activities and projects which require weather information. In its services to aviation, the department's responsibility goes to some extent beyond national boundaries in fulfillment of accepted international agreements and obligations which include, among other things, the collection and rebroadcast of meteorological data. Its missions are as follows:

- To provide meteorological expertise and professional services in support of national economic development, and for the safety and benefit of the community; and
- To provide information on meteorological and geophysical matters with the objective of traffic safety in air, on land and sea, mitigation of disasters due to weather and geophysical phenomena, agricultural development based on the climatic potential of the country, and prediction and modification of weather forecasts.

Apart from meteorology, the Department is also concerned with agrometeorology, hydrology, astronomy and astrophysics (including solar physics), seismology, geomagnetism, atmospheric electricity, and studies of the ionosphere and cosmic rays. PMD shoulders the responsibility to investigate the factors responsible for global warming and climate change, and their impact assessment and adaptation strategies in various sectors of human activities.[5]

At the time of its establishment in 1947, PMD inherited only 15 Meteorological Observatories from the Central Meteorological Organization then operating in the subcontinent. The Department, with its continuous efforts, has improved weather forecasting capabilities by

[5] Source: http://www.pakmet.com.pk/PMD/pmdinfo.html

expanding the network of meteorological observatories, developing methods of observation, and improving telecommunication facilities and forecasting techniques. The major achievements of the Department are the introduction of a modern flood forecasting system, earthquake and nuclear explosion detection system, radar, satellite, computer technology, flight safety consultancy, services in seismic design of dams, buildings and other development and disaster relief schemes. The Department has also played a vital role in research work and its scientists have made valuable contributions. More than 300 scientific papers have been written and published in both national and international scientific journals. A major emphasis in research has been laid on the field of artificial rain making, ground water detection, arid zone research, ozone measurements, solar energy, wind power potential, and oceanographic and space research. Many of the research organizations such as the Arid Zone Research Institute (AZRI), Space and Upper Atmospheric Research Corporation (SUPARCO), and Pakistan Atomic Energy Commission (PAEC) started their functioning with the initial assistance of the Pakistan Meteorological Department. Meteorological services are extended on a regular basis to the Civil Aviation Authority (CAA), Federal Flood Commission (FFC), Pakistan Agriculture Research Council (PARC), Ministry of Environment, and Ministry of Food and Agriculture. The Department processes the raw data and issues meteorological forecasts and warnings used by various user agencies.

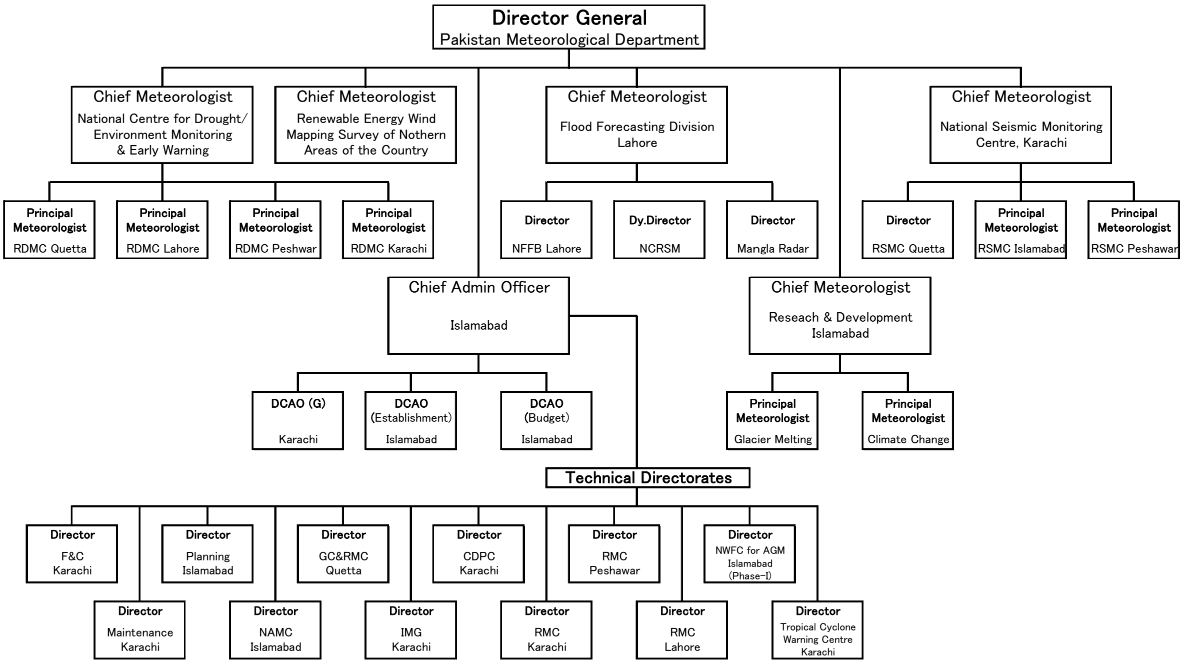
3.5.2 General Organization of PMD

In pursuance of its objectives, the Department has established a network of observing stations to generate meteorological, geophysical and phenological data; a telecommunication system for speedy dissemination of data; meteorological offices to analyze data for issuing forecasts and warnings for aviation, agriculture, shipping, sports, irrigation, etc.; and climatological and data processing units for scrutinizing, comparing and publishing data for appraisal of long-term weather trends and earthquakes.

1) Organization

The Pakistan Meteorological Department is headed by a Director General. Functionally, the Department is represented by six Chief Meteorologists/ Officers under the Director General where the locations are distributed in the whole of Pakistan based on the demarcation of the responsibilities and roles. Under the Chief Administration Officer, the function is divided into 12 technical directorates. Mainly, the core offices/ centres are located in Islamabad, Lahore and Karachi in terms of the originality and regionality based on targeted functions.

The existing organization chart is shown in Figure 3.5.1.



Source: PMD

Figure 3.5.1 Organization Chart of PMD

The recruitment for technical and administrative posts has been carried out in accordance with approved recruitment rules and prevailing government policies. Being the scientific department, the proportion of administrative posts is very low as compared with scientific staff. All administrative cadres carry only 5% of the total sanctioned strength.

The total manpower working in all grades and cadres (sanction base) as of 2010 is 2,676 of which 2,276 sanctioned posts are nonsupervisory positions irrespective of their technical/ administrative cadre. In the officers cadre (both technical/administrative), the sanctioned strength is 400 (see Appendix 3.5.1.).[6]

2) Budget

The PMD currently has more than 2,500 officers/staff with an annual budget of about Rs.400 million for general administration and operation in recent years and an average budget of about Rs.270 million for project and development budget in the most recent six years. The details are shown in the following table.

[6] Source: http://www.pakmet.com.pk/PMD/pmdinfo.html and Planning Directorate of PMD

Table 3.5.1 Budget Statement of PMD

Fiscal Year	Current Budget (mil. Rs.)	Development Budget (mil. Rs.)	Total Budget (mil. Rs.)
2000 - 2001	152.384	---	---
2001 - 2002	156.102	---	---
2002 - 2003	180.924	---	---
2003 - 2004	187.903	---	---
2004 - 2005	223.439	90.302	313.741
2005 - 2006	264.290	184.481	448.771
2006 - 2007	322.652	259.371	582.023
2007 - 2008	352.828	467.066	819.894
2008 - 2009	394.991	662.716	1057.707
2009 - 2010	417.880	88.003	505.883
2010 - 2011	451.327	165.136	616.463

Source: JICA Study Team

As shown in the table above, the budget for administration and operating cost is favorably increasing yearly.

3.5.3 Flood Forecasting Division, Lahore (FFD)

1) About FFD

The Flood Forecasting Division (FFD) of the Pakistan Meteorological Department, which is located in Lahore, is one of the most important sections of the PMD for the Multi-Hazard Early Warning System in Pakistan.

This centre was established in 1978 in collaboration with UNDP. It plays a pivotal role in the entire flood mitigation process. Hydrometeorological data from the various national and international sources is received in this office, which then processes the data to produce flood forecasts and warnings to be disseminated outwards to various national organizations.

The details of operations of this centre were originally backed by the following components:

a. Extra-Ordinary Rainfall and Discharge Measurement System

This system is operating under the administration of WAPDA. For this purpose, Rim stations have been set up by WAPDA in catchment areas of the Indus River at "Kachura", which measure the snow melting and inflow through the station. The instruments, which are installed at Bishma, Ogi, Phulra, Tarbela and Daggar, read the flow rate and take into account the rain element. All this information is collected by WAPDA and passed on to Flood Forecasting Division (FFD) through its 44 telemetry stations (See Figure A-53 in Appendix of Chapter 4.) The second type of discharge data of canals is collected by the Provincial Irrigation Department through its own network; utilizing police department facilities, data is passed on to FFD Lahore.

This is supplemented by the manually observed data from the Surface Water Hydrology Project of WAPDA. In addition to data measurement sites at the main rivers, the Provincial Irrigation Department also maintains a limited network of manually observed hydrological stations at barrages and important nullahs.

The cross border data is provided in accordance with the agreement between Pakistan and India (through the respective Commissioners for Indus water), with river flow data of the selected sites at the Jhelm, Chenab, Ravi and Sutlej Rivers on the basis of reimbursement of the actual cost of data measurement collection and transmission to Pakistan.

b. Quantitative Precipitation Measurement (QPM) Radars operated by FFD

A radar with the wavelength of 5.3 CM is installed at Sialkot. It detects the position of clouds and precipitation within the radius of 230 kilometers. This radar also covers 17 catchment areas of rivers. Two (2) Meteorological Doppler Radars are installed at Lahore and Mangla which provides quantitative and three-dimensional precipitation data in catchment areas of the main reservoirs.

c. Computer Centre

After the data has been received from the concerned quarters, it is fed into the computers which are installed at FFD Lahore. The data is processed every six hours and based on the analysis, the flood forecast report is produced daily for the concerned agencies.

2) Current Activities

As described in item (1) of this sub-section, the main objective of the establishment of the FFD was to create a flood forecasting system in the Indus River Basin (EWS for “River Flood”). However, the mandates of FFD have been expanded as follows:

a. General Responsibilities of FFD

The current responsibility of FFD is to maintain and update the flood forecasting service for the whole of Pakistan and the Flood Early Warning System for the Indus River System, covering the Indus River Basin downstream of Tarbela Dam, which includes the Indus, Jhelum, Chenab, Ravi, Sutlej and Kabul Rivers, and to research the flood flow analysis, as the initial objective of the Division.

In addition to and based on maintaining and upgrading of the Indus River Flood Forecasting System, the major actions required to be taken by FFD before, during and after the flood season are summarized below.

i) Flood Preparatory Measures

- Ensure serviceability of the meteorological equipment including QPM Radars in Lahore, Mangla and Sialkot, teleprinter network, FAX, APT and Internet;
- Ensure availability of the following items sufficient to last for the whole flood season: surface and upper air meteorological charts, isohyetal maps, various forecast forms, data tabulation sheets stationery, etc.;
- Update the calibration of the radar and flood forecasting models;
- Ensure availability of sufficient staff strength to maintain round-the-clock roster of duties for the meteorological and hydrological work;
- Liaison with Pakistan Telecommunication Company Limited (PTCL)'s Coordination officer to provide 24-hour maintenance services for the teleprinters, Internet and the office and residential telephones of all the flood related functionaries; and
- Conduct a familiarization training of the senior cadre and junior cadre government functionaries actively involved in the process of flood mitigation. Training must include such functionaries as the Relief Commissioner, Director General (Relief), Chief Engineer for Hydrology of WAPDA, Chief Engineer of FFC, Chief Engineer for Hydrology and Drainage of PIDA, Director for Flood of PIDA, and Director of F/G/S/PDMA for the senior course.

ii) Functions During Flood Season

Floods in Pakistan are mainly caused by the heavy monsoon rains during the summer monsoon period from July to September. Officially, the flood season covers the period from June 15 to October 15, every year.

The Chief Meteorologist of FFD is personally responsible for the issuance of timely and reliable flood forecasts/warnings to afford pre-flood initiation measures to reduce damage to life and property due to floods. He is required to remain in touch with his office even outside the working hours to maintain a close watch on the flood-generating weather situations. In case a situation for Category-II or Category-III floods develop (refer to Figure 4.1.9 in Chapter 4), he is to give advance verbal briefings to PDMA (former Relief Commissioner Punjab), Chairman of FFC, Director General of Engineers (Army), Director General of Meteorology, Chairman of NDMA, and Member (Water) of WAPDA. Such briefing should be over and above the written qualitative forecasts issued when the approaching monsoon low/depressions draw closer. In order to avoid undue public panic, flood forecasts to the public should be given only when the possibility of floods has positively developed. In such cases, suitably tailored flood forecasts must be provided to the press and the electronic media on time. The improved flood forecasting system will benefit the public through more reliable and more advanced flood information given to them. It is important that the necessary trust be placed in the forecasts issued by Chief Meteorologist of FFD and under no circumstances should the forecast issued by him be allowed to be amended without his consent. This is because the flood forecasting is the sole prerogative of the Chief Meteorologist and no one else in the present set-up has the necessary technical means or the knowhow to make any change.

As for the Indus River flooding, under a serious pre-flood situation, the Chief Meteorologist of FFD may invite the Director for Floods of the Irrigation Department, Chief Engineer (H & WM) of WAPDA, and a representative of PCIW to an emergency meeting in his office to discuss the necessary flood-related actions. Additionally, daily press briefings may be commenced in consultation with the PDMA (former Relief Commissioner Punjab).

In case of Category-Ill flood situations, a forecast of probable maximum flood (PMF) in respect of Mangla/Tarbela, should be issued in yes/no terms and a Member (Water) of WAPDA be personally informed of it by the Chief Meteorologist of FFD Lahore.

3) Summary of Flood Warning by FFD

As described in Item 2) Current Activities above, FFD has responsibility for the flood forecasting and early warning for the whole country and downstream of Tarbela Dam in the Indus River Basin, in particular, in collaboration with WAPDA and the Provincial Irrigation Department. The types and kinds of flood forecasts released by FFD are presented in Table 3.5.2 to Table 3.5.5. There are three kinds of flood forecasts; (i) Qualitative flood forecast, (ii) Quantitative flood forecast, and (iii) Early warning. The manners of forecasting and warning are summarized below.

a. Qualitative Forecast

Qualitative flood forecasts are meant to provide advance information about the approaching weather system, which may cause a significant flood wave in the Indus river system. Three qualitative flood forecasts called Blue, Yellow and Red alerts are issued to alert the concerned Government agencies, based on the location and situation of the monsoon low/depression or tropical cyclone. The three colour alerts are as follows:

- Blue Alert: In case of the possibility of flood within 24 to 72 hours depending upon the future movement of the monsoon low/depression at Rajhastan;
- Yellow Alert: In case the occurrence of flood may become imminent, the monsoon low/depression turning towards the catchment; and
- Red Alert: In case the low/depression arrives and starts to directly affect the catchment area and the heavy flood-producing rains start.

b. Quantitative Forecast

Based on actual precipitation amounts and measurements of flow discharge, the following forecasts and early warning messages have been issued by FFD in accordance with the flood situation. The flood forecast has seven parts issued in two bulletins (Bulletin A and Bulletin B).

Table 3.5.2 Quantitative Forecast and Warning by FFD

Title	Major Contents	Timing
Routine Daily Flood Forecast (RDFF) (for Basic Information) (for Flood Forecast)	Observed Indus River discharge, meteorological charts, data of meteorological radars	once a day (before mid-day)
	Bulletin-A (1) General situation of river flows, (2) Meteorological features, (3) Weather forecast expected next 24 hrs, (4) Amount of rainfall during the past 24 hrs in the country, (5) General weather outlook next 48 hrs. ***Bulletin-B (when necessary)*** (6) Weather/rain forecast in the upper and lower catchment areas of all the five rivers, (7) Quantitative forecast of river flows at 22 sites including rim stations.	

Source: PMD

In terms of intensity of flow discharge indicated in RDFF as explained above, in Pakistan, floods are classified into the following five levels:

Table 3.5.3 Classification of Floods Issued by FFD

S.No.	Classification	Detail
1	Low Flood	A flood situation when the river is flowing within its 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 flowing 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: JICA Study Team Original Source: SOP of FFD-PMD

The discharges in each flood classification of the Indus Rivers are shown in the attached Appendix 3.5.2 and the travel times between each focal point in the river system for forecasting are also shown in the attached Appendix 3.5.3 and 3.5.4, respectively.

c. Early Warning

Under the effect of an approaching weather system, the flood situation undergoes rapid fluctuations. This quite often necessitates the issuance of a special flood forecast pertaining to a specific site. This is, in fact, the most important forecast issued by FFD. Most commonly it is issued in respect of the rim station but can also be issued for any other site downstream. The common contents of an “Early Warning” issued by FFD are as follows:

Table 3.5.4 Early Warning Issued by FFD

Title of Forecast	Major Contents	Timing
Significant Flood Forecast	Name of River and location Flooding time, period and discharge quantity	Ad-hoc
Areal Flood Inundation Forecast	Name of villages likely to be inundated when the flood exceeds the exceptionally high flood level and spill over is expected to cause inundation of the area along the river channel.	Ad-hoc

Source: PMD

d. Miscellaneous Flood Forecast/ Information

Aside from the standard flood forecasting described above, the following information has been issued when necessary.

Table 3.5.5 Miscellaneous Flood Forecast/ Information Issued by FFD

Title of Forecast	Major Contents	Timing
Weather Information by FFD	For non-technical persons: (1) Prevailing meteorological situation (2) Rainfall recorded during the last 24 hrs (3) the weather and the flood forecast in descriptive form	Ad-hoc in monsoon Season
Flood Information for Media	Generally conducted in the evening at about 6 pm only on occasions when the flood situation is serious enough to call for such briefings to filter out unauthorized and incorrect flood information from reaching the public.	
Special Press Briefings by Minister of Water and Power/ Chairman of FFC or Chairman of NDMA	A brief mention of the prevailing weather system. Mention of a few heavy rainfall amounts and any reported damage A brief on the present and future flood situation Advice to the flood prone population Question / answer session Concluding Remarks	Chief Meteorologist of FFD may advise the Minister of W&P/ Chairman of FFC or NDMA to conduct special press briefings for the public in the context of flood mitigation.

Source: JICA Study Team

The kinds of flood forecasts and early warnings are collectively tabulated in Appendix 3.5.5.

3.5.4 Tropical Cyclone Warning Centre (TCWC) in Karachi

1) About TCWC

As one of its mandatory responsibilities, PMD prepares and issues tropical cyclone warnings in Pakistan. The Cyclone warnings are issued by the Marine Meteorology and Tropical Cyclone Warning Centre (TCWC) of PMD located in Karachi City.

2) Role of TCWC

The responsibilities and roles of TCWC are as follows:

a. Tracking of Tropical Cyclones

Tracking of tropical cyclones in Pakistan is done with conventional surface and upper air observations, model outputs and guidance, data/output of high resolution regional models, cyclone detection radar, meteorological satellites' output and data, and AWS installed at the coast.

b. Tropical Cyclone Watch, Alert and Warning with Other Related Alerts and Warnings

The TCMC also issues tropical cyclone watches, alerts and warnings.

c. GMDSS Safety Net Message for MetArea-IX

To comply with IMO/WMO's Global Maritime Distress Safety System (GMDSS) which is an internationally agreed-upon set of safety procedures, types of equipment, and communication protocols used to increase safety and make it easier to rescue distressed ships, boats and aircraft, TCWC prepares and issues the high seas forecasts/ marine bulletins for Metarea-IX daily at 0700 UTC for broadcast through the INMARSAT SAFETYNET SYSTEM. These bulletins are also issued at 1900 UTC if so required.

3) Summary of Watches, Alerts and Warnings Issued by TCMC

The types and kinds of watches, alerts and warnings issued by TCMC are summarized below.

a. Tropical Cyclone Watch

The "Tropical Cyclone Watch" is issued when a tropical cyclone forms or enters the Arabian Sea north of Lat. 10^{o}N. This is issued irrespective of the cyclone's threat to affect Pakistan's coastal areas. Its purpose is to keep the concerned authorities watchful.

b. Tropical Cyclone Alert

The "Tropical Cyclone Alert" is issued when there is likelihood that a tropical cyclone may affect Pakistan's coastal areas.

c. Tropical Cyclone Warning

The "Tropical Cyclone Warning" is issued when there it is very likely that a tropical cyclone may affect Pakistan's coast. These warnings are issued every three or six hours and/or whenever necessary.

Table 3.5.6 Tropical Cyclone Warnings by TCMC

Item	Description
Contents	a. The tropical cyclone (TC) location b. Intensity c. Maximum sustained winds d. Projected movement e. Expected landfall
Types of Warnings	(i) Warning bulletins for ships on the high seas (ii) Warning bulletins for ships plying the coastal waters (iii) Port warnings (iv) Fisheries warnings (v) Warnings for Government officials and functionaries (NDMA and PDMAs) (vi) Warnings for recipients who are registered with PMD (vii) Warnings for aviation (vii) Warnings for the general public through electronic and print media (viii) NGOs and Civic Community Bodies

Source: PMD

d. Dissemination of Tropical Cyclone Warnings

The modes of telecommunication used for the dissemination of tropical cyclone warnings in Pakistan are:

- Coastal Radio (ASK) covering the Arabian Sea north of 20oN, Gulf of Oman and the Persian Gulf;
- Telephones;
- Electronic and print media;
- Radio Pakistan;
- Pakistan television;
- Telex/Telefax;
- Website www.pakmet.com.pk; and
- E-mail.

The mode of telecommunication differs for different types of messages. When one type of communication channel fails, the alternate channel is used.

3.5.5 National Drought Monitoring Centre

The climate of Pakistan in its lower southern half belongs to the arid and hyper-arid category in the climate system. Some regions of the country in each season remain drastically dry and are always vulnerable to drought. As shown in historical records of disasters in the Pakistan, all the provinces of Pakistan have a history of facing major droughts in the past. The drought issue has widely affected a number of people in the whole of Pakistan as much as any other environmental hazard, such as floods, flash floods and earthquakes. Heretofore, the responses to drought for the distressed economic and social sectors, whenever such situations arose, had been taken on an emergency and on ad-hoc basis. Such reactions to drought crises often resulted in the implementation of hastily prepared assessments and response procedures that led to ineffective, poorly coordinated and untimely responses.

In this connection, PMD took an initiative to establish the National Drought/ Environment Monitoring and Early Warning Centre (NDMC-PMD) after the worst drought in Pakistan, which occurred during 1999-2001 as a permanent footing under the project for NDMC-PMD by locally funded budget. The main objective of the Centre and the project is to monitor the drought situation in the country and issue timely advisories. Its National Centre is in Islamabad while four Regional Drought Monitoring Centers (RDMC's-PMD) are in Lahore, Karachi, Peshawar and Quetta. These four RDMC's-PMD are responsible for data collection and analysis in their respective regions.

1) Current Activities

a. General Responsibilities of NDMC-PMD

The general responsibilities of NDMC-PMD are itemized below.

- Study on Probabilities of Occurrence of Rainfall/Weighted Area Rainfall Percentage Departure;
- Collection and calculation of Cumulative Precipitation Index (CPI), Percent of Normal Rainfall, Standard Precipitation Index (SPI), Moisture Index Classification, Reservoir Data (Tarbela, Mangla, Rawal, Simly, Khanpur dams), and River and Stream Flow Data;
- Calculating Return Periods (Frequency) of Drought at the regional/ provincial level by using a Regional Drought Identification Model (REDIM);
- Issuance of Fortnightly Drought Bulletins; and
- Relationship-building with NGOs related to utilization of drought advisories/ bulletins to end users.

b. Responsibilities of RDMCs-PMD

The responsibilities of the four RDMCs are as follows:

- Collection of meteorological data from the network stations in the respective regions;
- Coordination with the voluntary agencies operating the gauge stations and help/support in running the stations smoothly for them; and
- Storage and processing of the data and transmitting it to the National Centre in the desired format.

c. AWS Newly Installed by NDMC-PMD for Observation and Analysis of Drought

These centers (NDMC-PMD and RDMCs-PMD) serve as a hub for the collection, consolidation and analysis of drought-related data from all the possible sources in the country. In order to strengthen the network, 50 automatic weather stations (AWS) have been installed in different regions, particularly the drought-prone areas of the country. The data of 11 meteorological parameters (air temperature, humidity, wind speed, wind direction, dew point, sea level pressure, station level pressure, solar radiation, soil moisture at standard depths [5, 10, 20, 50, 100 cm] and snow level) are transmitted through satellite and GPRS technology to ensure timely access to the data from remote areas of the country as well. As of June 2010, meteorological data at 25 stations can be observed in real-time through the system as shown in the figure below.

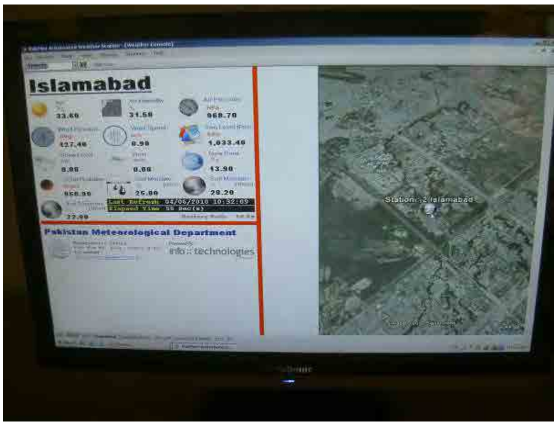


Figure 3.5.2 The Real-Time Observation System of AWS in NDMC

Moreover, NDMC-PMD has also installed 450 ordinary rain gauges at town level in four provinces. NDMC-PMD is also collecting information on the water level situation of small dams in Barani areas of the country.

d. Preparation and Issuance of Drought Advisory

NDMC-PMD will prepare and release drought advisories using the aforementioned collected and analyzed data, particularly SPI calculated from point rainfall data, water availability in reservoirs, soil moisture data where available, Reference Crop Evapotranspiration (ETo) data, river and stream flow data, and field reports.

Based on the analysis, advisories are issued. These advisories and information are disseminated through the NDMC-PMD official website www.ndmc.gov.pk and other electronic and print media. NDMC-MD issues fortnightly drought bulletins.

As a case example, a drought advisory in the past is shown below.

GOVERNMENT OF PAKISTAN
MINISTRY OF DEFENCE (DEFENCE DIVISION)
PAKISTAN METEOROLOGICAL DEPARTMENT
(Headquarters Office)
Post Box No. 1214, Sector H-8/2
ISLAMABAD

Islamabad November 23, 2004

Advisory No: 3

DROUGHT: UP DATE

This update is being issued in continuation of our previous drought advisories issued on 27th July and 30th August 2004.

Hydrological Drought:

Hydrological drought conditions in the country, specially availability of surface water in major reservoirs have further aggravated. Since the temperatures in the catchment areas have already reached freezing level, as such no significant improvement in these reservoirs is expected during the next three months, though normal winter precipitation is expected in the catchment areas, but most of this precipitation would be in the form of snowfall and its melting generally start in March.

Better water management by the concerned agencies during the last few months have helped to ease out the water crises to a manageable level but still we are likely to face about 45-50% water shortage for the Rabi crop. Initial estimates indicate normal winter rains which would help to mange this shortage to some extent (Inshallah) as the wheat crop is not a water demanding crop.

GOVERNMENT OF PAKISTAN
MINISTRY OF DEFENCE (DEFENCE DIVISION)
PAKISTAN METEOROLOGICAL DEPARTMENT
(Headquarters Office)
Post Box No. 1214, Sector H-8/2
ISLAMABAD

Islamabad November 23, 2004

Reservoirs Status

Tarbela Dam:

Today water level in Tarbela Dam is 113 feet below the maximum conservation level. Which means 1.655 million acre feet (m.a.f.) live water storage is available against the total dam live capacity of 9.30 m.a.f. Last year on 22nd November 2003, 3.724 m.a.f. was available in the dam, which means this year 56% less water is available in Tarbela even compared to last year.

Mangla Dam:

Today water level in Mangla Dam is 70 feet below the maximum conservation level. Which means that only 1.590 m.a.f. live water storage is available against the total dam live capacity of 4.82 m.a.f. Last year on 22 November 2003, 2.817 m.a.f. water was available in the dam, which means that this year 49% less water is available in Mangla compared to last year.

Source: NDMC-PMD

Figure 3.5.3 Drought Advisory Example

2) Current and Future

PMD is very interested in spreading climate watches and advisories to end users/ farmers at grassroots level. However, dissemination of useful information to end users has lagged behind, especially in rural areas of Pakistan where such information needs are the greatest. One of the major reasons is the lack of adequate and appropriate dissemination and communication procedures that can enhance the value of the agrometeorological information and climate watch services. In addition, it is essential for farmers as grassroots level to fully understand meanings of drought advisories as well as necessary actions to be taken based on the information. Therefore, awareness and education activities related to dissemination of drought and climate watch advisories are also significantly concerned. In this connection, disseminating information and educational materials is a key element of response to natural disasters. Electronic media greatly expedites the process of dissemination and enables prevention messages to reach an expanded audience.

In this regard, NDMC-PMD has conducted a project named “Networking National Institutions and End Users through Electronic Media” in collaboration with Sustainable Land Management Project (SLMP) under the NDMA and WFP. The objectives of this Networking Project by NDMC-PMD are described below.

Table 3.5.7 Networking National Institutions and End Users through Electronic Media by NDMC-PMD

Objectives	Integration between national institutes (NDMC-PMD, etc.) and media centers to ensure timely availability of climate information in user-friendly languages, including: 1. Dissemination of climate information tailored to users' needs and the recommended crop management strategies for farmers; and 2. Improvement of farmers' knowledge on climate information application.
Project Activities	• The Workshops on “role of media in Strengthening of Drought & Flood EWS” • Recruitment of 4 Research Associates at 4 Provinces capitals for EW in local languages • Allocation of 32-PRI line along with UAN number (111-638-638) allotted by PTA • Preparation of 18 CDHs and 26 Climate outlooks and Air on 16 radio stations
Budget	SLMP: 5.1 million PKR WFP: 11.9 million PKR
Term	12 months

Source: JICA Study Team

As succeeding activities, NDMC-PMD is preparing the product of education programs for EWS by the end of 2012 in this project.

3.5.6 National Weather Forecast Centre (NWFC) in Islamabad

1) About NWFC

The National Weather Forecasting Centre (NWFC) is also one of the important centres of PMD for general weather information, and the EWSs of hydoro-meteorological disasters. In particular, flood forecasting and warninigs for Lai Nullah Basin have been issued from NWFC. NWFC is located in Islamabad.

2) General Current Activities by NWFC

As a general weather forecasting institution, NWFC releases and updates the following weather information:

- Weather outlook for the whole of Pakistan;
- National weather forecast for the next 24 hrs;
- Cities forecast (Four Day Weather Outlook for different cities);
- National and Cities Weekly Weather Outlook; and
- Seasonal weather forecast.

In addition, NWFC together with FFD is responsible for general flash flood forecasting based on the daily weather forecast data. For this purpose, the Flood Forecasting, Warning and Monitoring Centre (FFW&MC) has been established in NWFC at Islamabad.

3) Flood Forecasting and Warning System for Lai Nullah Basin (Lai Nullah FFWS Project)

The Lai Nullah Basin has a catchment area of 234.8 km^2, extending to the twin cities of Islamabad and Rawalpindi. On 23 July 2001, an unprecedented rainfall occurred over Islamabad-Rawalpindi resulting in 620 mm of rain in a span of about 10 hours. The resulting flood had caused the worst damage in the basin, including death of 74 people and the complete or partial destruction of about 3,000 houses.

In this connection, PMD has established a flash flood EWS Lai Nullah Basin (Lai Nullah FFWS Project) under a Japan Grant Aid Project. This Lai Nullah FFWS Project includes the installation of the following facilities and equipment:

- Master Control Center: 1
- Other Control Center: 3
- Relay Station: 1
- Rainfall G Station: 4
- Rainfall G Station: 2 + Building
- Water L G Station: 2 + Building
- Warning Post: 1 (Siren) + 9 (Siren + Building)
- Patrol Car: 3 units

The Lai Nullah FFWS Project has involved not only PMD but also other related agencies to appropriately operate the FFWS. The District Government of Rawalpindi has prepared the "Flood Relief Plan" for smooth operation and recognition of the system every year. According to the plan, flood warning posts are maintained by TMA. In addition, the list of locations, functions and maintenance offices for the FFWS system is shown in the following table.

Table 3.5.8 System Summary of Lai Nullah FFWS

Station	Function	Organization in Charge
1. Master Control Station		
1.1 PMD, Islamabad	• Flood forecasting; data collection • Data processing • Dissemination of flood information to related agencies (Data transmission subsystem	PMD
2. Rainfall Gauging Station		
2.1 PMD, Islamabad	Automatic rainfall data observation (Telemetry subsystem)	PMD
2.2 Saidpur		
2.3 Gorla		
2.4 Bokla		
2.5 RAMC		
2.6 Cgajlala		
3. Water Level Gauging Station		
3.1 Kattarian Bridge	Automatic water level data observation (Telemetry subsystem)	PMD
3.2 Gawal Mandi Bridge		
4. Repeater Station		
4.1 RAMC Telemetry Repeater	• Repeater function for telemetry	PMD
4.2 RAMC Wireless LAN Repeater	• Repeater function for wireless LAN	
5. Monitoring Station		
5.1 FFC	Flood information monitoring (Data transmission subsystem)	FFC
5.2 WASA of RDA	Flood information monitoring (Data transmission subsystem)	WASA
6. Executive Warning Station		
6.1 TMA Rawalpindi: -- Warning Control & Supervision -- Flood Information Monitoring	Control and supervision of warning system Flood information monitoring (Data transmission subsystem)	CDG/TMA
7. Flood Warning Post		
7.1 WP-1: TMA Rawalpindi	Flood evacuation warning by motor siren and loudspeaker	TMA
7.2 WP-2: Christian Colony		
7.3 WP-3: Water Treatment Facility adjacent to MC		
7.4 WP-4: Ratta Amral Bridge		
7.5 WP-5: Gunj Mandi Bridge		
7.6 WP-6: Pir Wadhai Bridge		
7.7 WP-7: Fire Station Pir Wadhai		
7.8 Sector IV-B, Khayaban Park		
7.9 WP-9: Gawal Mandi Children's Park		
7.10 WP-10: Gpvernment Middle School, Dhoke		

* Two (2) units of 4WD vehicles are required for emergency and operation/maintenance.

Source: JICA Study Team

PMD has established a centre, namely, the Flood Forecasting and Warning Master Control Centre (FFWMC), to manage and control this Lai Nullah FFWS Project. The FFWMC belongs to NWFC as part of its role in the flash flood EWS.

3.5.7 National Seismic Monitoring & Tsunami Early Warning Centre in Karachi (NTWC)

1) NSM & TEWS and Tsunami Early Warning

Tsunamis are infrequent high impact hazards. These events can cause a considerable number of fatalities, inflict major damage, and cause significant economic loss to large sections of coastlines. Pakistan (Sindh-Makran coast) was also hit by a tsunami in 1945 due to a major earthquake in a subduction zone in the Indian Ocean (Makran subduction zone). Some recent studies have also revealed that the coastal areas from Runn of Kutch to Pasni (along Sindh – Makran coast) are under threat of a future tsunami that may be generated owing to some big earthquake in the Arabian Sea.

In the aftermath of the catastrophic trans-Indian Ocean Tsunami of 26 December, 2004 and the unprecedented Kashmir Earthquake of 8 October, 2005 and keeping in view the potential risk of a tsunami along the Pakistan coast, Pakistan Meteorological Department (PMD) has established a state-of-the art Seismic Monitoring and Tsunami Early Warning Centre (NSM & TEWS also known as the National Tsunami Warning Centre: NTWC) at the PMD Complex, Karachi (with a backup centre at Islamabad) with support by the Government of Pakistan and UNESCO / IOC.

2) Protocols in SOP by NTWC

The National Tsunami Warning Centre (NTWC) has been operational since 28 November, 2008 on an around-the-clock basis. The mission of the NTWC is to provide timely and easily understandable tsunami warnings when a major earthquake occurs under sea at a shallow depth. In order to achieve the objectives NTWC uses National and Global Seismographic network data on real-time basis to monitor seismic activity in order to locate potential tsunamigenic earthquakes. NTWC also receives tsunami advisories issued by the International Tsunami Warning Centres like the Pacific Tsunami Warning Centre (PTWC) and Japan Meteorological Agency (JMA) for the Indian Ocean. Upon receiving all the necessary data/information, the centre evaluates the threat to the coastal areas of Pakistan and issues Tsunami Bulletins to Emergency Response Authorities and Media. NTWC also receives sea level data through the IOC website to verify the generation and severity of the potential tsunami. This information is also disseminated in subsequent bulletins according to the procedure laid down in the SOPs.

Multiple communication channels have been established for dissemination of the bulletins. Two SMS terminals for mobile phone dissemination and three FAX terminals (two automated and one manual) have been reserved for this purpose. Routine tests and exercises are carried out to test the Standard Operating Procedure.

The NTWC keeps watch on the Indian Ocean and Pacific Ocean in general and Arabian Sea in particular. The Arabian Sea floor is comprised of four tectonic plates named the Eurasian Plate, Arabian Plate, Indian Plate and African Plate. In the North Arabian Sea, near the Makran coast, the Arabian Sea Plate is subducting underneath the Eurasian plate, resulting in a subduction zone commonly known as the Makran Subduction Zone. Subduction zones in the oceans are mainly responsible for destructive tsunami generation. Separate Standard Operating procedures have been prepared for each oceanic area.

The summaries of the tsunami warning system with the conditions according to the SOP are shown in Table 3.5.9, Table 3.5.10 and Figure 3.5.4.

Table 3.5.9 Magnitude and Tsunami Potential

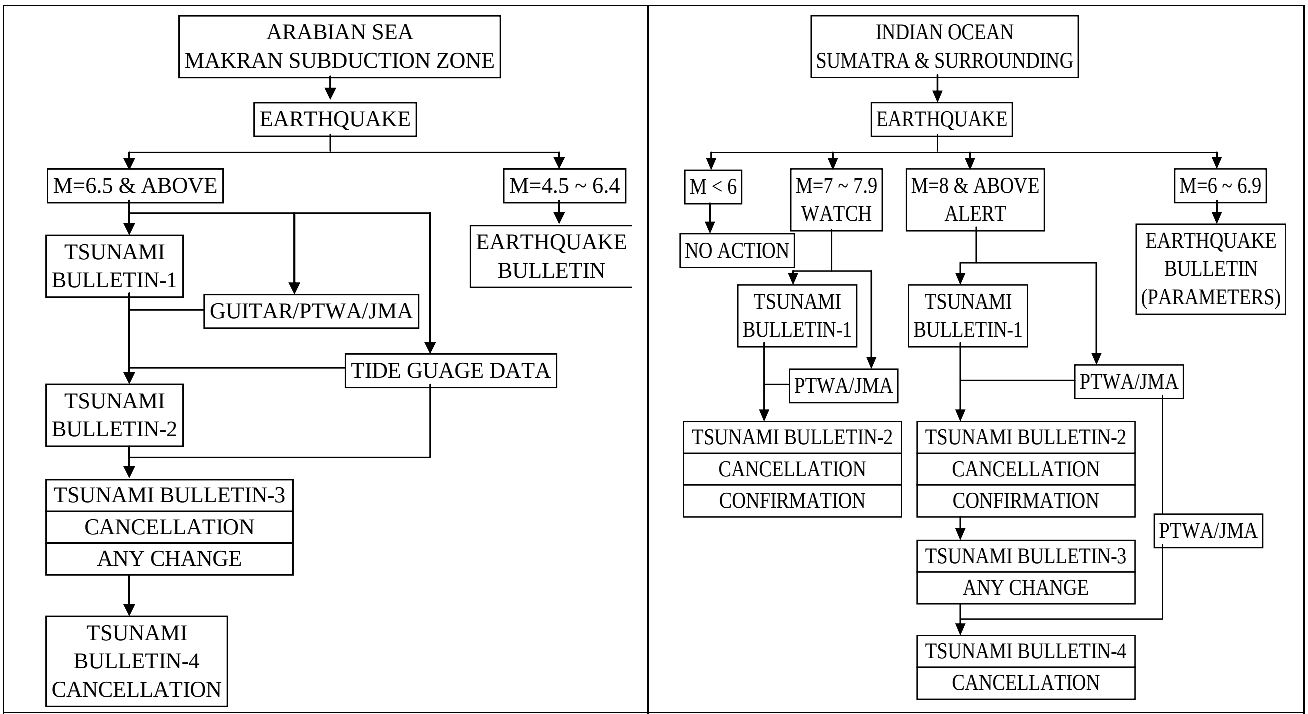
Location	Magnitude	Tsunami potential	Action
Under the Arabian Sea	Less than 4.5	A small possibility of local destructive tsunami	No Action
	4.5 to 6.4		Earthquake bulletins
	6.5 to 7.0		Tsunami bulletins
	7.1 to 7.5	Local destructive tsunami	
	7.6 to 7.9	Regional/ wide spread destructive tsunami	
	8.0 and above	Widespread destructive tsunami	
Indian Ocean, Sumatra and Surroundings	Less than 6.0	A small possibility of local/regional tsunami	No Action
	6.0 to 6.9		Earthquake bulletins
	7.0 to 7.9		Tsunami bulletins
	8.0 and above	Widespread tsunami	

Source: Tsunami warning SOP, PMD

Table 3.5.10 Contents of Tsunami Bulletins

Bulletin No.	Contents	Target
1	Earthquake parameters, tsunami **evaluation based on historical earthquake and tsunami data**	Arabian Sea
2	Earthquake parameters, **evaluation regarding potential and destructive effects** of tsunami, **estimated arrival times/wave heights** based on simulation and information from PTWC and JMA, tide gauge data	
3	Earthquake parameters, tide gauge data, **Cancellation** in case of no tsunami generation or **Any Change of Information**	
4	Earthquake parameters, **Cancellation** in case tsunami generation is confirmed.	
1	Tsunami **Watch** and Earthquake parameters, tsunami evaluation based on historical earthquake and tsunami data	In case < M8 Indian Ocean (Sumatra and surroundings)
2	**Confirmation** (Observation of Tsunami Activity)	
	Cancellation (Observation of Tsunami Activity)	
1	**Tsunami Alert** and Earthquake parameters and tsunami	In case > M8 Indian Ocean (Sumatra and surroundings)
2	Tsunami **estimated arrival times/wave heights** based on simulation and information from PTWC and JMA, tide gauge data with Earthquake parameters	
3	Earthquake parameters, tide gauge data, **Cancellation** in case of no tsunami generation or **Any Change of Information**	
4	Earthquake parameters, **Cancellation** in case tsunami generation is confirmed.	

Source: Tsunami warning SOP, PMD



For Arabian Sea	For Indian Ocean (Sumatra and Surroundings)

Source: PMD

Figure 3.5.4 Flowchart of Tsunami Warning SOP

3.5.8 Summary of the Role and Functions of PMD in Multi-Hazard EWS

As described above, most of the early warning messages regarding water-related hazards are issued by PMD. The coverage for the warning and alert issuances against each disaster are summarized below.

Table 3.5.11 Summary of the Role and Functions of PMD in Multi-Hazard EWS

Disaster	Forecasting Agency	Remarks
(Indus River Basin) Flood	FFD-PMD *1	Issued in accordance with SOP*2 prepared for Indus, Jhelum, Chenab, Ravi, Sutlej and Kabul.
Flash Flood	FFD-PMD NWFC-PMD*3	Issued in accordance with SOP prepared for Bein, Aik, Basantar, Deg, Palkhu by FFD. Issued in accordance with Flood Relief Plan Lai Nullah by FFWMC-NWFC*3 * Except for nullahs mentioned above, PMD issues General Flash Flood Warning together with weather information from NWFC.
Landslide	None	EWS System has not been prepared, but NDMA, GSP and ERRA have partly prepared Hazard Maps for vulnerable areas. PMD should establish landslide EWS due to the accumulated rainfall amount in cooperation with related agencies (such as GSP and NDMA).
Cyclone	TCWC-PMD *4 NWFC-PMD	Issued by SOP (Draft).
Storm Surge	TCWC-PMD	Storm Surge Disaster shall be forecast in Cyclone EWS.
Tsunami	NSMC-PMD*5	Issued by SOP.
Drought	NDMC-PMD*6	Forecasting System has been established. (As fortnightly advisory base)

Note*1: FFD: Flood Forecasting Division of PMD at Lahore
*2: Standard Operating Procedure
*3: NWFC: National Weather Forecasting Centre at Islamabad
FFW&MC: Flood Forecasting, Warning & Monitoring Centre of PMD for General Flash Flood at Islamabad
FFWMC: Flood Forecasting & Warning Master Control Centre for Lai Nullah at Islamabad
*4: TCWC: Tropical Cyclone Warning Centre of PMD at Karachi
*5: NSMC: National Seismic Monitoring Centre of PMD at Karachi
*6: NDMC: National Drought Monitoring Centre at Islamabad

(Source: JICA Study Team in association with PMD; Presentation Materials by Mr. Azmat Hayat Khan, Director of NDMC-PMD for National Drought Monitoring Center; Concept Proposal Paper on Networking National Institutions and End Users through Electronic Media for Drought Monitoring Center; SOP by FFD-PMD)

3.6 Federal Flood Commission (FFC)

3.6.1 Introduction

After the creation of Pakistan, a Central Engineering Authority was constituted under a Chief Engineering Adviser to deal with the issues of water, power and allied engineering matters at the national level. It was re-designated as the Chief Engineering Advisor’s Office after the establishment of the Water and Power Development Authority (WAPDA) in 1959.

Up to the end of 1976, the Provincial Governments were responsible for the planning and execution of flood protection works. The disastrous floods of 1973 and 1976 resulted in heavy losses indicating that existing flood protection facilities and planning were inadequate to provide effective protective measures for the country. Heavy losses sustained by the economy were discussed at an Inter-Provincial Conference in 1977 and, subsequently in January 1977, it was decided to establish the Federal Flood Commission (FFC) for the purpose of integrated flood management on a country-wide basis.

The establishment of FFC greatly helped in integrating the planning measures at the national level and providing financial resources for the flood projects. Federal funding through FFC became a vehicle for quick execution of flood management projects. The Office of the Chief Engineering Adviser (CEA) acts as Secretariat for the Commission. The Provincial Governments undertake the implementation of the National Flood Protection Plans (NFPPs). The Federal Government, however, provides the resources for meeting the capital costs of projects under NFPPs. Though Federal funding has provided impetus for flood management planning in Pakistan, the available financial resources have been gradually declining in terms of actual funding as well as in real terms due to inflation.

FFC has played a unique role in remodeling the flood risk management of the country on modern lines with the help of foreign loans, and especially in establishment of a modern flood forecasting warning system.

FFC is supporting WAPDA and PMD in establishing a modern flood forecasting and warning system in the country. Three state of the art S-Band Doppler weather radars at Lahor, Sialkot & Mangla have been provided to PMD, while a new hydrometric data measurement and transmission system has also been established for WAPDA.

Also, FFC has prepared flood inundation maps to facilitate the identification of the villages likely to be inundated for a specific level of flood to be determined on the basis of running the hydrodynamic model. Such information will enable issuance of early flood warnings to potential inundation areas.

FFC provides the necessary support to the provinces in the flood fighting process and both the financial and technical support to the provinces in executing the flood protection works.

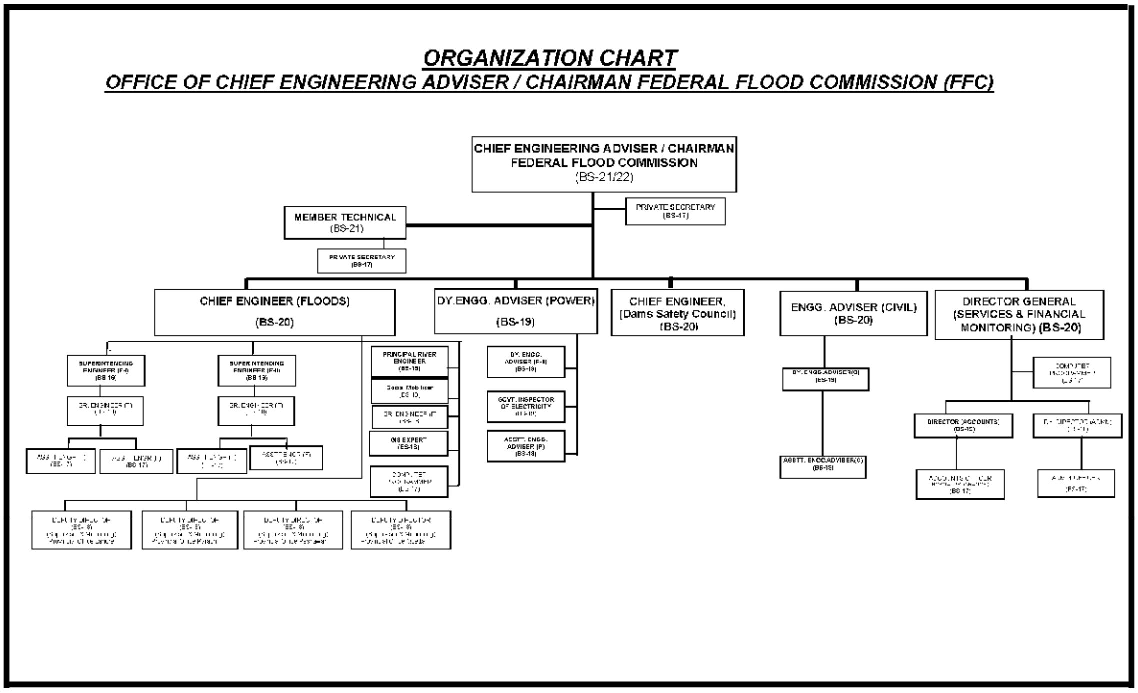
For coordinating the flood management and forecasting activities with specific reference to avoid flood peak synchronization during the flood season, FFC convenes the Coordination Committee at the federal level. The committee is composed of i) Chief Engineering Advisor/Chairman FFC, ii) Member (Water), WAPDA, iii) Director General - PMD, iv) Pak Commissioner for Indus Waters, v) Chairman IRSA and vi) Rep. of Director General Engineers, Army.

3.6.2 Organization of FFC and the Roles/Responsibilities of Each Cell

The major functions under the charter of duties for FFC as given in paragraph 2 of Resolution dated 04-01-1977 are listed below and original Resolution is attached in Appendix 3.6.1 herewith:

- Preparation of National Flood Protection Plans (NFPPs);
- Approval of flood control schemes prepared by Provincial Governments and concerned federal agencies;
- Review of flood damages to public sector infrastructure and review of plans for restoration and reconstruction works;
- Measures for improvements in the Flood Forecasting and Warning System;
- Standardization of designs and specifications for flood protection works;
- Evaluation and monitoring relating to progress of implementation of NFPPs;
- Preparation of a research program for flood control and protection; and
- Recommendations regarding principles of regulation of reservoirs for flood control.

The Office of CEA/ FFC is an attached department of the Ministry of Water and Power. The organization of FFC is shown in Figure 3.6.1.



Source: FFC

Figure 3.6.1 Organization of FFC

As shown in Figure 3.6.1, FFC has the following sections:

1) Flood Cell

The Flood Cell is the main sector for flood protection (structural and non-structural) and damage mitigation activities in FFC:

- Implement the functions of FFC;
- Run Flood Communication Cell during flood season for effective dissemination of river flows and weather related information to the President's and Prime Minister's Secretariat, Ministry of Water and Power, and other important high ranking officials;
- Implement structural and non-structural flood control measures under different programs as envisaged in NFPP; and
- Monitor the implementation of flood protection works under different programs as envisaged in NFPP.

In March 2010, taking advantage of the JICA training and dialogue program on the "Local Emergency Operation Plan with Flood Hazard Maps" and no cost IFAS facility, a Flash Flood Cell was established in the Flood Cell (Section) to work on a viable plan for emergency operation using flood hazard maps and to provide technical input.

2) Engineering Advisory Cell

The functions of the Engineering Advisory Cell are as follows:

- Scrutiny of feasibility reports, PC-Is, Conceptual/Inception/Interim Reports, etc., prepared by WAPDA, Provincial Governments and other agencies;
- Watch daily operations of major reservoirs (Tarbela, Mangla and Chashma) and inform senior offices accordingly; and
- Exchange of technical data and general liaison with international organizations, namely: the International Commission on Irrigation and Drainage (ICID), IIMI, FAO, WMO, UNEP, UNDP, UNESCO, etc.

3) Other Core Sections (Cells) of FFC

The other major Sections/Cells of CEA/FFC and their responsibilities are as follows.

Table 3.6.1 Other Major Cells of FFC

Section/Cell	Functions
Dam Safety Council	Carry out periodic inspections of dams through D.S.O. WAPDA and advise WAPDA regarding repairs and maintenance of dams and reservoirs;
	Review the plans of new dams and monitor the implementation of such projects;
	Review the plans and specifications for expansions, modifications, major repairs, revival or otherwise of dams/reservoirs;
	Supply technical data and general liaison with the World Bank International Commission on Large Dams (ICOLD) and UN Organizations; and
	Keep close liaison with the International Commission on Large Dams (ICOLD).
Power Cell	Scrutinize power projects prepared by WAPDA and KESC and render expert advice to the Ministry;
	Monitor and evaluate performance of WAPDA and KESC and suggest improvements in operational procedures;
	Coordinate hydroelectric development activities between GTZ, federal and provincial governments; and
	Exchange of technical data and general liaison with international and national bodies on power engineering, namely: the World Engineering Council (WEC), Energy Working Groups of Asia Pacific Economic Cooperation (APEC), etc.
PANCID/ PANCOLD Secretariat	Exchange of technical data and general liaison with international organizations, namely: the International Commission on Large Dams (ICOLD) and International Commission on Irrigation and Drainage (ICID);
	Arrange seminars, symposiums and workshops in collaboration with ICOLD/ICID; and
	Act as the Secretariat of the Pakistan National Committee on ICOLD and ICID.
Management and Administration Cell	Administrative coordination of trainings (both local as well as foreign);
	General services management;
	Annual budgeting of office and development projects, utilization, control and audit; and
	Maintenance of project accounts, processing of consultancy services bills, internal inspection of accounts and financial monitoring of development projects.

Source: JICA Study Team

3.6.3 Manpower and Budget

1) Manpower

The total manpower working in all grades and cadres (sanction base) was 153 as of 2011, of which 36 are sanctioned posts as officer cadre. In the staff cadre, the sanctioned strength is 117.

2) Budget

The average annual fiscal budget/expenditure of FFC in recent years is estimated at approximately Rs.40 million. These fiscal budgets have been disbursed for operating and administration costs for FFC and its offices. On the other hand, FFC has also managed project budgets for the fiscal flood control program. These budgets have mainly been disbursed to each Provincial Implementation Agency for flood control projects, such as PID or equivalent government agencies. The details are shown in the table below.

Table 3.6.2 Budget and Expenditure of FFC

Fiscal Year	Budget (Rs. in million)		Expenditure (Rs. in million)	
	Main CEA/CFFC	Normal/Emergent Flood Program	Main CEA/CFFC	Normal/Emergent Flood Program
2000 - 2001	9.994	200.000	10.241	50.000
2001 - 2002	10.434	58.025	12.006	57.781
2002 - 2003	13.491	45.174	13.369	42.822
2003 - 2004	14.596	350.000	13.655	384.744
2004 - 2005	17.000	500.000	22.124	497.500
2005 - 2006	27.710	797.200	30.254	753.285
2006 - 2007	34.698	947.219	33.277	947.219
2007 - 2008	38.000	1,381.840	37.340	884.613
2008 - 2009	42.050	859.971	37.846	815.317
2009 - 2010	43.731	575.110	39.303	78.358
2010 - 2011	47.228	735.798	48.585	276.760
Total ('00-'11)	298.932	6,450.337	298.000	4,788.399
Average ('00-'11)	27.176	586.394	27.091	435.309

Source: JICA Study Team

3.6.4 NFPPs initiated by FFC (Activities of FFC in the Present and Past Days)

As described in the previous sub-section 3.6.2, FFC has formulated flood management planning and practices in Pakistan through the preparation and approval of implementing NFPPs with various related activities, such as standardization, review, evaluation and recommendation of various flood mitigation activities. The ultimate objectives of FFC's activities are the following:

- Reducing flood losses in an economically sound manner;
- Prioritizing of areas of greater economic hazards;
- Protecting the cities and vital infrastructural installations;
- Exploring the possible use of existing flood control facilities;
- Promoting appropriate land use in flood hazard areas;
- Minimizing adverse effects on the national ecosystem and environment; and
- Creating flood awareness and adaptability in the riverine areas.

In this connection, FFC has since its establishment executed three 10-year National Flood Protection Plans covering the periods from 1978-1987 (NFPP-I), 1988-1997 (NFPP-II), and 1998-2007 (NFPP-III). At the moment FFC is implementing NFPP-IV(2008-2017) with Normal Annual Development Program/Emergent Flood Program being the only activity under it so far. In this context (refer to Table 3.6.2), from 2008-2011, all the funds mentioned have been provided under Normal ADP.

Brief details of projects executed/ completed under NFPP-I, NFPP-II and NFPP-III are presented hereunder:

1) National Flood Protection Plan-I (NFPP-I), 1978-87

Under NFPP-I, the major emphasis was on the implementation of structural flood protection measures. However, the need for modernization of flood forecasting and flood warning was recognized and these tasks were assigned to PMD and improvement of the existing telemetric network was undertaken by WAPDA.

Table 3.6.3 Outline of NFPP-I

Item	Description
Implementation Process	Normal Annual Development Program
Cost actually spent (Need Based)	Rs.1,630 million
No. of flood protection schemes completed (in Punjab, Sindh, Balochistan, KP, AJK, FATA, and GB)	350
Funding agency	100% by GOP

Source: JICA Study Team

2) National Flood Protection Plan-II (NFPP-II), 1988-97

Programs executed under NFPP-II are as follows.

Table 3.6.4 Outline of NFPP-II

Item	Description
Normal Annual Development Program	
Cost (Need Based)	Rs.2,541 million
No. of schemes completed	170
Funding agency	100% by GOP
Flood Protection Sector Project-I (FPSP-I)	
Approved cost	Rs.4,860 million
No. of schemes completed	257
Foreign funding (ADB)	US$131.07 million 80% by ADB, 20% by GOP
Prime Minister's River Management Program 1994-1996	
Cost	Rs.613.384 million
No. of schemes (in Sindh and Punjab)	10
Funding agency	100% by GOP
* Non-structural Measures undertaken in NFPP-II	
Procurement and installation of 1st phase of Meteoroburst Telecommunication System including one Master Station and 24 remote site stations.	
Installation of 10-CM Quantitative Precipitation Measurement devices (QPM) and Meteorological Radar for the Flood Forecasting Division (FFD) at PMD, Lahore	
Pre-feasibilities studies for four barrages towards increasing their design discharge capacity with a view to ensuring increased flood carriage owing to the experience of the 1992 floods.	
Preparation of Flood Plan Maps of the Indus River (3-reaches).	
Establishment of the National Flood Forecasting Bureau (NFFB) now FFD, at PMD premises in Lahore.	
Other Related Programs/Projec	
i) 1988 - Flood Damages Restoration Project -1988(FDRP) funded by IDA/World Bank, ADB.	
ii) 1992-94: Flood Damages Restoration Project-1992-94(FDRP) funded by IDA/World Bank, ADB, Kfw of Germany.	
iii) Flood Management of Kaha Hill Torrent/Study/Project – JICA.	
iv) Flood Management of Mithawan Hill Torrents (JICA/Swedish Grant).	
v) Indus River Regime Study – By Mott Macdonalds of UK.	

Source: JICA Study Team

3) National Flood Protection Plan – III (NFPP-III), 1998-2007

Programs executed under NFPP-III are as follows.

Table 3.6.5 Outline of NFPP-III

Item	Description
Normal/Emergent Annual Development Program	
Cost (Need Based)	Rs.3,415 million
No. of flood protection schemes (In four provinces, AJK, FATA (KP), ICT and NA (GB))	362
Funding agency	100% by GOP
Second Flood Protection Sector Project (FPSP-II)	
Cost actually spent	Rs.4,165 million
No. of schemes completed	101
Flood Forecasting and Warning System	Rs.432.123 million
Funding agency	80% by ADB, 20% by GOP
Flood Forecasting & Warning System for Lai Nullah Basin in Islamabad–Rawalpindi	
Approved Cost	Rs.360 million
Cost actually spent	Rs.348 million
Funding (Japanese Grant-in-Aid)	Rs.337 million
Funding (GOP share)	Rs.11 million
Facilities provided in the project:	
2 telemetry rainfall gauging stations at Golra, Islamabad and Bokra, Islamabad	
2 water level gauging stations at Kattarian Bridge, Rawalpindi and Gawal Mandi Bridge, Rawalpindi	
Master control station in PMD, Islamabad	
2 monitoring stations at FFC and TMA/Rescue-1122-Rawalpindi	
Executive Warning Control room in Rawalpindi Fire Brigade, and	
9 warning posts at various locations	
* Other non-structural measures undertaken in NFPP-III:	
Procurement and installation of 24 HF-Radio sets, also covering Kabul River and Swat River	
Procurement and installation of 20 additional remote stations under existing Meteoroburst Telecommunication System (Phase-II)	
Upgrading of Lahore 10-CM Quantitative Precipitation Measurement Meteorological Radar	
Upgrading of 5.36-CM Sialkot Meteorological Radar to 10-CM Quantitative Precipitation Measurement Weather Radar	
Procurement and installation of new 10-CM Quantitative Precipitation Measurement Meteorological Radar at Mangla, Jhelum	
Development of initial/first version of Computer Based EWS through NESPAK, PMD and Delft Hydraulics, Flood Early Warning System (FEWS)	
Expansion of Flood Plain Mapping activity covering remaining reaches of River Indus, along with rivers Jhelum, Chenab, Ravi, Sutlej, etc.	
Bathymetric Survey and flow management in the Indus River and its major tributaries (i.e., Sutlej, Ravi, Chenab and Jhelum) for improvements in the discharge rating curves and to collect data for FEWS Model and Flood Plain Mapping Activity	
Other Related Programs/Project	
i) Study to ascertain minimum quantum of water escapages downstream Kotri Barrage to check sea water intrusion-GoP funded.	
ii) Study to ascertain minimum quantum of water escapages downstream Kotri Barrage to address environmental concerns of flora, fauna, mangrovers -GoP funded.	
iii) Study on Environmental concerns of all the four provinces with reference to minimum environmental flows in Indus River System upstream Kotri Barrage – GoP funded.	
iv) Comprehensive Flood Management & Environmental Improvement Plan for Lai Nullah Basin in Islamabad-Rawalpindi-JICA/GoJapan Grant Aid Project	

Source: JICA Study Team

4) National Flood Protection Plan – IV (NFPP-IV), 2008-2017--At Initial Stage

Keeping in view the level of investment made under NFPP I, II and III and the spending capacity of the executing agencies, it was decided to propose Rs.30,000 million for the 10-Year Comprehensive and Integrated Flood Management Plan (i.e., NFPP-IV). In formulating the financial strategy for the next 10-year plan, the following main components have been considered:

- Leftover works (including leftover works under FPSP-II), for which Pre-Feasibility Studies have already been carried out;
- Implementation of physical works, as indicated by the Provinces and Federal line agencies under Priority-I (works are proposed to be implemented under FPSP-III and FPSP-IV);
- Implementation of need-based schemes under the Normal Annual Development Program/ Emergent Flood Protection Plan on a yearly basis;
- Implementation of Flood Forecasting and Warning System Improvements (under FPSP-III and FPSP-IV); and
- Institutional strengthening of the Federal Flood Commission and all related departments.

The proposed plan costing Rs.30 billion has been prepared in consultation with concerned stakeholders and envisages the construction of flood protection works (spurs, embankments, retaining walls, dykes, etc.) in all the four provinces and federal line agencies, and additionally implementation of flood forecasting and warning system improvements with emphasis on flash flood monitoring. However, these component has not been commenced except for the normal/ emergency flood programs and related flood protection projects. As of February 2012, FFC is planning and preparing revised NFPP-IV and will have completed the plan by the end of 2012. Over all investment originally proposed under the NFPP-IV with completed related projects are broken down as follows.

Table 3.6.6 Outline of NFPP-IV

Sr. No	Province/Agency	Estimated Cost (Rs. in Billion)
I	Punjab	11.250
	Sindh	7.750
	KP (former NWFP)	2.750
	Balochistan	2.000
	FATA	0.750
	Northern Areas	0.250
	AJK	0.250
	Subtotal-I	25.000
II	WAPDA	0.586076
	PMD	2.200
	Subtotal-II	2.786076
III	FFC, Consultancy, Monitoring & Evaluation, Institutional Strengthening, Capacity Building, Training etc	2.213924
	Subtotal-III	2.213924
Grand Total: I+II+III		*30.000*
Other Related Programs/Project (Completed)		
i) Study on Strengthening the Regulatory Capacity of Dams Safety Council of Ministry of Water & Power-ADB funded.		
ii) Technical Cooperation Project on Lai Nullah Flood Risk Assessment & Administration – JICA/Gov. Japan		

Source: FFC

3.7 Prime Minister’s Secretariat and Ministry of Disaster Management

The Prime Minister of Pakistan is the Chief Executive of the country under the Constitution of Pakistan 1973. It is the Prime Minster who is responsible for the executive branch of the government and the day to day work of the Federal Government. The Prime Minister is elected by the Parliament and belongs to the majority party. The Prime Minister must be a member of the Lower House of the Parliament, i.e., National Assembly of Pakistan. The Prime Minister is Head of the Cabinet and oversees the work of all the Ministries/Divisions. He presides over cabinet meetings, which are normally held in the Prime Minister’s Secretariat (PM Secretariat). He also presides over the National Economic Council (NEC), Executive Committee of the National Economic Council (ECNEC), and meetings on other important national issues. The PM Secretariat provides secretarial assistance to the Prime Minister. It is headed by the Principal Secretary to the Prime Minister (PSPM). The PM Secretariat also includes the Public Affairs Wing, headed by the Special Secretary to the Prime Minister (SSPM), which deals with development projects. The PM office is the highest policy-making office in the country. The policy-making matters required to be submitted to the Prime Minister are routed through the Minister in Charge of the relevant Ministry. Only policy issues which the Ministers concerned feel important are submitted to the Prime Minister. Some of the important matters that require the Prime Minister's personal attention include the following:

- Defense-related issues;

- Important policy issues;
- Important decisions relating to the Cabinet;
- Policy matters relating to the administration of the Civil Services and administrative reforms;
- Special Packages announced by the Prime Minister; and
- Parliamentary Questions.

In this regard, NDMA had belonged to the PM Secretariat as a focal division directly under the Prime Minister since its creation.

On November 26, 2011, the Cabinet Office issued Notification No.4-14/2011-Min.I. for the creation of new four (4) ministries including the Ministry of Disaster Management. The Ministry of Disaster Management incorporates the functions of the NDMA and Global Environmental Impact Study Centre, Islamabad.

Table 3.7.1 Function of Ministry of Disaster Management

Sr. No	Agency/Organization Incorporated	Previous Allocation
1.	National Disaster Management Authority.	Prime Minister's Secretariat
2.	Pakistan Environmental Protection Council.	IPC Division
3.	Pakistan Environmental Protection Agency.	Capital A&D Division
4.	Pakistan Environmental Planning and Architectural Consultants Limited (PEPAC).	Planning and Development Division
5.	Global Environmental Impact Study Centre, Islamabad.	Planning and Development Division
Sr. No	**Function**	
6.	National policy, plans strategies and programs with regard to disaster management including environmental protection, preservation, pollution, ecology, forestry, wildlife, biodiversity, climate change and desertification.	
7.	Coordination, monitoring and implementation of environmental agreements with other countries, international agencies and forums. (previously allocated in Economic Affair Division)	

Source: Cabinet Division (Notification No.4-14/2011-Min.I.)

3.8 Cabinet Division

3.8.1 Introduction

Pakistan came into being on 14 August 1947. The newly founded Government of Pakistan inherited part of the Cabinet Secretariat from undivided India under the British Rule. Initially, the Cabinet Division was established as the Cabinet Secretariat and was located at Karachi, then the capital of Pakistan, under a Secretary General to perform the following functions:

- Co-ordinate the work of Secretaries in the ministries;
- Act as Secretary to the Cabinet; and
- In the performance of his duties, the Secretary General was made responsible to the Prime Minister.

Rules of Business 1950 assigned the other businesses related to secretarial works of the Cabinet to the Cabinet Secretariat (formerly the Cabinet Division), such as provision of a secretariat for committees of cabinet, appointment, budget and privileges of Ministers, setting-up of rules, and coordination activities.

After the approval of the new Constitution of the Islamic Republic of Pakistan by the National Assembly in 1973, the new Rules of Business for the Federal Government were formulated. Accordingly, the following tasks related to disaster risk management were assigned to the Cabinet Division:

- All secretarial work for the Cabinet, Council of Common Interests, Inter-Provincial Conference, National Economic Council and their Committees, and the Secretaries' Committee;
- Follow up and implementation of decisions of all the abovementioned bodies;
- National Economic Council: Its constitution and appointment of members;
- All matters relating to the President, Prime Minister, Federal Ministers, Ministers of State, Persons of Minister's status without Cabinet rank, and Special Assistants to the Prime Minister;
- Strength, terms and conditions of service of the personal staff of the Ministers, Ministers of State, Special Assistants to the Prime Minister, and dignitaries who enjoy the rank and status of a Minister or Minister of State;
- Implementation of the directives of the President/Prime Minister;
- Coordination of defense efforts at the national level by forging effective liaison between the Armed Forces, Federal Ministries and the Provincial Governments at the national level; and Secretariat functions of the various Post-War Problems;
- Communications security;
- Instructions for delegations abroad and categorization of international conferences;
- Security and proper custody of official documents and security instructions for protection of classified matter in Civil Departments;
- Preservation of state documents;
- Disaster relief;
- Defense of Pakistan Ordinances and Rules;
- Federal Land Commission;
- General coordination between the Federal Government and the Provinces in the economic, cultural and administrative fields;
- Promoting uniformity of approach in formulation of policy and implementation among the Provinces and the Federal Government in all fields of common concern;

- Discussions of policy issues emanating from the Provinces which have administrative or economic implications for the country as a whole; and
- Administrative control of the National Commission for Human Development.

3.8.2 Emergency Relief Cell (ERC)

The Emergency Relief Cell (ERC) in the Cabinet Division at the Federal level is the national focal point for managing disasters, releasing funds for relief and immediate rehabilitation in particular. The primary mandate of ERC lies in the area of supplying emergency relief. The Provincial Governments and the local administration provide relief assistance during calamities. The National Disaster Plan (NDP) of 1974 covers procedures, organizational set-up, the primary responsibilities of implementing agencies, and standard procedures for the monitoring of disaster operations. The plan encompasses all disaster situations and multiple contingencies. Therefore, all relief activities regarding disasters had been managed by ERC prior to the establishment of NDMA. Since then, ERC has coordinated the activities of all the related agencies—federal divisions, provincial governments, semi-governmental, and international and national aid giving agencies—in the conduct of relief operations. It also administers the Prime Minister's Flood Relief Fund, which is maintained at the Federal level. In response to the catastrophic 2010 flood disaster, ERC has released more than Rs.5 billion from the Flood Relief Fund.

ERC operates an Emergency Control Room, which coordinates the situation during calamities by liaising with relevant agencies such as FFC, PMD, and Provincial Governments. ERC also maintains a warehouse in the capital, Islamabad, stocking essential nonperishable relief items such as medicines, blankets, clothing, and tents. In addition, there is a Relief Goods Dispatch Organization located in Karachi. This is responsible for receiving and dispatching all relief goods from foreign and local agencies in the event of a disaster. ERC also maintains an Aviation Squadron with a fleet of six helicopters, whose task is to assist in rescue operations and enable officials to visit the affected areas. The ERC maintains the PM Disaster Relief Fund, established in 2000 at the Federal level. The Prime Minister approves required funds for the provincial governments including FATA, Gilgit Baltistan (GB), and Azad Jammu & Kashmir (AJK) during humanitarian crises.

As stated above, the substantial role, considerable responsibilities and mandates are duplicated with the mandatory tasks of NDMA. Therefore, ERC could be merged with NDMA as a section.

3.9 Pakistan Water and Power Development Authority (WAPDA)

3.9.1 Introduction

1) General Information

WAPDA, the Pakistan Water and Power Development Authority, was created in 1958 as a semi-autonomous body for the purpose of coordinating and giving a unified direction to the development of schemes in the water and power sectors, which were previously being dealt with by the respective Electricity and Irrigation Department of the Provinces.

Since October 2007, WAPDA has been bifurcated into two distinct entities, namely: WAPDA and the Pakistan Electric Power Company (PEPCO). WAPDA is responsible for water and hydropower development, whereas PEPCO is vested with the responsibility of thermal power generation, transmission, distribution and billing. There is an independent Chairman and MD (PEPCO) replacing the Chairman WAPDA and Member (Power) who were previously holding the additional charges of these posts.

WAPDA is now fully responsible for the development of Hydroelectric and Water Sector Projects. The Charter of Duties of WAPDA is to investigate, plan and execute schemes for the following fields:

- Generation, transmission and distribution of power;
- Irrigation, water supply and drainage;
- Prevention of water logging and reclamation of waterlogged and saline lands;
- Flood management; and
- Inland navigation.

The Authority consists of a Chairman with three major wings as actual working sections, namely, the Coordination Wing, Power Wing, and Water Wing under three Members, each working through a Secretary.

2) Water Wing

Aside from being responsible for the integrated development of water and power resources in Pakistan, WAPDA was also entrusted with the work of implementing the Indus Basin Settlement Plan signed between India and Pakistan in 1960 to develop replacement works for management of river water and irrigation systems. Since then, it has been engaged in building water development projects which involve extensive research and investigation to augment the country's water resources.

Member (Water) controls the water sector in the entire country, divided into north, central and south zones, generally covering KP and the provinces of Punjab and Sindh, respectively, for execution of SCARPs and surface water development projects. Chief Engineers and Project

Directors implement projects falling under the regions within the zones. In addition, the Water Wing has a Chief Engineer (Coordination and Monitoring) for construction and operation of dams and all other projects under Water Wing services (TS) and two separate General Managers for the Ghazi Barotha Hydropower and the National Drainage Project. The Planning Division of the Water Wing, headed by a General Manager, looks after all planning activities in the water sector. The activities of water resources and hydropower development and Vision-2025 are handled by three General Managers (i.e., Technical, South, North), GM (P&D) and GM Hydropower Development.

3.9.2 Dam and Reservoir Control of WAPDA

WAPDA has operated and maintained the dams, the objectives of which are hydropower generation, irrigation, drainage, prevention of water logging, and reclamation of saline land. The major dams managed by WAPDA are enumerated in the attached Appendix 3.9.1 and described below.

1) Responsibility and Role for Indus River Flood Warnings

WAPDA is actively involved in the flood forecasting process by providing the much needed river and rain data from its telemetric gauge sites within the upper catchments of the Indus, Jhelum and Chenab Rivers. During the previous flood forecasting project (from 1977 to 1987), WAPDA was assigned the responsibility for establishing and maintaining a telemetric network of river and rain stations to support the flood forecasting models in the Indus River Basin. A total of about 40 such stations were established. The number was gradually reduced to about 20 due to maintenance problems, especially in respect of the river gauging equipment which developed frequent problems. It was decided to assign three categories to the telemetric stations in relation to their relative importance in flood forecasting. WAPDA has maintained only 15 category-l stations during the last few years. The system has now been replaced with a new set of equipment using the meteorburst-based communication system.

WAPDA 's telemetric network is directly linked to FFD and is looked after by an officer of the level of research officer whose office is located within the premises of FFD.

Aside from providing the hydrometric flood data, WAPDA is also involved in providing the data from such hydraulic structures as Mangla and Tarbela dams and the Chashrna barrage.

A great scope exists in the future for assigning the flood mitigation role to Mangla and Tarbela reservoirs by linking up the operation of the two reservoirs with the flood forecasting system. Resorting to pre-flood releases on the basis of the flood forecasts can create necessary flood storage.

The features and main specifications of dams administered by WAPDA are described hereunder.

2) Tarbela Dam

Tarbela Dam, located on the Indus River 50 miles (about 80 km) northwest of Islamabad, was completed in 1974. It is the world's largest earth- and rock-filled dam, which has greatly enhanced the agricultural and industrial potential in the country. Due to silt carried by inflowing water, to the extent of 110,000 MAF per year since 1974, sedimentation has taken place and has reduced the gross reservoir capacity from 11.620 MAF to 8.496 MAF.

a. Main Development Objectives

The Tarbela Dam was mainly constructed to transfer the Indus water to eastern rivers under the Indus Basin Treaty signed in September 1960, to irrigate the land previously fed by the eastern rivers, and to produce power for industrial and domestic uses.

b. Project Financing

Development of the Tarbela Dam was financed by:

- Tarbela Development Fund (TDF);
- International Bank for Reconstruction and Development (IBRD-World Bank);
- Asian Development Bank (ADB);
- Canadian International Development Agency (CIDA); and
- Organization of Petroleum Exporting Countries (OPEC).

3) Mangla Dam

Mangla Dam is an earthfill type dam constructed on River Jhelum in 1967 as part of the Indus Basin Development Plan. It is a multipurpose project designed to conserve and regulate the floodwater of River Jhelum for purposes of irrigation and power generation. Due to deposition of silt during its 34 years of operation, the dam’s gross capacity has been reduced from 5.88 MAF to 4.82 MAF. Initially, its life was estimated at 120 years, but later on with the implementation of watershed management practices in the catchment area, its expected life is now estimated at 170 years.

a. Main Development Objectives

Mangla Dam was constructed mainly to provide irrigation water to replenish the waters of the three eastern rivers and to produce electric power for industrial and domestic uses.

b. Project Financing

Development of the Mangla Dam was financed by:

- IBRD-World Bank; and
- ADB.

4) Chashma Barrage and Chashma Hydropower Project

Chashma Barrage is a gate structure the leaves of which are raised to release water during flood and are closed to store the water in the reservoir during normal periods. The gate structure controls the water level in the upstream reservoir. The first project was built between 1967 and 1971; subsequently irrigation and hydropower projects were started in 1986 and completed in 2005 divided into three stages. Chasma Barrage was originally utilized for irrigation. However, irrigation projects using the Chashma Barrage are always facing crop and settlement damages due to the flood problem in downstream areas. In fact, it seems that drainage channels are lacking in its design and crossing structures are too high for flood discharge to pass, subsequently causing flood in the western side.

The Chashma Hydropower Project is located on the right abutment of Chashma Barrage. The barrage is located on the Indus River near the village Chashma in Mianwali District, about 304 km northwest of Lahore. The project has been estimated at Rs.17,821.77 million, including a foreign exchange component of Rs.9,264.25 million. The installed capacity of the power station is 184 MW, consisting of eight bulb-type turbine units of 23 MW capacity each. This was the first time that bulb turbines have been installed in Pakistan. The first unit was commissioned in January 2001, while final commissioning of all units was completed in July 2001.

WAPDA has controlled some facilities in Chashma Barrage.

a. Main Objectives of the Hydropower Project

Apart from effective water management through the barrage, the Chashma Hydropower Project has generated 8.193 Billion KWh of cheap hydroelectricity since its commissioning. Its annual generation in 2008-2009 was 1,096.910 million KWh with the station shared peak load of 184 MW.

b. Project Financing

Development of the Mangla Dam was financed by:

- ADB;
- KFW (Germany); and
- Pakistan Government (Local Fund).

5) Warsak Dam and Hydroelectric Power Project

Warsak Dam is located on River Kabul about 30 km from Peshawar in the northwest frontier Province of Pakistan.

The project consists of a mass concrete gravity dam with integral spillway, power tunnel, power station, a concrete lined 10-ft diameter irrigation tunnel on the right bank, and a 3-ft diameter steel pipe irrigation conduit on the left bank of the reservoir. The 250-ft high and 460-ft long dam with reservoir of 4 square miles had a live storage capacity of 25,300 acre-feet of water for irrigation of 119,000 acres of land and meeting power generation requirements. A spillway with nine gates is capable of discharging 540,000 cusecs of flood water.

The first phase, including construction of dam, irrigation tunnel, civil works for Phase-II and installation of four units each of 40 MW capacity along with a 132 kV transmission system, was completed in 1960 at a total cost of Rs.394.98 million. Two additional generating units each of 41.48 MW capacity were added in 1980-81 at a cost of Rs.106.25 million during the second phase of the project.

Warsak Dam has now completely silted up and has practically no available storage. Power generation is being achieved according to water inflows in River Kabul as a "Run-of-the-River" project. Lean flow period at Warsak is observed from October to March, during which its capability reduces to about 100 MW (Peak).

a. Main Objectives of the Hydropower Project

In addition to providing irrigation water from the dam during the early years of its life, the project has generated over 36.261 Billion KWh of cheap energy since its commissioning. Annual generation during 2008-2009 was 994.404 Million KWh while the station shared a 214-MW peak load.

b. Project Financing

The hydro power project financed by the Canadian Government was completed under the COLOMBO PLAN in two phases.

6) Ghazi Barotha Barrage and Hydropower Project

Ghazi Barotha Hydropower Project is located on the Indus River downstream of Tarbela Dam. The Project utilizes the hydraulic head available between the tailrace at Tarbela Dam and the confluence of the Indus and Haro Rivers for power generation. In this reach, the Indus River drops by 76 m in a distance of 63 km. This Project produces a minimum of environmental and social impacts.

Ghazi Barotha Hydropower Project consists of three main components: the Barrage, the Power Channel, and the Power Complex. The Project utilizes the normal Tarbela Dam releases to provide year-round maximum power generation during the daily hours of peak demand, including the months of May and June when reservoirs of Mangla and Tarbela Dams are historically at their lowest. This enhances the capacity of the whole power system by providing much needed relief in the form of cheap hydroelectricity.

The Barrage located 7 km downstream of Tarbela Dam, provides a pond which re-regulates the daily discharge from Tarbela by diverting the flow into the Power Channel. The principal features include 20 standard bays, 8 undersluices, and 8 head regulator bays in addition to rim embankments, fuse plug and dividing island.

The Barrage can pass the design flood of 18,700 cumecs, equivalent to the flood of record, through the standard bays and undersluices at the normal pond level of El. 340 m. The fuse plug has been provided to pass the extreme flood up to the capacity of Tarbela's spillway and tunnels equaling 46,200 cumecs.

Ghazi Barotha Hydropower Project holds the record for the biggest concrete-lined channel in the world. The channel is 51.90 km long with a concrete lining and design flow of up to 1600 cumecs at a water depth of 9 m. It has a bottom width of 58.4 m.

The Power Channel has a nearly contour alignment with hills on the left side and the land naturally draining towards the Indus River on the right side. The Power Channel intercepts 53 nullahs (natural drains) of which 27 major nullahs have been passed over the Power Channel by providing superpassages. The remaining 24 minor nullahs are being discharged into the Power Channel through individual inlets while one nullah is passing underneath the channel through a culvert.

In addition to 34 road bridges, including bridges for both Islamabad-Peshawar Motorway and the G.T road, there are 12 pedestrian crossings over the Power Channel.

The main railway line joining Rawalpindi to Peshawar also crosses the power channel and required the construction of the second longest single span railway bridge in Pakistan. This may be the last riveted bridge of its type constructed in Pakistan.

a. Main Objectives of the Hydropower Project

Ghazi Barotha Hydropower Project with a generation capacity of 1450 MW and an average energy output of 6600 GWh is a large, renewable and emission-free source of energy towards WAPDA's Vision 2025 goals.

b. Project Financing

Development of the Mangla Dam was financed by:

- World Bank;
- ADB;
- JBIC;
- KFW (Germany);
- European Investment Bank;
- Islamic Development Bank (IDB); and

- Pakistan Government (Local Fund).

3.9.3 Dam Construction Plan in the Future

WAPDA, in association with FFC, has conducted the planning, design and construction of the dam projects in which floodwater from upstream could be stored or retarded.

Actually, WAPDA and FFC proposed six large-scale dams and plans for construction of about 80 small- and medium-sized dams.

3.10 Function and Role of Other Agencies

3.10.1 Agencies Concerned with Disaster Risk Management and Reduction

There are other major concerned agencies and stakeholders involved in EWS aside from NDMA/ F/G/S/PDMA, PMD, FFC and WAPDA. The general functions of these organizations in DRM are briefly described hereunder.

3.10.2 Pakistan Army

Pakistan Army's corps of engineers, under the command and control of the Engineer-in-chief (E-in-C), is charged with the responsibility of providing the necessary help to the civil authority to carry out rescue and relief operations during and after floods. It is the responsibility of the provincial government to provide all the support equipment (boats, life jackets, vehicles, tents etc) to the Army for such operation.

Pakistan Army's flood-related function encompasses all the three phases of operations: the pre-flood, flood, and post-flood phases. The initial flood preparatory phase is when the adequacy and the serviceability of the flood fighting equipment are ensured. A number of pre-flood meetings are held at the level of E-in-C to help coordinate the activities of the other organizations/agencies in providing the required support to the Army. Since Punjab is the most flood prone province, it is the Relief Commissioner Punjab who provides the bulk of the flood fighting equipment to the Army. The CC Engineers 4 Corps of the Army that is stationed at Lahore acts as a liaison officer for the purpose. Pre-flood inspections of the flood protection structures are also carried out by the respective commander corps of engineers for their respective areas to ensure that the structures (bunds, barrages, spurs, etc.) are in a satisfactory state of maintenance. Discrepancy, if any, is brought to the attention of the Relief Commissioner and PIDA. Sometimes joint inspections with PIDA are carried out to save time.

3.10.3 Ministry of Education

Topics related to disaster management have been incorporated into national curriculum by Ministry of Education. National Education Policy 2009 raises “Education in Emergencies” as one issue for broadening the base and achieving access. In accordance with the policy, improvement of school safety and inclusion of disaster education into school curriculum are focused on. As a result, new national curriculum includes topics related to disasters and disaster management in the subjects of “English”, “Social Studies”, “Geography”, and “Civics”. It should be noted that topics related to disaster management are also included in curriculum for non-formal education in addition to curriculum for formal education.

In the subject of “English”, “Crisis Awareness and Management” becomes one of suggested themes for content of teaching materials and suggested sub-themes are listed up from Grade I to Grade XII. Under the subject of “Social Studies”, natural disaster is one topic of geography of Grade IV. The topic of natural disasters is also one topic of “Geography” of Grade VIII. “Civics” deals with topics of community services including CBDRM for Grade X, disaster risk reduction for Grade XII, and disaster management for Grade XII.

Although topics related to disaster management are included in national curriculum, implementation of the curriculum at school level has not been done yet. According to Education Department of Punjab Province, the topics above are not included in textbooks used in schools in the province at present. In addition, teachers have not had chances to receive training on teaching disaster management related topics so far. It requires more time to implement disaster education at school level.

In addition to disaster education through several subjects at classes, Rescue 1122 and other organizations including NGOs has implemented activities/workshops/training related to disaster management such as first aid training and evacuation drill at schools. Although these activities are not regular activities yet, the importance of these activities becomes recognized and implementation of them will be increased in the future.

3.10.4 Geological Survey of Pakistan (GSP)

1) Introduction

The Geological Survey of Pakistan (GSP) has the unique honor of being the only research organization which came into being with the creation of Pakistan on 14 August 1947. During the last five decades, its personnel strength has steadily grown. It now has a workforce of about 1,290 employees, including about 150 geologists.

In its formative years, the GSP also did the pioneering work in the fields of hydrogeology and engineering geology but gradually this work was overtaken by other agencies. However, in the process, the geological base of these studies could not be suitably strengthened and thus the desired results were not forthcoming. Consequently, the government has now again allowed GSP to carry out hydrogeological and environmental geology studies for the period 1998-1999.

The GSP is responsible for the study of the geology of the country in all pertinent details and to assess its resource potential. It undertakes the following:

- Geological mapping and other geoscientific surveys;
- Basic and applied research in earth sciences;
- Scientific investigations for an accurate understanding of the country's geological resources and their prudent management;
- Environmental geology and hydrogeological studies;
- Define the geological framework of Pakistan;
- Understand the country's mineral potential;
- Natural hazards and engineering geology;
- Ground water and soil condition; and
- Environment studies.

2) Organization and Budget

The Headquarters Office of GSP is located at Quetta, with the support of three Divisional Offices at Lahore, Karachi and Peshawar and two Regional Offices at Islamabad. Laboratories and sections are distributed in each office, as shown in the table below.

Table 3.10.1 GSP Organization

Office	Branch, Section, Laboratory
Headquarters at Quetta	Planning and Coordination, Monitoring and Evaluation Chemistry Division Geophysics Division Drilling Division
Divisional Office at Lahore	Specialized Centre for Sedimentary and Environmental Geology
Divisional Office at Karachi	Specialized Centre for Coal, Urban – Deltaic / Geology
Divisional Office at Peshawar	Specialized Centre for Igneous and Metamorphic Geology
Regional Office at Islamabad	Advanced Geo-science Laboratory Specialized Centre for Engineering/Earthquake/Hazard Geology

Source: JICA Study Team

The technical and other activities of the department are planned and controlled by the Management Advisory Committee (MAC) with all Deputy Director Generals and equivalent officers as its members under the Chairmanship of the Director General. The category-wise distribution of the manpower available in the department is given below.

Table 3.10.2 Category-wise Distribution of Gazetted and Non-Gazetted Staff of GSP

S. No.	Category	Number
1	Geologist	146
2	Geophysicist	18
3	Chemist	21
4	Drilling Engineer, etc.	25
5	Photogrammetrist	7
6	Other Technical	18
7	Administration & Accounts	29
8	Technical Staff	280
9	Ministerial Staff	155
10	BPS 1-2 Staff	308
Total		1,007

Source: GSP Yearbook 2009-2010*)*

The GSP gets its annual budgetary allocation in the federal budget every year and some allocation is also made for the department in the federal PSDP for undertaking its development projects. The budget figures for the last five years are given below.

Table 3.10.3 Budget of GSP (Rs. Million)

Year	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Current Budget	189.045	198.026	214.332	247.432	268.835
Development Budget	246.966	161.162	112.584	370.886	557.458
Total	436.011	359.188	326.916	618.318	826.293

Source: GSP Yearbook 2009-2010

3) Achievements Related to Disaster Risk Management

The GSP completed the following projects in the field of environment and engineering geology, especially related to the post-8 October 2005 earthquake in the northern areas, KP and AJK:

- Potential Hazards of Land Sliding and Mitigation Measures at Hattian Bala and other Earthquake Hit Areas;
- Natural Hazard Zonation Map of Muzaffarabad and its surrounding areas;
- Landslide Study and Hazard Zonation Map of Neelum Valley, AJK;
- Landslide Study and Hazard Zonation Map of Jhelum Valley, AJK;
- Landslide Study and Hazard Zonation Map of Kaghan Valley, KP;
- Engineering geological studies from Mansehra to Naran;
- Environmental and Urban Geological Studies of Gilgit and surrounding areas;
- Hydrogeological studies including water quality of open reservoirs (lakes) of Dadu Thatta Districts, Sindh; and
- Neo-tectonics and Quantification of Current Post-Seismic Deformation after the 8 October 2005 Earthquake in collaboration with Grenoble and Chambery Universities, France.

As shown above, DRM activities by GSP have been concentrated on landslide studies and preparation of hazard maps in AJK and KP based on the outcomes of the preparation of regional geological mapping and geochemical exploration.

3.10.5 Pakistan Space and Upper Atmosphere Research Commission (SUPARCO)

1) Introduction

SUPARCO, the national space agency, was established in 1961 as a Committee and was granted the status of a Commission in 1981. The President of Pakistan signed and promulgated SUPARCO Ordinance of 1981, which was issued in the Gazette of Pakistan on 21 May 1981, to provide for the establishment of a Space Research Council (SRC), an Executive Committee of the Space Research Council (ECSRC), and the Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), granting SUPARCO an autonomous status. The then Chairman of SUPARCO established three Technical Wings, namely: Space Technology Wing, Space Research Wing, and Space Electronics Wing. The National Assembly ratified SUPARCO Ordinance vide Pakistan Space and Upper Atmosphere Research Commission (Amendment) Act, 1987-Act No. II of 1987, providing for, *inter alia*, the replacement of the President of Pakistan with the Prime Minister of Pakistan as President of the Space Research Council.

SUPARCO remained under the administrative control of the Cabinet Division for almost 20 years, until September 2000. During this period, only one meeting of the SRC (headed by the President of Pakistan) and 13 meetings of ECSRC (headed by the Federal Minister for Finance) were held. The last meeting of ECSRC was held on 9 September 1999. The SRC, in its first-ever meeting held on 24 December 1984, approved the Long-Term Development Program of Space Science and Technology in Pakistan, submitted by SUPARCO, which contained projects of national importance.

On 10 December 2000, the Cabinet Division issued Office Order No. 564, through its Notification No. 5/11/2000-Admin.II, whereby in pursuance of the order of the Chief Executive of Pakistan, SUPARCO Commission was transferred from the Cabinet Division to the National Command Authority (NCA); the Space Research Council and Executive Committee of the Space Research Council were dissolved and were replaced with the Development Control Committee (DCC) of NCA.

SUPARCO is mandated to conduct R&D in space science, space technology, and their peaceful applications in the country. It works towards developing indigenous capabilities in space technology and promoting space applications for the socio-economic uplift of the country.

2) Function

The functions of SUPARCO are as follows:

- Undertake research and conduct pilot studies based on the applications of Satellite Remote Sensing (SRS) data and Geographic Information System (GIS) technology as it applies to natural resources surveying, mapping and environmental monitoring;
- Undertake research studies in space and atmospheric sciences including satellite meteorology, satellite radiance, troposphere/stratosphere studies, atmospheric pollution, satellite geodesy and astronomy;
- Undertake research studies relating to the ionosphere and associated radio wave propagation and geomagnetism;
- Development, design, fabrication, assembly, and launching of:
  - Communication satellites for voice, video, Direct-to-home TV broadcast services and digital data transfers;
  - Earth observation satellites for various scientific/technological applications; and
  - Sounding rockets for upper and middle atmospheric research.
- Establishment and operation of ground receiving stations for:
  - Acquisition of SRS data for earth resources surveying, mapping and environmental monitoring studies;
  - Acquisition of data for atmospheric/meteorological studies;
  - Transmitting and receiving signals from communication satellites; and
  - Reception of signals from ships, boats and vehicles in distress under the satellite-aided search and rescue COSPAS-SARSAT program.
- Establishment and operation of facilities for tracking satellites/rockets to determine their orbital parameters, trajectories, etc.;
- Development of instrumentation for various scientific and technological experiments; and
- Development of software for different functions.

3.10.6 Drought Emergency Relief Assistance (DERA) Unit

1) Introduction

Immediately after the worst drought damage in Pakistan during the period 1998-2001, the Drought Emergency Relief Assistance (DERA) Program was launched in November 2001 to mitigate the negative impact of that drought, to revive the economy, and to promote more sustainable use of available water and other productive resources. Under the program, the main focus remained on improvement and management of available resources. The DERA Program directly supported the government’s strategy to sustain the income and welfare of the poor by promoting labor-intensive community works to accelerate recovery and generate income enhancement activities for physical development and economic growth in the drought affected areas. The program supports the government strategy to revive the agrarian economy, build up infrastructure, and manage and promote more sustainable use of locally available water and other productive resources. The main objectives of the DERA Program are as follows:

- Support the Government efforts to mitigate the effects of drought in most adversely affected areas/regions;
- Implement water conservation measures; and
- Support infrastructure and services to restore agricultural growth.

2) DERA Unit and Function

The DERA Program has been managed by the DERA Unit located in the Blue Area. The Unit has the following functions:

- Facilitate the process of program implementation in the drought hit areas of all the four provinces;
- Develop a Financial Management System, and release funds to provinces;
- Develop an operational manual for the DERA Program as a guideline for implementing agencies;
- Ensure timely submission of audit reports to donors;
- Function as Secretariat of the National Steering Committee (NSC) on drought;
- Monitor and evaluate the financial progress of the DERA Program;
- Liaison with donors and other stakeholders for smooth and speedy implementation of development projects, SOEs disbursement, and other related issues; and
- Coordinate activities carried out in the provinces to mitigate the effects of drought.

The DERA Program has been divided into two phases, Phase-I and Phase-II and will be terminated in 2011.

3.10.7 Provincial Irrigation Department (PID/PIPD)

Provincial Irrigation (and Power) Departments (PID/PIPD) are also playing a role as one of the central players of disaster risk management activities, such as flood damage mitigation in particular. As the implementing agency for the construction of infrastructure regarding irrigation/agricultural structures of the Provincial Government, the PID/PIPD has responsibility for design, construction, operation and management of flood control facilities as a part of irrigation system improvement. In addition, PID/PIPD has disseminated the flood warning issues together with PMD since the PID/PIPD observed the flow discharge at each of its administrating facilities in rivers, such as weirs, barrages, siphons and other related structures. In this regard, the PID/PIPD has the mandate to inform PMD of the real-time flood discharges at its administrating structures during flooding. At the same time, PID/PIPD has also released the flood discharge information directly to the District Governments concerned to avoid the delay of emergency information.

3.10.8 Pakistan Council of Research in Water Resources (PCRWR)

1) Introduction

The Pakistan Council of Research in Water Resources (PCRWR) was established in 1964, under a resolution and named as Irrigation, Drainage and Flood Control Research Council (IDFCRC) within the Ministry of Natural Resources. It was brought under the control of Ministry of Science and Technology in 1970. The Council was renamed as Pakistan Council of Research in Water Resources (PCRWR) in 1985. The PCRWR is an apex autonomous body established with the objective to conduct, organize, coordinate and promote research in all aspects of water resources. Since its inception, PCRWR has played its role as a national research organisation by undertaking and promoting applied as well as basic research in various disciplines of water sector, more specifically, irrigation, drainage, surface and groundwater management, groundwater recharge, watershed management, desertification control, rainwater harvesting, , water quality assessment and monitoring, and development of innovative water resource management, conservation and quality improvement technologies, etc.

2) Mandate

The PCRWR is mandated to conduct, organise, co-ordinate and promote research in all fields of water resources engineering, planning and management, so as to optimally use the available land and water resources and to help achieve sustainability in the agricultural sector.

3) Structure (Board of Governors)

The Act of Parliament for establishment of the Pakistan Council of Research in Water Resources received the assent of the President on April 14, 2007. The 1st meeting of the Board of Governors (BoG) was convened on September 17, 2007 at the PCRWR Headquarters, Islamabad. The overall decision-making body of the PCRWR is its Board of Governors (BoG), responsible for the control, direction and superintendence of the affairs of the PCRWR. Technical and Executive Committees assist the Board in its operation. The Federal Minister and Secretary (Scientific and Technological Division), Ministry of Science and Technology are the President and Vice President of the Board respectively.

4) Functions

Undertake research on development, management, conservation, utilization and quality of water resources.

Develop and maintain National Water Resources Database.

Design, develop and evaluate water conservation technologies.

Undertake contractual research and provide consultancy services to the private and public sector.

Establish liaison and collaborate with other related national and international research and development organizations. Publish scientific papers, reports, periodicals, arrange seminars, training workshops and conferences on water related issues.

- Conduct, organize, coordinate and promote research on all aspects of water resources, including irrigation, drainage, reclamation, navigation, drinking water, industrial water, and sewerage management and to set up national centers, wherever necessary.
- Advise the government and submit policy recommendations regarding quality, development, management, conservation and utilization of water resources.
- Develop and maintain national water resources database, for use by the planning, implementing agencies and public.
- Design, develop and evaluate water conservation technologies for irrigation, drinking and industrial water.
- Commercialize its research and development results by the sale of products, patents and services.
- Undertake contractual research and provide consultancy services to the private and public sector.
- Establish liaison and collaborate with other related national and international research and development organisations, universities and NGOs.
- Publish scientific papers, reports and periodicals, and arrange seminars, training workshops and conferences on water- related issues.
- Initiate national water quality monitoring program, in the urban and rural areas of Pakistan and develop technologies for providing safe drinking water to the public.
- Conduct and coordinate research or desertification, drought and flood mitigation.
- Provide financial and technical support to universities and research institutions for collaborative research projects and fellowships.
- Design and develop water related technologies and items of utility for various users according to market demand and undertake design and development projects on contract.
- Undertake human resources development, through training skills related to the specialized functions of the Council.

3.10.9 National Institute of Oceanography

1) Introduction

The National Institute of Oceanography (NIO) was established in 1981 by the Ministry of Science and Technology, Government of Pakistan (MoST). The main area of research of the Institute is the north Arabian Sea and beyond. The oceanic and atmospheric processes of the north Arabian Sea modify our climate, offer numerous living and non-living resources. Oceanographic research brings together all the scientific disciplines needed to study the ocean: physics, chemistry, biology, geology & geophysics, ocean technology, coastal hydraulics & coastal zone management.

Pakistan coast is about 1046 Km long extending from Indian border in the east to the Iranian border in the west. The Exclusive Economic Zone (EEZ) of Pakistan is about 240,000 sq. km, with additional continental shelf area of about 50,000 sq. km. As such, the total maritime zone of Pakistan is over 30% of the land area. This region is characterized by distinctive oceanic phenomena, that produces rich fisheries, mineral, and hydrocarbon resource.

Extensive survey, data collection and research are required to understand the above processes and features which have direct bearing on locating the living and nonliving resources and their sustainable exploitation and conservation. The program of NIO has been oriented and set up to develop the capabilities and facilities for achieving these objectives including the concerns about important oceanic phenomena & features, such as Monsoon and climatic change, Upwelling and circulation, Mixing of Red Sea and Gulf Water, Indus estuary and sedimentation, Submarine Indus Cone, Murray Fracture Zone (Leaky Transform Fault) and Makran Subduction Margin.

The marine resources of Pakistan have so far remained unexploited and concerted efforts for oceanographic research in the country are required.

2) Capacity

Presently 30 scientists are involved in oceanographic activities, 26 of these have been trained abroad. In addition there are, 39 supports staff on the roll of NIO. The Institute has its own building on the Clifton shore. For deep sea research NIO has access to a hydrographic cum oceanographic Research Vessel. In addition to the main laboratories at Karachi, NIO also has a research station at Gwadar Baluchistan coast. NIO in a relatively a short period of its existence has made optimum use of the limited resources. It has initiated, conducted and completed a number of projects related to ocean research and has effectively responded to a wide variety of user's requirements, that is marine industry and national institutions involved in the field of marine research.

3.10.10 Indus River System Authority (IRSA) and Pakistan Commission for Indus Waters (PCIW)

1) Indus River System Authority (IRSA)

Because of the lack of a formal agreement between the provinces on sharing Indus waters, the operation of the reservoir was conducted on an ad hoc basis during 1976 to 1993. A formal accord was reached between the provinces in 1991 that prescribed water allocation between provinces, and the Indus River System Authority (IRSA) was created in 1993 under an Act of the Parliament. This body with representatives from all provinces and federal government is chaired by one of the representatives on annual rotational basis. Regulation of the Indus River system including storage reservoirs at Tarbela and Mangla is now being handled by IRSA.

2) Pakistan Commissioner for Indus Waters (PCIW)

The Indus System of Rivers comprises three Western Rivers the Indus, the Jhelum and Chenab and three Eastern Rivers - the Sutlej, the Beas and the Ravi; and with minor exceptions.

The Government of India and the Government of Pakistan were equally desirous of attaining the most complete and satisfactory utilization of the waters of the Indus system of rivers and recognizing the need. In this regard, the Indus Waters Treaty was signed for a water-sharing between the Republic of India and Islamic Republic of Pakistan, brokered by the World Bank in 1960. The Indus Waters Treaty gives India exclusive use of all of the waters of the Eastern Rivers and their tributaries before the point where the rivers enter Pakistan. Similarly, Pakistan has exclusive use of the Western Rivers. Pakistan also received one-time financial compensation for the loss of water from the Eastern rivers. Also the countries agree to exchange data and co-operate in matters related to the treaty. For this purpose, the treaty created the Permanent Indus Commission (Pakistan Commissioner for Indus Waters (PCIW)), with a commissioner appointed by each country.

3.10.11 Survey of Pakistan

Established in 1947, the Survey of Pakistan (SOP) headed by the Surveyor General of Pakistan responsible for topographic mapping and aerial photography is based in Rawalpindi with a number of regional offices distributed at urban centers throughout Pakistan. All departments which require topographic maps make their request to SGP and many are permanently registered with it for mapping and aerial photographs procurement. The SOP performs these functions under the auspices of the Ministry of Defence (MOD).

3.10.12 National Engineering Services Pakistan (Pvt) Limited (NESPAK)

National Engineering Services Pakistan (Pvt) Limited (NESPAK) is Pakistan’s premier consultancy organization. NESPAK was established in 1973 as a private limited company by the Government of Pakistan. The objective of its creation was to create a pool of talented engineers, attain self-reliance in engineering consultancy and replace foreign consultants. The company has achieved these objectives to a large extent. NESPAK offers a broad spectrum of expert consultancy services ranging from conception to completion and operation of development projects. The scope of these services covers prefeasibility and feasibility studies, surveying and mapping, investigations, design, tender and contract documentation, construction/installation supervision, contract management and post-construction services.

NESPAK, having expertise in almost all engineering disciplines, specializes in the fields of power and mechanical; water and agriculture; architecture and planning; highways, bridges, airports and seaports; environmental and public health engineering; engineering for industry; heating, ventilation and air-conditioning; information technology and geographical information systems (GIS).

In particular, the NESPAK has worked under Ministry of Water & Power and has, and is giving services in GIS, GPS, Water Resource Development, Flood Management, Risk Assessment etc. In this connection, the NESPAK has a number of useful data and knowledge for disaster management activities such as river data, hydrological data and analyzed results, geological data and topographical data.

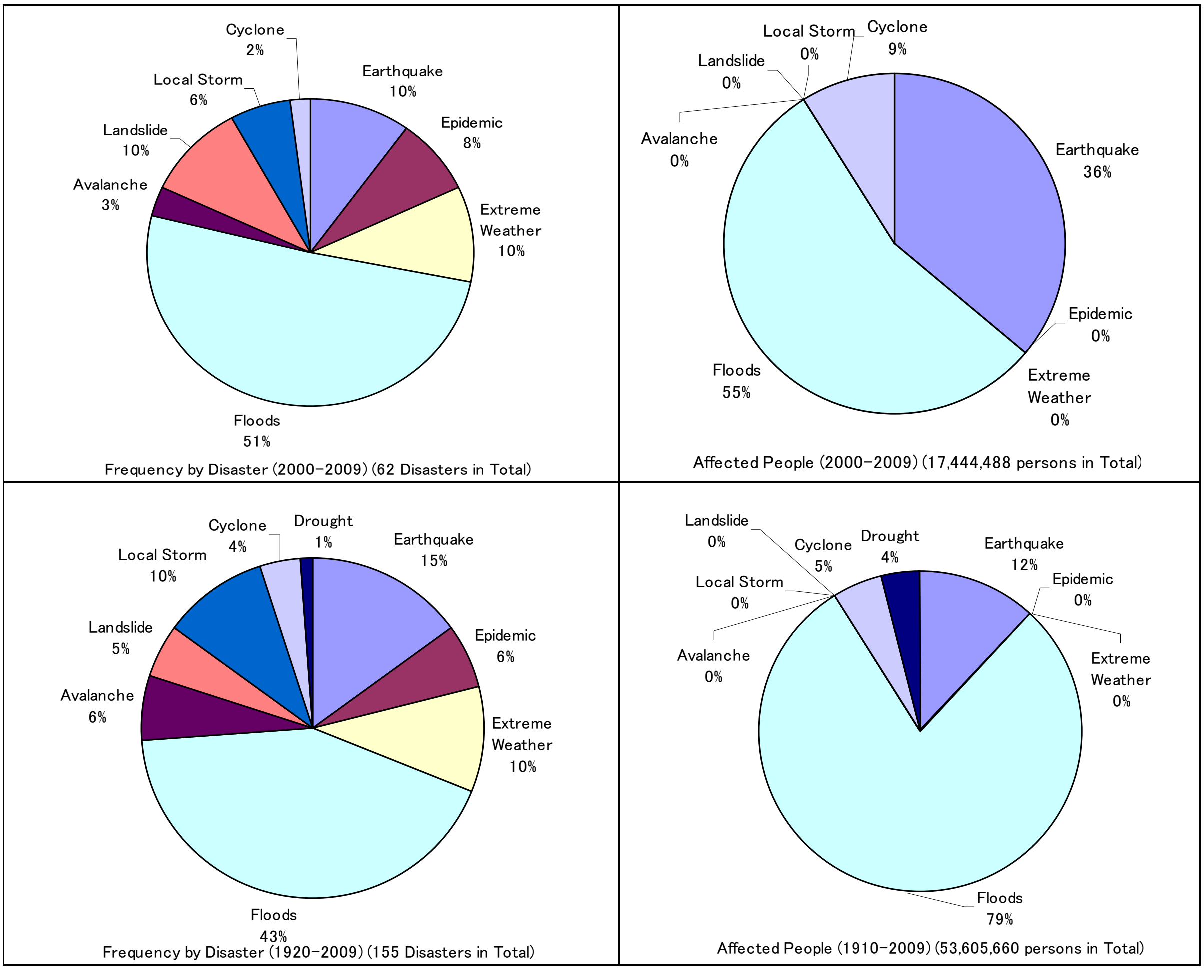
CHAPTER 4 HAZARD AND RISK ASSESSMENT

4.1 Disaster Situations in Pakistan

4.1.1 Past Disaster Situations in Pakistan

1) Meteorological/Weather Phenomenon as Dominant Reason for Damages

Pakistan is one of the most vulnerable countries to disasters in the world since she has more variety in terms of topography and meteorology by region. The earthquake of 8 October 2005 highlighted Pakistan's vulnerability to disaster risks. This has been further evidenced by the recent tremendous tragedies of the Indus River Flood from the end of July 2010 to the middle of September and the 2011 Sindh Flood in which the damages also extended to the eastern Balochistan and southern Punjab in September 2011. As shown below, Pakistan has been hampered by damages from a wide range of disasters in the past.



Source: "EM-DAT: the OFDA/CRED International Disaster Database www.em-dat.net

Figure 4.1.1 Brief of Past Disasters Affecting Pakistan

In general, disasters due to meteorological/weather phenomenon, such as floods including local storm and cyclone, landslides and extreme weather, are the dominant causes of damage. Climate change and variability are major dynamic pressures that increase vulnerabilities of Pakistani society to disasters. These natural disasters would increase damages to humans and societies compounded by artificial disasters. For example, perennial floods cause the occurrence of epidemics or other disasters, resulting in deterioration of the living environment. In this regard, disaster management plan and EWS plan should be formulated through an integrated approach, also addressing concerns about secondary impacts of disasters in collaboration with poverty reduction activities and enhancement of people's living standards.

2) Earthquake as the Most Deadly Type of Disaster

The profile of natural disasters in Pakistan compiled from the internal study of NDMA and WFP, and the international database (EM-DAT) is shown in Table 4.1.1. Among all types of natural disasters, earthquake is the second most frequent, next to flood, and the most deadly type. It is notable that earthquake ranks first in terms of losses per event.

Table 4.1.1 Profile of Natural Disasters in Pakistan

Type	EM-DAT *1				NDMA *2					
	Event/ year	Dead/ event	Affected/ event	Loss/ event	People homeless	Deaths	Injured	People affected	Total Affected	Total Loss *3
Drought	0.03	143	2,200,000	247,000	-	223	-	2,269,300		247,000
Earthquake	0.66	3,900	339,198	274,553	2,853,585	142,812	88.096	1,294,429	4,236,110	5,019,255
Epidemic	0.31	27	1,712	-	-	-	-	-	-	-
Extreme temp.	0.41	101	48	-	-	-	-	-	-	-
Floods	1.72	136	565,236	33,908	8,927,685	11,702	1,262	38,669,44 7	47,598,394	2,746,030
Mass mov. Dry (landslides)	0.03	50	-	-	3,100	384	114	200	3,414	-
Mass mov. Wet	0.55	33	227	-	-	-	-	-	-	-
Storm	0.59	85	128,641	95,937	22,597	11,654	1,183	1,057,00	1,080,780	4,100

Source: *1 : EM-DAT, 1980-2008, *2 : NDMA Annual Report 2010 (Internal Study NDMA&WFP))
Note: *3 : Thousand USD

Available significant historical data from national and international sources on earthquakes that have affected Pakistan are presented in Table 4.1.2. Though there are various data sets, the number of documented events in Pakistan is very limited. Most of the available data was recorded after the 20th century.

Table 4.1.2 Significant Earthquake Data in Pakistan

Source	Period	No. of Data	Mag	No. of Killed	No. of Injured	No. of Affected	Bldg. Damage	Damage	Economic Loss
NGDC	25-2009	42	○	○	○	×	○	×	○
EM-DAT	1935-2008	23	×	○	×	○	×	×	○
IISEE	1900-2006	55	○	○	○	×	×	○	×
PMD	25-1905	55	×	○	×	×	×	×	×

○: Information available ×: Information not available

Source: JICA Study Team

3) Summary of Disaster Situation in Pakistan

The general current status of disasters in Pakistan is summarized below:

Table 4.1.3 General Current Status of Disasters in Pakistan

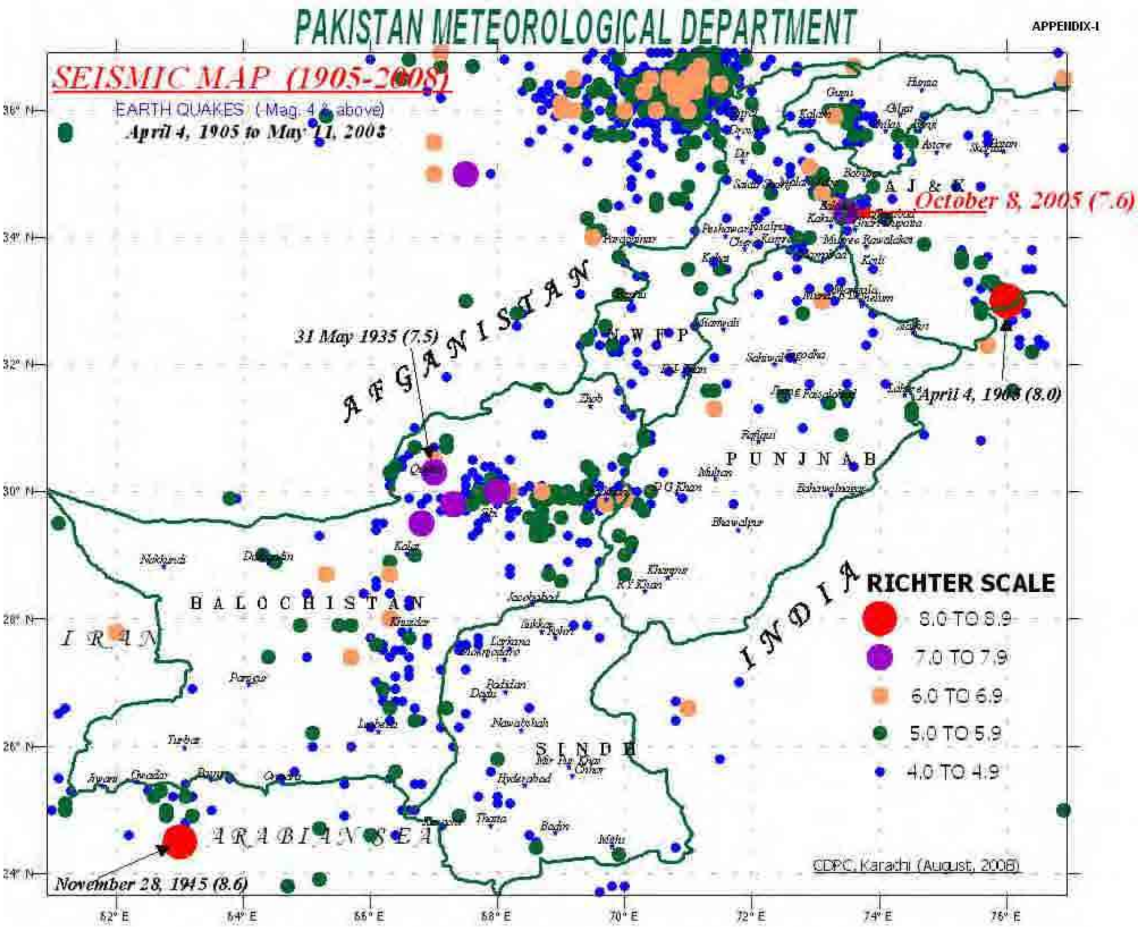
Type of Disaster	Current Status in Pakistan
Floods	• Occur normally due to tropical monsoon depressions systems that originate from the Bay of Bengal during the monsoon from July to September • "(Indus) River Flood" broadly inundating floodplains along major Rivers (Indus, Jhelum, Chenab, Ravi, Sutlej) • "Flash Flood" seriously damaging cities, farmlands along footing areas of mountains/hill torrents • "Coastal Flood" harming low-lying areas along coasts by cyclones, storm surge and local downpours
Cyclone with Storm Surge	• Cause "Coastal Flood" • Hit Pakistan once every 4~5 years • In particular, Sindh and Balochistan Provinces are vulnerable.
Earthquake and Tsunami	• Occur in small magnitudes and big earthquakes occasionally because Pakistan lies in a seismic belt • Even if small scale earthquake occurs, considerable damages are caused due to low quality and non-quake-resilience of buildings
Drought	• The most serious drought occurred during 2000~2002 • Frequently occurs in Sindh, Balochistan and the southern parts in Punjab because the mean annual rainfall volumes in these locations are less than 200-250mm

Source: JICA Study Team

4.1.2 Characteristics of Disasters in Pakistan

1) Earthquakes and Tsunamis

Earthquakes and tsunami hit Pakistan periodically. Figure 4.1.2 shows the epicenters of earthquakes with magnitude larger than 4, between 1905 and 2008, as compiled by PMD. Table 4.1.4 shows a list of significant earthquakes from the National Geophysical Data Center.



Source: PMD

Figure 4.1.2 Seismic Map (1905-2008)

Table 4.1.4 Significant Earthquakes Data in Pakistan

Date						Earthquake Location				Earthquake Effects				
										Deaths	Injuries	Damage	Houses Destroyed	Houses Damaged
Year	Month	Day	Hour	Min.	Sec.	Lat.	Lon.	Depth	M	Num	Num	$Mill	Num	Num
25						33	72							
1668	5	2				24	68	10						
1669	6	4				33.4	73.3							
1688	5					24	68							
1827	9	26				31.6	74.3			1000				
1851	4	19	14	30		25.1	62.3							
1852	1	24				27.7	68.8			350				
1892	12	20				30.5	66.2							
1909	7	8	2	30		35.5	72.5			10				
1909	10	20	23	41		30	68	60	7.2	231				
1931	8	27	15	27		29.8	67.3	60	7.4					
1935	5	30	21	32	46	29.5	66.8		7.5	60000		25		
1945	11	27	21	56	40	24.2	62.6	25	8.3					
1947	8	5	14	24	10	25.5	63		7.6					
1955	2	18	22	48	33	30.5	67			12				
1972	9	3	16	48	28.8	36	73.4	36	6.2	100			1000	1000
1974	12	28	12	11	43.7	35.1	72.9	22	6.2	5300	17000	3.255		
1978	3	16	2	0	0.5	29.926	66.302	33	5.9	1				
1981	9	12	7	15	54.1	35.693	73.594	33	5.9	220	2500	5		
1981	12	12	20	26	46.9	29.856	66.962	33	4	6	12		45	45
1983	8	6	4	52	53.6	30.349	67.84	10	4.2				25	25
1984	2	16	17	18	41.6	36.431	70.826	208	6.1	4	13	5		
1986	5	15	14	38	9.2	29.627	69.363	18	5.2					
1986	10	16	19	54	10.4	27.727	66.65	43	4.5				150	150
1990	3	4	19	46	19.6	28.925	66.331	10	6.1	11		1		
1990	6	17	4	51	45.5	27.398	65.719	15	6.3					
1992	5	20	12	20	32.8	33.377	71.317	16	6	50				
1992	8	28	0	50	50.4	29.087	66.74	9	5.5	4				
1997	2	27	21	8	2.3	29.976	68.208	33	7.1	60			500	500
1997	3	19	19	57	11.9	34.872	71.62	50	4.9	15				
2002	11	1	22	9	29.2	35.517	74.654	33	5.4	11	40			
2002	11	20	21	32	30.8	35.414	74.515	33	6.3	19	40		100	100
2004	2	14	10	30	22.1	34.774	73.216	11	5.4	24	40		1420	1420
2004	5	8	20	11	44.2	30.126	67.121	10	4.5	1	30			
2005	3	2	11	12	14.9	30.378	68.038	52	4.9		1			
2005	10	8	3	50	40.8	34.539	73.588	26	7.6	86000	69000			
2006	3	10	7	50	14.3	33.129	73.887	10	4.9	1	22			
2006	4	4	9	12	23.4	34.6	73.136	10	4.8		28			
2007	10	26	6	50	6.6	35.304	76.753	10	4.8	1	12			
2008	10	28	23	9	57.6	30.639	67.351	15	6.4	166	370		3487	3487
2008	10	29	11	32	43.1	30.598	67.455	14	6.4		1			
2009	2	20	3	48	48.2	34.204	73.899	10	5.4		44			

Source：National Geophysical Data Center

Due to the tectonic setting in the Arabian Sea where the Arabian plate subduct beneath the Eurasian plate, large earthquakes along Arabian coast had occurred historically, as listed in Table 4.1.5. Epicenter locations of listed earthquakes are plotted in Figure 4.1.3.

Table 4.1.5 Catalog of the Makran Historical and Instrumental Great Earthquakes (magnitude>=6.5)

Date yy-mm-dd	Latitude N	Longirude E	Depth (km)	Ms	Mw	MMI
326 BC	24.00	67.30				VIII-IX
1008-5	25.00	60.00				X
1483-2-18	24.90	57.90				VIII-IX
1668-5	25.00	68.00				VIII-IX
1765	25.40	65.80				VIII-IX
1851-4-19	25.10	62.30				VIII-IX
1927-07-07	27.00	62.00		6.5		
1929-09-03	26.40	62.30		6.5		
1934-06-13	27.43	62.59	35.0	7.0		
1945-11-27	24.50	63.00	25.0	8.3		
1947-08-05	25.10	63.40	35.0	7.6		
1969-11-07	27.90	60.10	35.0	6.5		
1983-04-18	27.79	62.05	64.0		7	

Note: Ms:Surface wave magnitude, Mw:Moment magnitude, MMI:Modified Mercalli Intensity
Source: Mohammad Heidarzadeh et al., 2008[7]

Source: Mohammad Heidarzadeh et al., 2008

Figure 4.1.3 Location of Epicenters of Major Earthquakes along Arabian Coast The locations of events of 1008 and 1524 are not certain. CF is confidence factor.

It should be noted that not all of the large earthquakes had generated tsunamis. Besides, tsunamis can be generated by volcanic origin. A historical study of tsunamis in the Arabian Sea indicates

7 Mohammad Heidarzadeh et. al., 2008a, Historical tsunami in the Makran Subduction Zone off the southern coasts of Iran and Pakistan and results of numerical modeling, Ocean Engineering 35, pp. 774–786.

that there remain uncertainties about tsunamis that affected Pakistan, as listed in Table 4.1.6. Note that confidence factor for most of the records are 1 or 2.

Table 4.1.6 Historical Tsunamis in the Arabian Sea

Year	Long.	Lat.	Mw*	Type of Source	Loss of Life	CF**	Remarks
326 BC	67.30	24.00	Unknown	Earthquake	Unknown	1	Macedonian fleet destroyed
1008	60.00	25.00	Unknown	Earthquake	1,000	2	Large wave were produced which drowned some ships and killed all of their passengers
1524	-	-	Unknown	Earthquake	Unknown	1	A Tsunami in Dabhul reported by the Purtugease fleet
1897	62.30	25.00	Unknown	Volcanic	Unknown	1	Hundreds of tons of fish were brought to the Makran coasts
1945	63.00	24.50	8.1	Earthquake	4,000	3	The secondly deadliest Tsunami in the Indian Ocean after 26 December 2004 event

Note: *Moment Magnitude; **Confidence Factor
Source: Mohammad Heidarzadeh et al., 2008

Table 4.1.7 shows the run up data due to historical tsunami.

Table 4.1.7 Historical Tsunami in the Arabian Sea

Date	Time	M	Run up (m)	Location
1883/08/27	02:59	（Volcano）	0.50	Karachi
1945/11/27	21:56:40	8.3	15.24	Pasni, Ormara
1945/11/27	21:56:40	8.3	1.37	Karachi

Source：National Geophysical Data Center

a. Base Factors Causing Earthquake and Tsunami Disaster in Pakistan

Figure 4.1.4 shows the tectonic setting around Pakistan. Plate boundary between the Eurasian plate and Indian plate runs through Pakistan’s territory from south-west to north-east, and Arabian plate subducts beneath Eurasian plate in the southern part of Pakistan, with a rate of 19 mm/year.

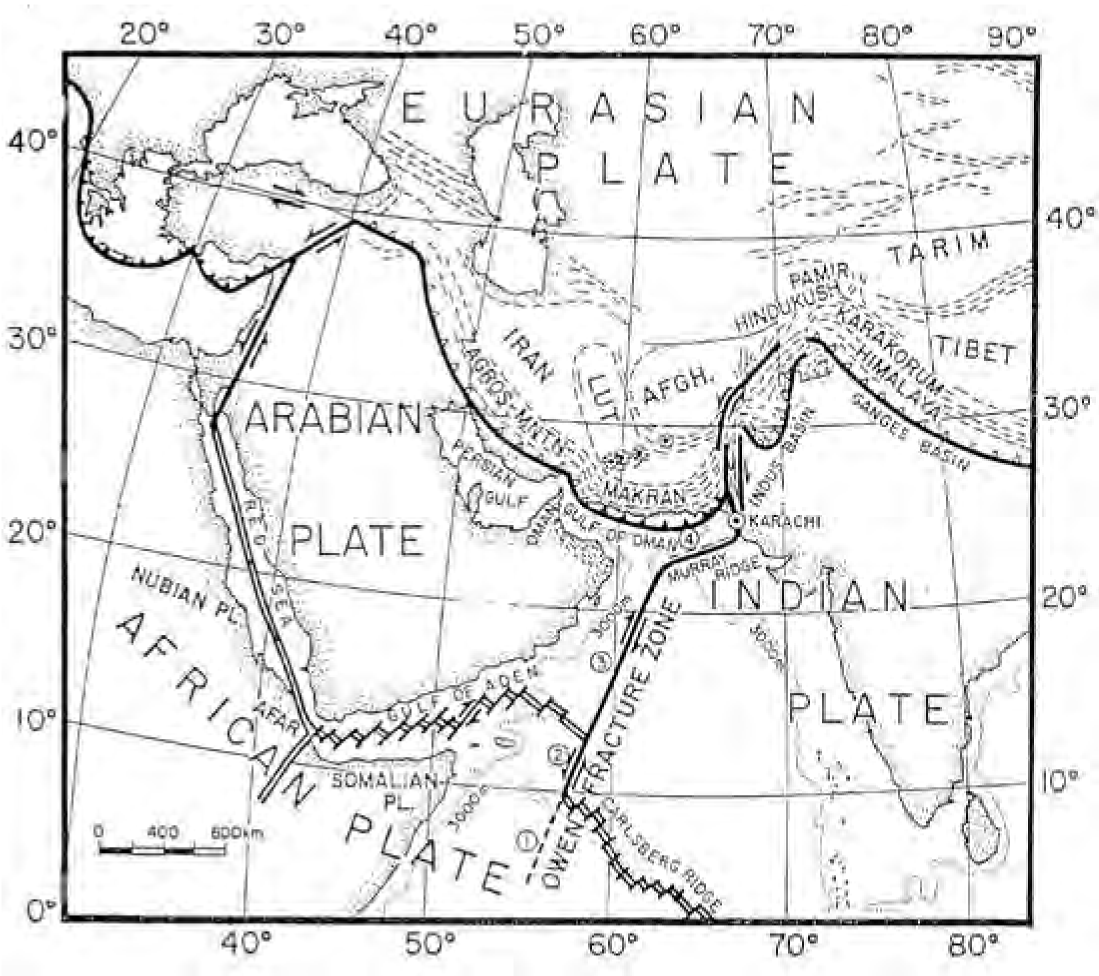
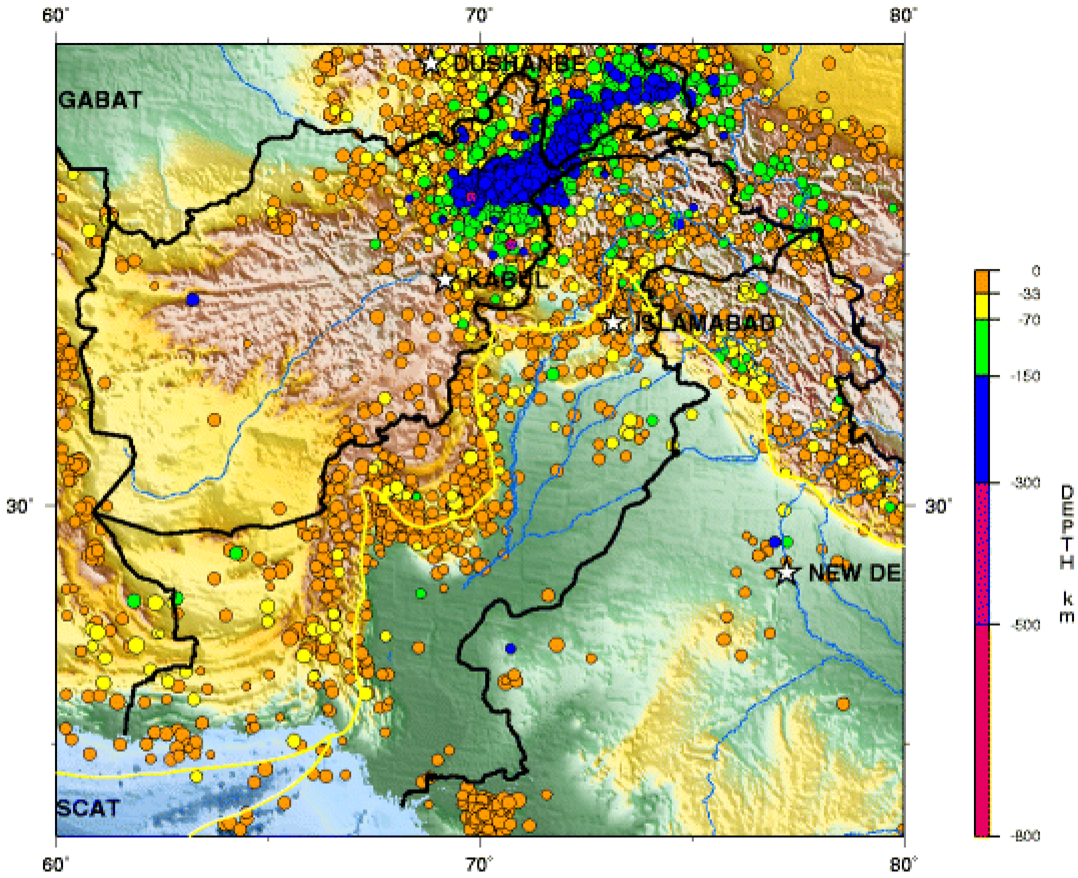


Figure 4.1.4 Location of Epicenters of Major Earthquakes along the Arabian Coast

Due to its tectonic setting, seismic activity in Pakistan is high. For example, Figure 4.1.5 shows seismicity in Pakistan for the period of 1990-2006. It is notable that seismicity is especially high in the northern and western parts of the country.



Source: USGS

Figure 4.1.5 Seismicity in Pakistan, 1990 to 2006

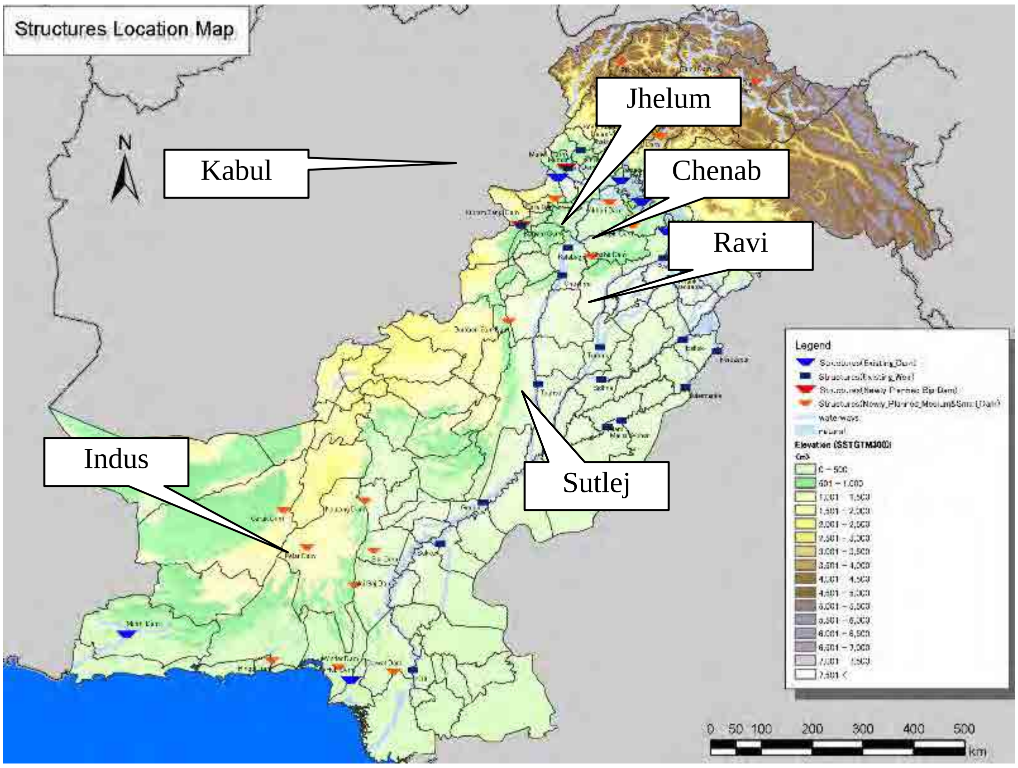
b. Earthquake Magnitude and Area causing Damages in Pakistan

In Pakistan, historical earthquake records (Table 4.1.8) show that earthquakes as small as magnitude 4 had caused victims. Earthquakes with magnitudes larger than 7, such as the 1935 Quetta earthquake and the 2005 Kashmir earthquake, had caused significant numbers of death. This fact can be attributed to the vulnerability of buildings to earthquake.

Due to its tectonic setting, large earthquakes had historically occurred along the Makran subduction zone, though not all of them had generated tsunami. As Makran subduction zone is located 70 km from the Pakistan coast, it is reported that the 1945 tsunami hit the coast in less than 20 minutes. Distant tsunamis had not affected Pakistan so far. The 2004 Indian Ocean Tsunami did not reach Pakistan, as Pakistan is located behind the Indian subcontinent where the tsunami originated.

2) Meteorological Situation Causing Disaster

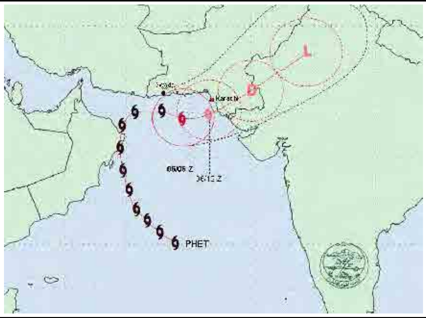
Pakistan has one of the highest number of people on average who are physically exposed to floods, which occur normally due to tropical monsoon depressions from July to September as described in Section 4.1.1. The low pressures/ depressions/ cyclones originating from the Bay of Bengal passing over lower Central India and Rajputana, enter Pakistan and continue towards the north into Kashmir. The mountain ranges in the extreme north of Pakistan provide a perennial source of inflow into the rivers. Floods particularly hit Punjab and Sindh while hill torrents tend to affect the hilly areas of KP, Balochistan and the federally administered northern areas (GB). Flood events of 1950, 1992, 1998 and 2010 caused many deaths and huge losses to the national economy. These tremendous damages have mainly been caused by the overflow of water in the Indus River System, namely, Indus, Jhelum, Chanab, Ravi, Sutlej and Kabul River. According to official sources, floods in Pakistan during the decade spanning 1991 to 2001 caused an estimated damage to property of over Rs.78,000 million.



Source: JICA Study Team

Figure 4.1.6 Mapping of the Indus River System

About 14 cyclones were recorded during the period 1971-2001. Including the intensity of the depression, there were approximately 200 cyclones and depressions spawned during the period of 1891-2010. The coastal belt of Pakistan, especially the coastal areas of Sindh, is highly vulnerable to tropical cyclones and associated storm surges. The climate changes rapidly resulting in increase in frequency, intensity and changes in tracks of storms. Although the frequency of invasion of tropical cyclones is low along the Pakistani coast, yet they cause considerable damage in the area. Such unprecedented damage to lives, property and infrastructure leaves adverse impact on the socio-economic development of the region. The coastal belt is mostly low-lying, therefore, storm surges extend several kilometers inland damaging standing crops and converting the agriculture land into gully lands for a long time.

	
Cyclone Phet Satellite Image	Cyclone Phet Tracking and Prediction

Source: PMD

Figure 4.1.7 Images of Cyclone Phet that Hit Pakistan in 2010

Since Pakistan lies in sub-tropical arid to semi-arid zone, it is classified as a "water stress country by international standards". The livelihood and welfare of the people living in rainfed regions are particularly vulnerable to year-to-year fluctuation of precipitation, which is quite risky because average annual rainfall is only 500 mm and it is seasonal and uneven. In Pakistan, water is absolutely vital for rural life as 80% of rural population directly or indirectly depends on the agriculture sector.

Pakistan is also at considerable risk of landslide disasters. Sediment disasters are defined as the phenomena that cause direct or indirect damage to the lives and properties of people, inconveniences to the life of people, and/or the deterioration of the environment, through a large-scale movement of soil and rock. Damage due to these disasters occurs in several forms: 1) the ground on which buildings and farmland are situated are lost due to a landslide or an erosion; 2) houses are ruined by the destructive force of soil and rock during their movement; 3) houses and farmland are buried underground by a large-scale accumulation of discharged sediment; and 4) aggradation of a riverbed and burial of a reservoir caused by sediment discharge along a river system, which may give rise to flooding, disorder of water use functions, and deterioration of the environment. At all the places around mountain areas in Pakistan, landslide disasters are likely to occur as hazard due to particular orogenic phenomena and downspouts resulting in destabilization of the slope.

Almost all the semi-arid and arid areas of Pakistan are currently experiencing drought with varied intensities. The severe drought reaches its climax in low rainfall zones including most of Balochistan, southern parts of Sindh and southeastern parts of Punjab.

The annual total rainfall ranges between 35mm and 110mm whereas the annual loss of moisture through evapotranspiration reaches 2000 mm. The climate of these areas ranges from arid to hyper-arid where ratio of precipitation to evapotranspiration varies from only 1% to 10%. The mean annual rainfall fails to meet 75% to 90% of mean annual evaporation in these areas. In arid zone, crop production is uneconomical under rainfed conditions. During 1998-2001, rainfalls in Sindh and Balochistan were about 50% to 60% less than the historical rainfall. The underground and surface water resources depleted which added more miseries in the lives of people. The incidence of poverty increased and more white-collar employees fell below the poverty line.

As described above, Pakistan has always been hampered by meteorological disasters, such as floods, cyclones and droughts. However, there is no integrated statistical data accumulation system for disaster records in Pakistan. In this connection, the historical disaster data recorded by EM-DAT during recent decade is shown in Table 4.1.8 below:

Table 4.1.8 Summary of Meteorological Damage in Pakistan

Dates		Location	Sub-Type	Killed	Affected
Start	End		if any	Person	Person
Drought					
00/11/1999	00/00/2003	Thar, Kohistan, Kachoo	Drought	143	2,200,000
Extreme temperature					
00/05/2006	00/05/2006	Punjab, Sindh, Balochistan	Heat wave	84	100
13/06/2005	28/06/2005	Punjab, Sindh, Balochistan	Heat wave	106	200
01/05/2003	06/06/2003	Punjab	Heat wave	200	
00/12/2002	00/12/2002	Rivers plains in East	Cold Wave		
00/05/2002	00/05/2002	Center, South	Heat wave	113	24
00/01/2001	00/01/2001		Cold Wave		
00/06/2000	00/06/2000	Punjab	Heat wave	24	
00/04/1999	00/04/1999		Heat wave	11	
Flood					
15/08/2009	17/08/2009	Ismalia, Kalu Khan, Adina	Flash Flood	36	75,000
17/07/2009	19/07/2009	Karachi	Unknown	52	70
14/04/2009	14/04/2009	Mardan district	Flash Flood	14	10
09/08/2008	20/08/2008	Rajanpur district	Flash Flood	37	90,752
02/08/2008	04/08/2008	KPK	Flash Flood River Flood	36	200,012
24/05/2008	26/05/2008	Swat valley	Flash Flood	10	
10/08/2007	13/08/2007	KPK	Flash Flood River Flood	22	
10/08/2007	13/08/2007	Karachi, Sind province	City Flood	44	20
20/07/2007	20/07/2007	Oshai Darray (KPK)	Flash Flood	80	
16/06/2007	20/06/2007	KPK	Flash Flood	22	500
23/06/2007	25/06/2007	Karachi, Gadab town	City Flood	228	186
28/06/2007	22/07/2007	KPK	Flash Flood River Flood	130	2,000
03/08/2006	08/08/2006	KPK	Flash Flood River Flood	233	775
00/12/2006	00/12/2006	Kashmire	Flash Flood	20	
31/08/2006	11/09/2006	Punjab	River Flood	20	
28/07/2006	12/09/2006	Sindh	River Flood		
01/08/2006	22/08/2006	Karachi, Sindh, Katcha	?	74	5,050
24/07/2006	22/08/2006	Azad Kashmir, Muzaffarabad	Flash Flood River Flood	40	2,000
09/07/2006	13/07/2006	Govek, Faqir, Api (Waziristan)	Flash Flood	13	300
05/07/2005	14/08/2005	Punjab, Sindh	River Flood	42	58,020
21/06/2005	05/08/2005	Charsadda, Nowshera, Peshawar	Flash Flood River Flood	39	460,073
20/03/2005	24/03/2005	districts: Kohlu, Sibbi	Flash Flood	20	3,500
02/03/2005	08/03/2005	Qila Abdullah, Chaman, Gw	Flash Flood Coastal	15	5,000
09/02/2005	16/02/2005	Pasni Tehsil, Chaman,	Flash Flood Coastal	520	7,000,450
01/08/2004	08/09/2004	Sialkot District (Pasroor)	Flash Flood River Flood		
00/07/2004	00/08/2004		Flood	5	
05/09/2003	09/09/2003	Dir, Warri, Barkand, Gand			
15/07/2003	01/09/2003	Sindh, Balochistan, Punjab	River Flood		
22/07/2003	05/08/2003	Badin, Thatta, Larkana	River Flood	230	1,266,223
30/09/2002	30/09/2002	Sodi Jey Wali, Khorah Tra	Flash Flood	1	1,000
22/08/2002	28/08/2002	Peshawar and its surround	River Flood	22	3,010
15/08/2002	15/08/2002	Peshawar	Flash Flood	14	
22/07/2001	25/07/2001	Islamabad Capital Territory	Flash Flood	210	400,179
15/07/1999	15/07/1999	Sanjzvi, Dukki, Thal, Har		20	1,000
07/03/1999	07/03/1999	Dadu, Level 1 = Sind		14	43
Avalanche					
30/03/2007	02/04/2007	Chitral region (Hindu Kus)	Avalanche	43	3
27/12/2005	04/07/2006	Dassu (Kohistan district)	Avalanche	24	
Landslide					
21/03/2007	21/03/2007	Dir district (North)	Landslide	80	
05/01/2007	05/01/2007	Near Kotli (Kashmire)	Landslide	20	2
03/07/2006	04/07/2006	Ghaeel village (Kalam area)	Landslide	29	5
02/05/2003	02/05/2003	Ronala village (Kohistan)	Landslide	12	
00/07/2001	00/07/2001	Karachi, Hyderabad, Sukkar	Landslide	16	12
10/07/2001	10/07/2001	Chitta Katha, Kaghan valley	Landslide	15	
Storm					
26/06/2007	06/07/2007	Baluchistan, Sindh	cyclone Yemyin	242	1,650,000
00/01/2005	00/01/2005	Lwargi		58	
16/02/2003	22/02/2003	Baluchistan, Sindh		51	2,557
27/05/2002	27/05/2002	Punjab province	Local storm	14	12
28/03/2001	28/03/2001	Chak Miran (Punjab Province)	Local storm	4	500
13/08/1999	13/08/1999	Kasur (Near Lahore)		27	411
20/05/1999	22/05/1999	Thatta, Umer Kot, Mirpur	Cyclone 2-A	231	535,940

Source: EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be

In this project, disaster damage data survey was conducted by means of hearing from FFC, NHA, PMD, WAPDA, PID and district governments throughout the study in site. The collected data was compared with the EMDAT data. However, there are a number of inconsistencies between the EMDAT data and the collected data. Moreover, most of the government agencies have not recorded such disaster data. These results are described in the succeeding sections in this chapter.

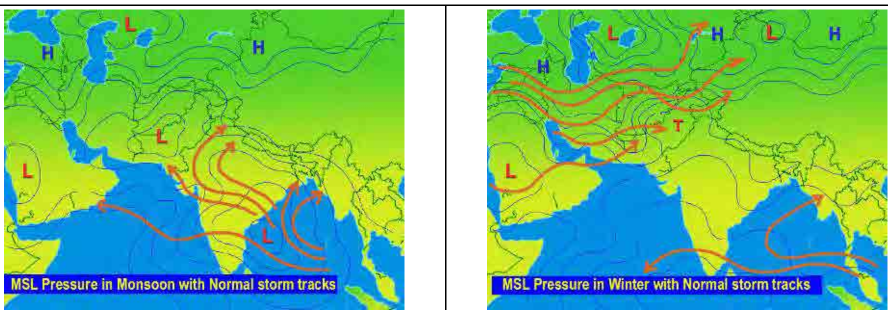
a. Atmospheric Pressure Patterns Causing Flood

The Indus River floods occurring from continual rain and flash floods in Pakistan are mainly caused by the monsoon conditions during the summer period from July to September. Officially, the flood season extends a little further to cater to any possible exceptions and covers the period from 15 June to 15 October. The official flood season beginning time has been changed from 15 June to 1st June on account of experience of 2010 unprecedented flash rains and floods. There are two situations which cause flood producing rains in the upper catchments of the rivers. The two meteorological situations in relation to different conditions of intensity and movement of monsoon low/depression may produce three categories of floods as described below.

Table 4.1.9 Two Climate Systems Resulting in Floods in Pakistan

Systems	Explanation	Relation with Flood
Westerly Wave	Eastward moving low pressure weather systems. Precipitation in winter (which is mainly in the form of snow) is on account of "Westerly Wave". During summer, the system weakens but is still effective. Snow deposited during winter becomes the major source of water supply into the rivers during summer.	Causing Category-I Flood (see Source: FFD-PMD Figure 4.1.8)
Monsoon System	Rainfall in summer is on account of the monsoon weather system. Unlike the westerly waves, the monsoon weather system is a low level weather system with heaviest rainfall limited to below five thousand feet elevation. Intensification of the monsoon weather system and the northward recurving of the monsoon depressions are due to the westerly waves.	Causing Category-II and Category-III Flood (see Source: FFD-PMD Figure 4.1.8)

Source: PMD and JICA Study Team



During Summer Season (Monsoon) | During Winter Season

Source: FFD-PMD

Figure 4.1.8 General Atmospheric Conditions in Pakistan

Category-I	Category-II	Category-III

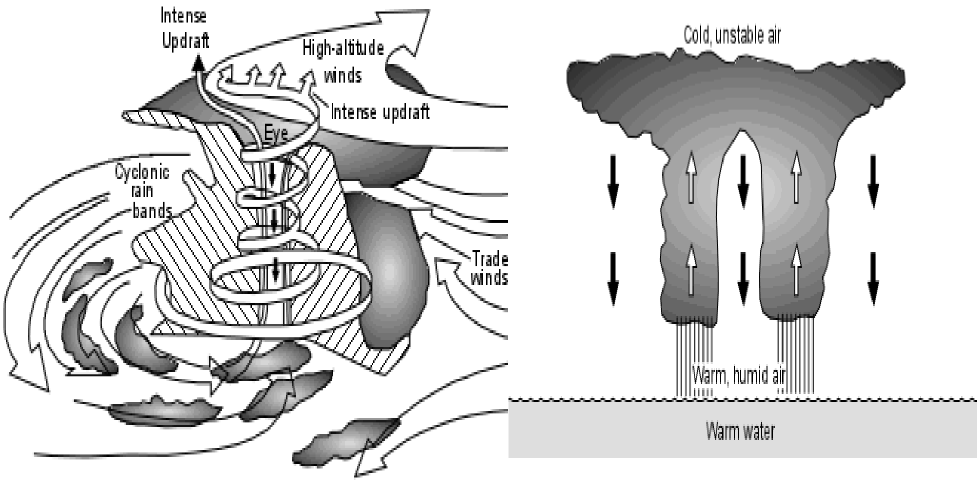
Source: FFD-PMD

Figure 4.1.9 Climate Situations Causing Floods in Pakistan

b. Cyclone Catalyst

An extra-tropical cyclone is a low/depression area of closed, circular fluid motion rotating in the same direction as the Earth's rotation. While tropical cyclones can produce extremely powerful winds and torrential rains resulting in heavy river flow and flash floods with related disasters, they are also able to produce high waves and damaging storm surge resulting in coastal floods and high tide.

The temperature of sea water where the cyclone is formed would have to be at least 26 degrees centigrade, and a higher temperature is more favorable for the evolution of cyclones. This warm water sustains instability, convection for further intensification, and keeps the tropical cyclone alive. Warm water accelerates the evaporation process and high temperature helps to intensify the system further by causing the surface atmospheric pressure to fall. Unstable atmosphere is required to continue thunder activity to make the environment favorable for a cyclone event by increasing the vertical current which lifts warm moist air beyond the level of condensation. The cool upper atmosphere and surface warm air increase the vertical temperature gradient to make the atmosphere unstable. The horizontal temperature gradient performs an equally significant role. Convergence at the surface, which is responsible in lifting up the warm and moist air, is intensified by strong divergence at 300 hpa and above. The latent heat released during condensation makes the divergence strong to remove/ disperse the air at the upper level. Consequently, the pressure at the surface falls further and intensifies the system. Strong divergence removes the air at the upper level, causing the pressure to fall at the surface, establishing higher surface pressure gradient which further intensifies the vertical current. As a result, the surface winds reach the level of cyclone.



Source: Muhammad Riaz, Chief Meteorologist, PMD

Figure 4.1.10 Structure of Cyclone

The frequency of tropical cyclone evolution by the climate developing system explained above has been influenced by the seasonal climate condition. As shown below, the season when the evolution of tropical cyclones occurs most frequently is between the monsoon and westerly wave seasons, that is, the months of June and October.

Source: Muhammad Riaz, Chief Meteorologist, PMD

Figure 4.1.11 Monthly Frequency of Tropical Cyclones and Depressions over the Arabian Sea (1891-2010)

c. Causes of Drought

Basically, drought might happen with the shifting climate conditions illustrated in Figure 4.1.8. Drought conditions appear over any of the vulnerable zones when the rain producing systems fail in succession. Winter rainfall generally fails when the tracks of western disturbances which move on to Pakistan from the west remain at a latitude of 35°N or higher. Under such a situation, no secondary western disturbances form below 30°N and, consequently, Sindh Province and parts of Balochistan can go completely dry. This situation has been found to occur quite often. The situation gets aggravated if the subsequent months of April and May also go completely dry and temperatures become very high, which is a normal feature of these months. Evapotranspiration tremendously increases and results in perpetual drought. During the summer months of June to September, if a monsoon low or monsoon depression which forms over the Arabian Sea or over the Bay of Bengal fails to reach Pakistan, the monsoon rains would be very scanty including in the northern parts of the country which include northern divisions of Punjab, parts of KP and GB. In fact, the rains over these areas occur due to the incursion of southwest winds from the Arabian Sea when these are accentuated due to the passing western disturbances. Conditions further worsen if the failure of summer rains is further supplemented by no rains during October and November, as was the case in 2001 in the Cholistan region wherein tribes and nomads had to move to other places and the Government had to take emergency measures during the drought period.

The El Niño and La Niña phenomena are the recent discoveries in the science of meteorology. These are abnormal weather phenomena. Whenever they appear, they change the weather patterns over the globe. There have been two strong El Niño events recorded in Pakistan. The first occurred in 1982-1983. The monsoons in 1983 failed badly. The second was in 1997-98, but there were no significant flood events in 1998 unlike those in the year 1983. Such a striking resemblance is something thought provoking and needs to be further examined. Similarly La Niña at times becomes a source of abnormal weather and may bring drought conditions.

The summary of the causes of drought is outlined below:

- Winds carrying continental, rather than oceanic air masses (i.e., reduced water content);
- El Niño (and other oceanic temperature cycles);
- Deforestation; and
- Global warming, (there is some speculation that it will have a substantial impact on agriculture throughout the world, and especially in developing nations).

3) District-Wise Disaster Records (interview survey by JICA)

The JICA Study Team has independently collected the district-wise disaster records through an interview survey to grasp the situation of district-wise historical disaster records as follows:

Table 4.1.10 Interview Survey for the Collection of Disaster Damage Records by JICA

Item	Descriptions
Targeted Districts	The districts designated as the "50 Vulnerable Districts" by NDMA
The No. of Districts of which interview survey has been obtained	37 Districts

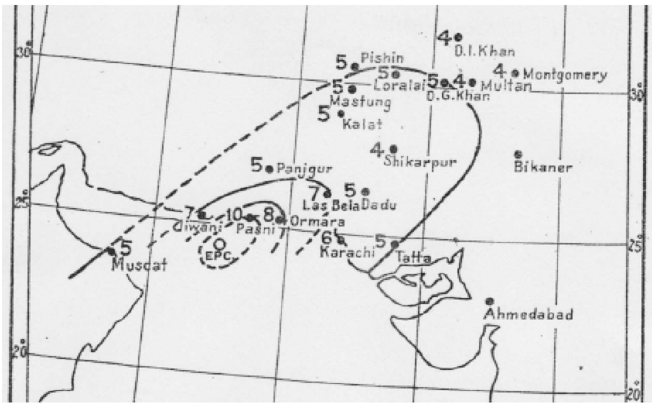
The summaries of results are shown in Appendix 4.1.1 in detail. However, these records can not be utilized for detailed hazard and risk assessment but for general identifications of flood and other damages.

4.2 Earthquake and Tsunami

4.2.1 Existing Condition

1) Isoseismal Maps

An isoseismal map due to major earthquake can be estimated through post-earthquake damage surveys in the field. It illustrates the spatial distribution of seismic intensity due to an earthquake and can serve as basic information to study earthquake disaster, combined with damage statistics. In Pakistan, the isoseismal maps are estimated for the 1945 Makran earthquake, the 2002 Nanga Parbat Haramosh earthquake (Khwaja et al., 2003[8]), and the 2005 Kashmir earthquakes, as shown in Figure 4.2.1 to Figure 4.2.2.

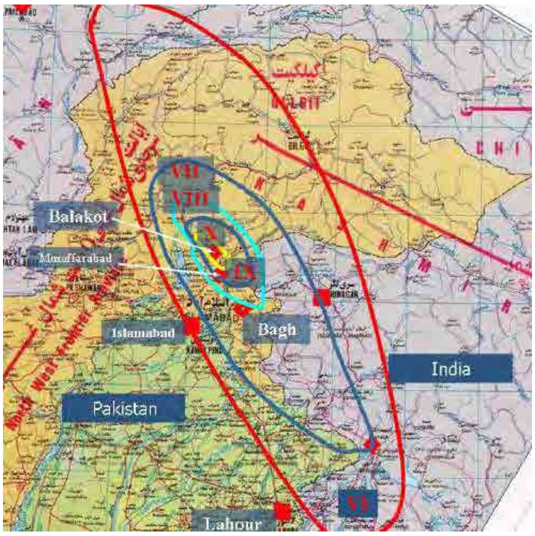


Source: India Meteorological Department, 1946[9]

Figure 4.2.1 Isoseismal Map for the 1945 Makran Earthquake

[8] A. A. Khwaja, MonaLisa, S. A. Khan, Q. Z. Chaudhry, M. Rafiq & A.T. Khan, 2003, Recent Seismic Activity Along the Western Margin of the Nanga Parbat Haramosh Massif, Pakistan, Islamabad J. Sci. Vol. 13 (1).

[9] India Meteorological Department, 1946, Scientific Notes Vol. X, No.125, The Makran Earthquake of the 28th November 1945



Source: S. Eshghi and M. Zare, October 2008, IIEES[10]

Figure 4.2.2 Isoseismal Map for the 2005 Kashmir Earthquake

2) Post-Earthquake Damage Survey

The post-earthquake damage survey gives an opportunity to draw lessons from earthquake disaster. In Pakistan, a detailed damage survey was conducted by ADB and World Bank after the 2005 Kashmir earthquake. Table 4.2.1 shows damage statistics by district obtained from the damage survey. Additionally, representative seismic intensity for each district was read from the isoseismal map using GIS and added for reference.

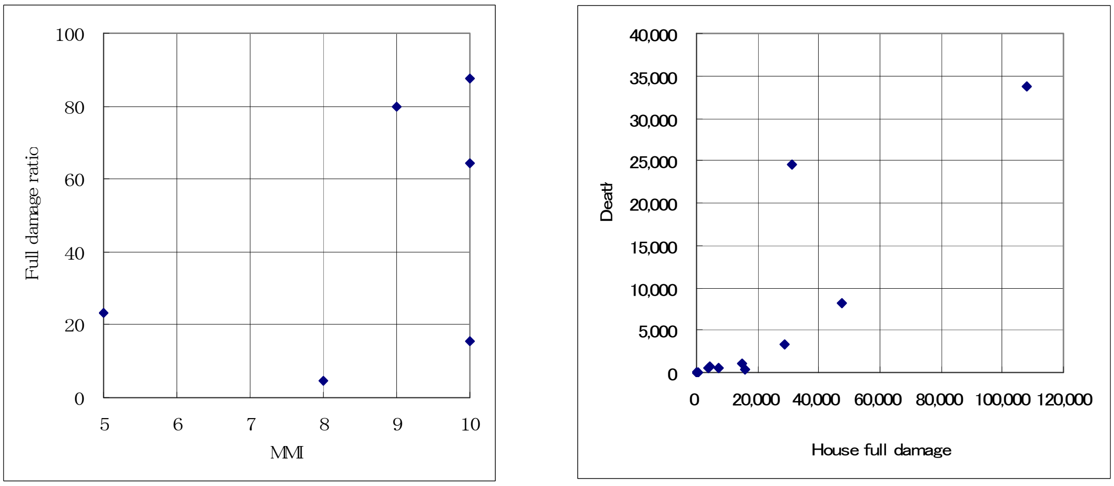
Table 4.2.1 Damage Statistics from the 2005 Earthquake

		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[11], Census data, 1998.

[10] S. Eshghi and M. Zare, 2008, Iso-seismal map of Balakot, Muzaffarabad earthquake of 8 October 2008, IIEES
[11] ADB-WB (2005), "Preliminary Damage and Needs Assessment – Pakistan 2005 Earthquake", prepared by Asian Development Bank and World Bank, Islamabad, Pakistan, November 12, 2005.

The correlation between seismic intensity and full damage ratio of houses is plotted in Figure 4.2.3. The number of fully damaged houses is plotted vs. number of deaths in Figure 4.2.3, which shows a good correlation.



Source: ADB and WB, 2005[12], Census data, 1998

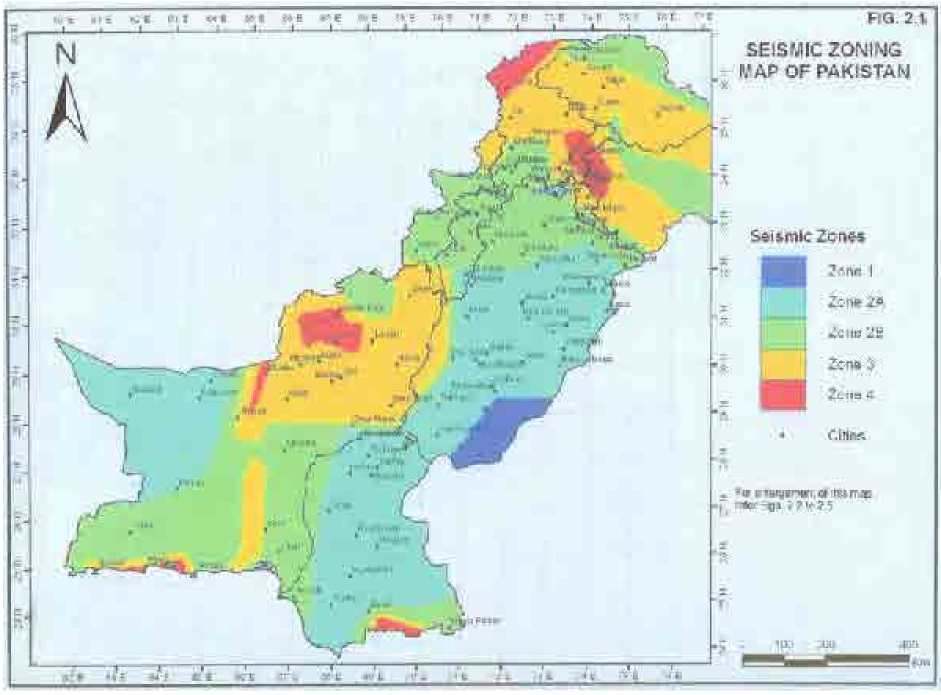
Figure 4.2.3 Relationship Between Seismic Intensity and Fully Damaged Houses (left), and Fully Damaged Houses and Number of Deaths (right)

4.2.2 Hazard and Vulnerability Analysis Results

1) Seismic Hazard Maps

A seismic hazard map on a regional scale including Pakistan was developed by the Global Seismic Hazard Assessment Program (GSHAP) during 1992-1999. In Pakistan, the national seismic zoning map was developed during the process of elaborating the building code in 2007, by the Ministry of Housing and Works, as shown in Figure 4.2.4.

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



Source: Building Code of Pakistan

Figure 4.2.4 Seismic Zoning Map of Pakistan

Seismic hazard maps on a local scale are also developed. ERRA had developed probabilistic seismic zoning maps in earthquake affected areas, and seismic hazard microzonation map for Balakot and Muzaffarabad.

NDMA develops 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 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[13]).

It is expected that these hazard maps and scenarios will be reflected in the local disaster management plan in the future.

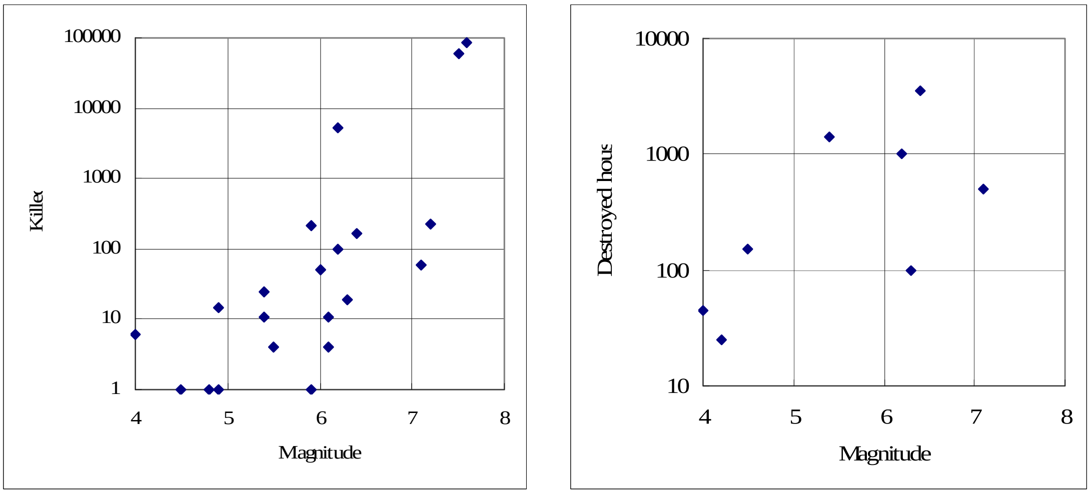
2) Relationship Between Magnitude and Casualty and Destroyed Houses

Using available data on earthquake damage in Pakistan, the relationship between earthquake magnitude and the number of killed victims and the number of destroyed houses was studied. Here, data from NGDC is used, since the data set includes magnitude and various damage data.

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

The result is plotted in Figure 4.2.5 Due to the limitation of available data, the number of plotted data for casualties is 21, and for destroyed houses is 8.

There seems to be some correlation between magnitude and number of casualties and destroyed houses. Correlation between magnitude and casualties is 0.57, and between magnitude and destroyed houses is 0.44. It is expected damage data will be accumulated in the future as well.



Source: NGDC and JICA Study Team

Figure 4.2.5 Relationship Between Earthquake Magnitude and the Number of Casualties (left) and Destroyed Houses (right) in Pakistan

Regarding the relationship between earthquake magnitude and economic loss, available data is very limited and varies greatly. Therefore, it is not possible to examine such correlation.

3) Census Data Analysis

The last census in Pakistan was conducted in 1998. Census data contains information on buildings, such as material used in outer walls, material used in roofs, and period of construction. Table 4.2.2 to Table 4.2.4 show the ratios of different types of outer walls, roofs, and period of construction in national scale, respectively. Distribution of types of material and period of construction for each district is shown in GIS maps.

As the strength of the house against earthquake is closely related to material and period of construction, this information can be a reference to evaluate overall vulnerability of houses. Detailed field survey to build an inventory of buildings, as conducted in earthquake risk study in Muzaffarabad and Mansehra by NDMA, will be necessary.

Owned housing built more than ten years shares a majority of 55.9%, which means they were built before 1988. As previous building code was issued in 1986, most of the houses would have been built prior to the 1986 code. Generally, older building code requires less seismic force for the building design than does the newer one. Besides, older building becomes vulnerable due to the aging, this statistics demonstrates that majority of houses are potentially vulnerable to earthquake.

Table 4.2.2 Types of Material Used in Outer Walls

Housing units by material used in outer walls	Ratio (%)	Number
Baked bricks/ Blocks/ Stones	58.5	11,230,921
Unbaked bricks/ Earth bound	34.5	6,624,295
Wood/ Bamboo	5.4	1,041,823
Others	1.6	314,699
Total	100.0	19,211,738

Note: RCC: Reinforced Cement Concrete, RBC: Reinforced Brick Concrete
Source: Census data 1988

Table 4.2.3 Types of Material Used in Roofs

Housing units by material used in roofs	Ratio (%)	Number
RCC/ RBC	21.4	4,110,266
Cement/ Iron sheets	13.1	2,511,750
Wood/ Bamboo	57.3	11,017,601
Others	8.2	1,572,121
Total	100.0	19,211,738

Source: Census data 1988

Table 4.2.4 Period of House Construction

Owned housing units by period of construction	Ratio (%)	Number
Under construction	0.9	138,162
Less thab 5 years	18.2	2,839,381
5 to 10 years	25.0	3,904,829
More than 10 years	55.9	8,714,883
Total	100.0	15,597,255

Source: Census data 1988

4) Tsunami Numerical Simulation

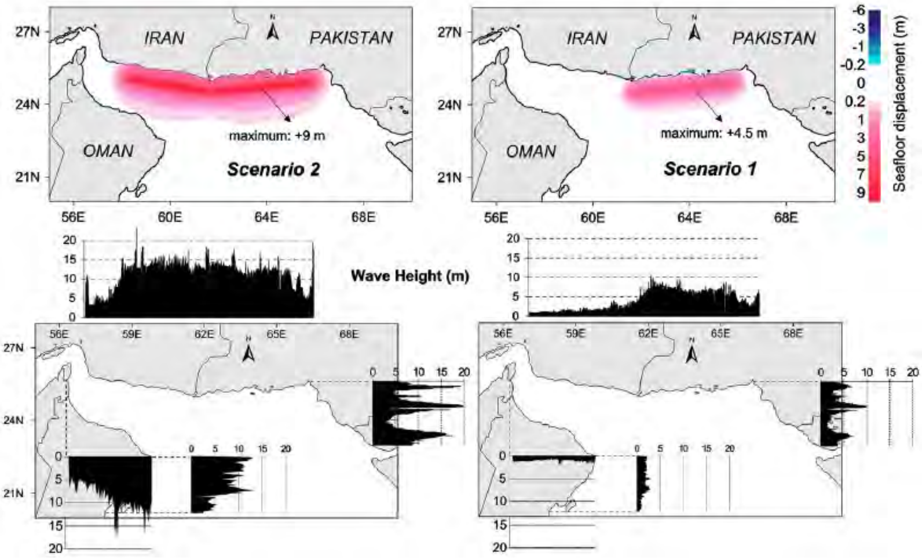
In Pakistan, a numerical simulation of tsunami was conducted by PMD to develop an inundation map in Gwadar (Rafi et. al., 2010[14]). The simulation assumes an earthquake with Mw 8.5 magnitude, located 120 km away from the coastline.

The result shows that the first tsunami wave arrives to Gwadar in 22 minutes, and the maximum run up at Gwadar is approximately 3.7 m. The maximum possible time duration for tsunami existence is 2 hours and 30 minutes approximately. It also estimates that maximum flow depth could be 5 m, and maximum inundation distance at Gwadar could be up to 1.46 km. It is pointed out that high resolution bathymetry data with topography is important to improve accuracy of simulation.

[14] Zahid Rafi, Nasir Mahmood, 2010, Numerical modeling of Tsunami inundation for potential earthquake at Makran subduction zone – A case study for Gwadar coast area

Iranian researchers also conduct numerous studies regarding tsunamis in the Arabian Sea, as mentioned in section 4.1, as well as numerical simulation considering the worst case scenario along the Makran coast.

The study for the worst scenario assumes an event with Mw 8.6 and Mw 9, as shown in Figure 4.2.6. Scenario 1 produces wave heights up to 10 m along Pakistan coasts, and scenario 2 causes wave amplitudes of 12 - 15 m and horizontal penetration of 1 - 5 km in various coasts.



Source: M. Heidarzadeh et al., 2009[15]

Figure 4.2.6 Seafloor Uplift Due to Two Worst-Case Earthquakes (above) and Distribution of Maximum Positive Tsunami Wave Heights Along Various Coasts (below)

4.3 Flood and Sediment

4.3.1 Existing Condition

1) Introduction

Pakistan is vulnerable to disaster risks from a various range of hazards as mentioned in Section 4.1. Among these disasters, flood is the most devastating and damaging natural disaster and subsequently causes tremendous losses of human lives, infrastructures and natural resources. Floods occur normally in Pakistan due to tropical monsoon depression systems that originate from the Bay of Bengal during the months of July to September. The depressions pass over central India and Rajpuntana and enter Pakistan and go towards the North into Kashmir.

The mountain ranges in the extreme north of Pakistan, such as in the regions of GB, AJK, KP and the Federally FATA, provide a perennial source of inflow into the rivers which finally join the

[15] Mohammad Heidarzadeh, MoharramD.Pirooz, and NasserH.Zaker, 2009, Modeling the near-field effects of the worst-case tsunami in the Makran subduction zone, Ocean Engineering36, 368–376

Indus River and flow into the Arabian Sea. In particular, floods hit the plains of Punjab and Sindh while hill torrents tend to affect the hilly areas of KP as well as FATA, Balochistan, AJK and GB.

In July 2010, unprecedented heavy monsoon rains began in the northern part of Pakistan and the floods affected the regions of GB and KP. In early August 2010, the heaviest flooding moved southward along the Indus River from the severely-affected northern regions toward western Punjab, and Sindh, as well as parts of Balochistan. This flood was the worst, affecting around 160,000 km^2 (1/5 of Pakistan's total land area). According to NDMA, the floods have affected over 14 million people with 1,825 deaths, 157 missing and around 3,000 injured; over 1.9 million houses were damaged; and over 6.3 million acres (2.57 million ha) of cropped areas were destroyed as of October 4, 2010. More details of the 2010 flood will be described in this subsection 4).

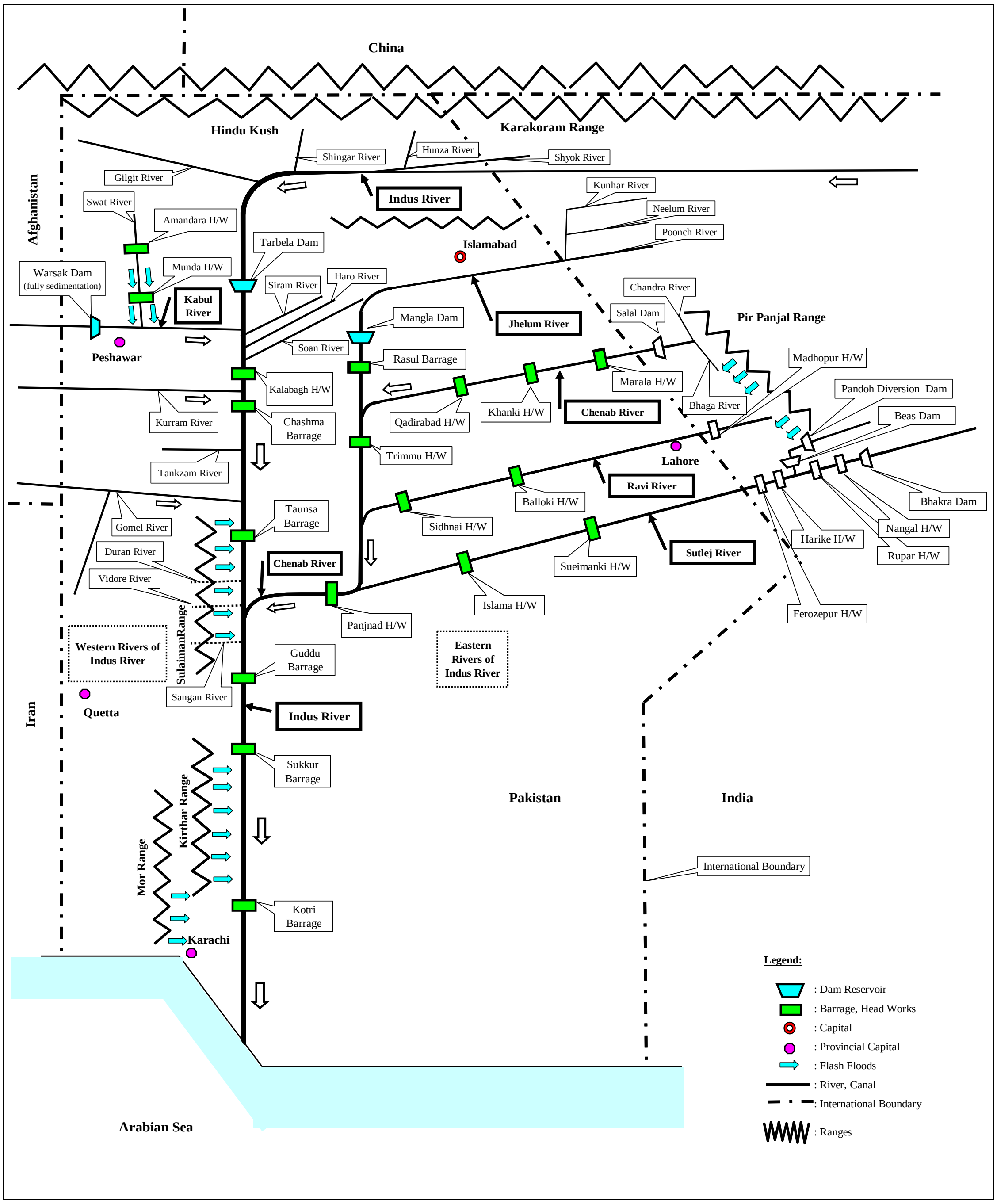
In Sindh Province, most of the low-lying area was flooded due to the heavy downpour by the strong monsoon condition from August to September in 2011. The floods have caused huge damage (466 people was killed, approximately 9.2 million people were affected and 232 thousand people were evacuated in relief camps with 6.1 million acres inundated. Out of inundated areas, 2.3 million acres of cropped areas were damaged.[16] The monsoon caused damages in not only Sindh but also eastern Balochistan and southern Punjab.

2) River System

The Indus River system[17] comprises the main river Indus and 13 tributaries in the hilly areas from the west and 14 in the plains. The rivers in the hilly area are named Shyok, Shigar, Gilgit, Hunza (GB), Swat, Kabul, Kurram, Tankzam, Gomel Zam, Darban (KP), Duran, Vidore, Sagam (Punjab/Balochistan). The Jhelum, the Chenab, the Ravi, the Beas and the Sutlej join the Indus from the east. Besides these five main rivers, the other rivers from the east, the Siram, the Haro, and the Soan, directly join the Indus, while the Kunhar, the Neelum and the Poonch join the Jhelum. The Chandra and the Bhaga converges into the Chenab. The river system provides nearly 60%[18] of the water utilized for irrigation.

A schematic diagram of the Indus River Basin in Pakistan is shown in Figure 4.3.1. The Indus River system with its principal tributaries in Pakistan is described below.

16 Summary of Losses / Damages due to Rain in Sindh-2011 (NDMA as of Nov.30 2011)
17 "The Indus Basin" History of Irrigation, Drainage and Flood Management, International Commission on Irrigation and Drainage (ICID), 2004
18 "Country Study for Japan's Official Development Assistance to the Islamic Republic of Pakistan" -Development toward a Sustainable Society: Medium- and Long-Term Perspectives-, JICA, November 2003



Source: Federal Flood Commission (FFC)

Figure 4.3.1 Schematic Diagram of Indus Basin River System

a. The Indus - Main

The Indus River originates from a spring called Singikabad near Mansarowar Lake on the north side of the Great Himalayan range in Kailash Mountain in Tibet at an altitude of 5,494 masl. The river is nearly 2,880 km long up to the Arabian Sea. The whole basin of the Indus River drains a total area of 1.15 million km2. Of the total catchment area, an area of around 0.44 million km2 is mountainous. The total population in the Indus River region is roughly estimated at 90% of the total population (180 million in 2008) in Pakistan.

The regional characteristics of natural hazards in Pakistan within the Indus River system are summarized below in terms of topographic and meteorological aspects, and causes of flood.

i) Gilgit-Baltistan (GB) Region

The northern areas of the Indus River are affected by westerly low pressure waves, which deliver precipitation (snow in winter and rain in summer), especially heavy snow falls over the mountain ranges of Hindu Kush, Karakoram, of which the highest peak is K2 (8,619 masl) and North-West Himalaya, of which the highest peak is Nanga Parpat (8,125 masl). The average maximum daily rainfall is less than 50 mm, and possibilities of flash floods are assumed to be low. The possibility of flash floods becomes high when there are heavy snowmelts, breach of natural dams filled by landslides and GLOFs.

ii) KP & FATA

The Indus River and its tributary Kabul flow through the regions of KP and FATA. The north part of KP and FATA is affected by the westerly waves, which deliver snow falls in winter and rainfalls in summer; especially it seems that these waves deliver heavy snow falls over the mountain ranges of Hindu Kush (the highest peak is Tirich Mir (7,708 masl)) in Chitral district. Peshawar and Chenab districts have high possibility of flood and flash floods caused by snowmelt from the Kabul River and tributaries from the northern part, and also flash floods from tributaries. The upper basin of the Kabul River is located in Afghanistan and no hydro-meteorological data is available. At the southern end of KP and FATA, at D.I. Khan, summer monsoon rain dominates. In the plain area, the average annual rainfall is about 300 mm, but the watersheds of tributaries are located in the Sulaiman Range over 3,000 masl, where the watersheds receive more rainfall and have a high possibility of causing flash floods. The area is vulnerable to floods/flashfloods, but lack meteorological facilities, forecasting/ warning systems and fundamental flood control facilities against flood/flashflood. The area must establish flood/flashflood warning systems especially for Swat, Chitral and Kabul Rivers, which bring heavy flooding through snow melting as well as rainfall, and also for and Kurram Rivers and hill torrent areas of D.I.Khan.

iii) Azad State of Jammu & Kashmir (AJK)

AJK region belongs to the Jhelum and Chenab rivers of the Indus River basin. AJK is located in the south side of the North-West Himalaya, of which the highest peak is Nanga Parpat (8,125 masl). The area is affected by both the westerly waves and south-west monsoon, and there summer monsoon rains are dominating. The gauging station of Muzaffarabad is recording average annual rainfall amounts of 1,547.0 mm. Heavy snow melt from Jhelum basin and heavy rainfall in the watershed of tributaries are causing floods and flash floods. The priority districts for floods should also consider risks of flash floods from tributary basins.

iv) Punjab

The main tributaries of the Indus River basin from the east in Pakistan are Jhelum, Chenab, Ravi and Sutlej rivers in Pakistan. The northern part of Punjab plain receives rainfalls all year round, but summer monsoon rains are dominating. In Punjab plain, Indus and major rivers (Indus. Jhelum, Chenab, Ravi and Sutlej) flow through. However, according to the Indus Treaty which was signed in September 1960 between India and Pakistan, waters of the three eastern rivers of Ravi, Beas and Sutlej are reserved for exclusive use of Pakistan. In order to restore water to the canal system fed by the three eastern rivers, the Indus Basin Project was commenced by Pakistan in February 1960. The project planned the construction of two storage dams, Mangla Dam on River Jhelum and Tarbela Dam on River Indus, five barrages, one gated siphon and eight inter river link canals of 590 km in length. Among the major rivers in Punjab Plain, the upper reaches of Jhelum, Chenab, Ravi and Sutlej are located in India and are not accessible to meteorological and hydrological data. Among six major rivers, Indus and Jhelum rivers have large reservoirs (Tarbela and Mangla Dams) and are able to control floods with proper flood forecasting. For effective use of the flood control functions of Tarbela and Mangla Dams, accurate flood forecasting will be required in order to protect people in the flood risk areas of Indus and Jhelum rivers. Chenab, Ravi and Sutlej have no flood control facilities, and present flood forecasting systems are base for flood risk management and flood risk reduction measures. Gujrat and Sialkot districts are selected as priority districts for flood risks but have a high possibility of flash floods from Pir Panial Range in India and the mountain range with heavy rainfalls. D.G. Khan and Rajanpur, which are located at the foot of the Sulaiman Range of the western periphery of Punjab plain, have suffered from hill torrents. The districts have a high risk of hill torrents and flash floods. Punjab Plain is covered by the canal irrigation system. However, average annual rainfalls of districts in the southern Punjab are as low as 100~200 mm and there are months which have no rainfalls.

v) Balochistan

There is no permanent river but only seasonal river in the region. Balochistan as a whole receives less annual precipitation than others and has months which have no rainfall at all. Around Quetta, the northeast part of Balochistan receives average annual rainfall of 282 mm and winter rain is dominating; Barkan and Khuzdar in the eastern periphery area, where the Sulaiman Range (the highest point: 2,328 masl) is located at the border with Punjab and Kirthar Range (the highest point: 2,174 masl), located at the border with Sind, have both winter rains and summer rains, but summer rains are dominating, and may be affected by monsoon rains. The area has flash flood risks; Pasni and Punjgar, located in the western coastal and inland areas of Balochistan, receive less than 100 mm of average annual rainfall.

vi) Sindh

This region has the Indus River basin only. The area is classified as arid and receives an average of less than 200 mm of rainfall yearly. Monsoon and cyclone rains are dominating, but there are months which have no rainfalls. Sindh has flood problems from Indus and also flash floods from tributaries and urban storm water. Tributaries which have watersheds in mountain ranges at western periphery areas of the Kirthar Range and Mor Range have flash flood risks.

b. Kabul River

The Kabul River originates in and drains the south-eastern slopes of the Hindu Kush range in Afghanistan and Chitral valley in Pakistan. The length of the river is 480 km with a total catchment area of 77,850 km2 traveling through Afghanistan. The catchment area of the Kabul River and its tributaries in Afghanistan is about 67,400 km2 and the remaining 10,450 km2 is in Pakistan. It reaches the Warsak Dam located 42 km down the border and joins the Indus near Attock.

c. Jhelum River

The Jhelum rises from a large spring at Verinag at the upper end of the valley of Kashmir. The river flows to Mangla reservoir and thereafter into Punjab plains, until it reaches Trimmu to join the Chenab River. The total length of the Jhelum is 810 km. The catchment area from Baramulla (India) to Muzaffarabad is 62,720 km2.

d. Chenab River

The Chenab River, biggest of the five eastern tributaries of Indus, originates in Himachal Pradesh where its two upstream branches – the Chandra and the Bhaga rise on opposite sides of Baralacha Pass (4,880 masl). The Chenab River eventually joins the Indus below Panjnad near Mithankot. The total length of Chenab up to its confluence with Indus at Mithankot is 1,361 km. Its catchment area is 66,760 km2.

e. Ravi River

The Ravi River is the smallest catchment of the Punjab rivers. It rises near the Rohtang Pass in Kangra and drains the southern slopes of Pir Panjal and northern slopes of Dhauladhar. The river runs parallel to the boarder for another 93 km, until it enters Pakistan about 32 km above Lahore. The river then continues across the plains until it meets the Chenab about 64 km below Trimmu. The total length of the river is 894 km with a catchment area of 39,680 km2.

f. Sutlej River

The Sutlej River rises in the highlands of Western Tibet in the Kailash mountain range, near the sources of the Indus, the Ganga and the Brahmaputra rivers. The river enters Pakistan below Ferozepur and eventually joins the Chenab, 4.8 km above Panjnad. The length of the river is 1,542 km, with a catchment area of 120,572 km2, and is the longest of the Punjab rivers.

3) Flood Damage Data Collection in FFC and by the JICA Study Team

a. Available Records of Past Flood Damages and Amounts

Historical records of flood damages in Pakistan are contained in the annual flood reports published by FFC, as shown in Table 4.3.1. The table shows there have been five major flood events – in 1950, 1973, 1976, 1992 and 2010 – which caused many deaths and huge losses to the national economy. Total damage to property by the destructive major floods in Pakistan has reached over Rs.400,000 million since 1950.

As to flood damage costs, however, it is revealed that, except for the total values of property damaged indicated in Table 3.4.1, there are no other flood damage costs or amounts estimated for respective annual floods, and no data of district-wide flood damage amounts is completely available in the office of FFC. For example, flood damages to water-related structures like irrigation, drainage, and flood protection facilities are estimated by respective Provincial Irrigation Departments (PIDs) in the aftermath of floods.

It is noted that in the wake of the floods, a related agency (like NDMA, FFC) for the flood and sediment disaster management should be responsible for monitoring of the reporting process among MDNA, PDNA, and NDMA-FFC regarding flood losses/damages, and keeping of the electronic records of damage data, maps, etc. The data keeping of flood records is very important.

As to the annual flood reports since its establishment in 1977, FFC has published the annual flood reports since 1998. The report contains the flood control objectives and their needs, requirement of flood management, functions of FFC, activities and achievements for each year, future planning in the flood sector, etc. The report also presents the role of various departments/agencies, flood warning dissemination system during the flood season, overall assessment of the previous year's monsoon season as well as country-wide losses/damages and number of rivers experiencing flood situations, maximum discharges experienced by the Indus River Basin, and comprehensive 10-year flood projection plan.

Table 4.3.1 Historical Flood Damages in Pakistan

Year	Value of Property Damaged (Rs in Million)		Lives Lost (persons)	Villages Affected (number)	Rivers Mainly Affected
	Unadjusted	Adjusted			
2011	Estimation		**466**	**33,933**	Whole of Sindh, parts of Balochistan / Punjab
2010	Estimation		**1,825**	**14,316**	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		**385,821.00**	**8,062**	**100,743**	

Source: Federal Flood Commission (FFC)

b. Further Collection of Past Data on Flood Damages

Under such circumstances, based on the request of the JICA Study Team, the following correspondences have been sent regarding data collection of the past flood damages and estimated costs district-wide for all the provinces in Pakistan.

Table 4.3.2 Further Collection of Past Flood Damage Data

Date		Correspondence Records
a) July 08	:	from JICA Study Team to FFC regarding data of flood damages and costs
b) July 28	:	from FFC to F/G/S/PDMA Punjab, Sindh, KP, Balochistan, GB, AJK, and FATA
c) August 16	:	from FFC to F/G/S/PDMA Punjab, Sindh, KP, Balochistan, GB, AJK, and FATA
d) September 27	:	from FFC to WCAP study team to include the data collection of flood damages and costs for JICA Study Team (refer to the above item a)) to the study on Water Statistics of Pakistan being undertaken by WCAP, sponsored by WB

Note: WCAP means Water Sector Capacity Building and Advisory Services Project.

According to FFC, it was anticipated that the collection of past data on flood damages as well as estimated costs which was now undertaken by WCAP, financed by WB, was to be finalized by the end of December 2010. However, to date, WCAP has not undertaken the task and FFC has not taken any action on this matter as of the end of February 2011.

4) The 2010 Flood Event

Pakistan experienced extraordinary rainfall beginning in late July 2010, which continued until September 2010. The result was unprecedented floods affecting the entire length of the Indus Basin in the country. The floods have been assessed to be the worst since 1929. According to the NDMA, the rain/floods have affected over 20 million people. Riverine floods, flash floods and landslides triggered by the rain caused severe damage to infrastructure in the affected areas.

Hereunder, based on the Damage, Needs and Assessment (DNA) Report[19], the 2010 flood event is mentioned in terms of experienced records of rainfall, flood discharge peak, flood damage reporting mechanism of NDMA- F/G/S/PDMAs -DDMA, classification of districts affected, and province-wise flood losses/damages.

a. Rainfall

The monsoon heavy rain started on 27 July 2010 in Khyber Pakhtunkhwa Province and stopped on 30 July 2010. As shown in Table 4.3.3, the rainfall gauging stations of Dir, Lower Dir, Saidu Sharif, Peshawar, Kohat, Cherat and Risalpur recorded a daily rainfall volume of more than 100 mm on 29 July 2010. The highest volumes were recorded at Risalpur Station at 280 mm/day and 401 mm per the two days of 29 and 30 July.

[19] Report on "Pakistan Floods 2010, Preliminary Damage and Needs Assessment (DNA), ADB, WB, November 2010"

Table 4.3.3 Daily Rainfall Record During Monsoon 2010 in KP, GB, and AJK

Province	July							August					July Monthly Average
Stations	25	26	**27**	**28**	**29**	**30**	31	1	2	3	4	5	
Gilgit &Baltistan													
Astore	0	0	0	2	14	21	6	2	0	0	0	0	*25.5*
Bunji	0	0	0	6	0	11	3	TR	0	0	0	0	*18.8*
Chilas	0	0	0	2	8	26	4	0	0	0	0	0	*14.1*
Garhi Dopatta	0	0	15	116	26	189	0	0	13	35	15	0	*265.6*
Gupis	0	0	0	2	32	20	0	0	0	0	0	0	*14.0*
Gilgit	0	0	0	5	11	14	6	TR	0	0	0	0	*16.2*
Azad Kashimir													
Kotli	0	55	0	103	6	47	12	37	0	3	1	1	*285.8*
Muzaffarabad	0	3	35	91	59	103	1	1	1	31	1	0	*359.4*
Rawalakot	0	0	2	105	19	171	0	0	2	5	6	2	*n.a.*
Pattan	0	0	1	52	97	84	8	0	0	1	6	0	*n.a.*
Khyber Pakhtunkhwa													
Chitral	0	0	0	6	41	13	0	0	0	0	0	0	*5.5*
Dir	0	0	25	57	149	0	0	0	4	0	1	0	*154.1*
Lower Dir	0	0	6	0	192	71	0	0	0	0	0	0	*n.a.*
Saidu Sharif	0	0	4	44	187	103	0	0	0	0	43	10	*152.6*
Peshawar	0	0	TR	TR	274	59	0	0	0	0	0	0	*46.1*
Balakot	0	0	71	45	45	90	5	3	0	0	6	9	*372.0*
Kohat	0	0	32	0	233	29	0	0	0	0	0	4	*n.a.*
Bannu	0	0	0	7	84	1	0	0	4	0	0	0	*n.a.*
Cherat	0	0	1	33	257	81	0	0	0	0	0	0	*93.4*
D.I.Khan	0	0	0	0	0	3	0	0	35	2	0	0	*60.5*
Kakul	0	0	1	31	35	124	0	0	5	0	0	4	*263.6*
Drosh	0	0	0	23	61	15	0	0	0	0	0	0	*22.1*
Risalpur	0	0	9	5	**280**	121	TR	0	0	0	0	0	*n.a.*

Notes: T.R. means rainfall was less than 1 mm, n.a means rainfall was not available.
Unit: mm (millimeter)
Source: Pakistan Meteorological Department (PMD)

b. Flood Discharge Peak

A comparison of historical maximum discharge peaks and the 2010 flood discharge peak is given in Table 4.3.4.

Table 4.3.4 Historical and 2010 Flood Discharge Peaks at Indus River Basin in Pakistan

River	Barrages/ Headworks	Designed Capacity	Historical Maximum Peak		Maximum-2010 Peak	
			Flood (outflow)	Date	Flood (outflow)	Date
Indus	Tarbela	1,500,000	875,000	1929		
			510,000	31-7-89	604,000	30-7-10
	Kalabagh	950,000	950,000	14-7-42	936,453	30-7-10
	Chashma	950,000	950,000	1958	**1,036,673***	1-8-10
			786,600	3-8-76		
	Taunsa	1,100,000	788,646	22-7-58	**959,991***	2-8-10
	Guddu	1,200,000	1,199,672	15-8-76	1,148,200	8-8-10
	Sukkur	1,500,000	1,166,574	15-8-76	1,108,795	10-8-10
	Kotri	875,000	981,000	14-8-56	939,442	27-8-10
Kabul	Nowshera	-	218,000	1965	**480,000***	29-7-10
Jhelum	Mangla	1,060,000	933,000	10-9-92	225,496	30-7-10
	Rasul	850,000	932,000	10-9-92	186194	01-8-10
Chenab	Marala	1,100,000	1,100,000	26-8-57	282,418	6-8-10
	Qadirabad	807,000	948,530	11-9-92	319,733	7-8-10
	Trimmu	645,000	943,225	8-7-59	323,026	11-8-10
	Panjnad	700,000	802,516	17-8-73	310,117	13-8-10
Ravi	Balloki	225,000	389,845	28-9-88	56,000	25-7-10
	Sidhnai	150,000	330,210	2-10-88	negligible	-
Sutlej	Sulemanki	325,000	597,000	8-10-55	negligible	-

Note: *Red-color boldface means a newly historical maximum peak of flood 2010.
Unit: Cusecs
Source: Federal Flood Commission (FFC)

In the Indus River, the 2010 flood peak at the Chashma Barrage and Taunsa Barrage were the highest and about 10% and 22% higher than the previous maximum peaks, respectively. The 2010 maximum peaks at barrages of Kalabagh (Jinnah), Guddu, Sukkur and Kotri were slightly lower than the historical peaks in the years 1942, 1976, 1956, respectively. In Kabul River, 480,000 cusecs (13,400m^3/s) at Nowshera became a new historical peak and just 220% higher than the previous record of 218,000 cusecs (6,170m^3/s) in 1965.

The hydrograph/ temporal variation of flood wave of flood 2010 in the Indus River is shown in Figure 4.3.2. The graph presents flood discharge peaks, travel time and duration at the main dams/ barrages of Tarbela, Kalabagh (Jinnah), Chashma, Taunsa, Gudu, Sukkur, and Kotri in the Indus River. It is noted that there were:

1) a bigger flood wave peak (480,000 cusecs) at Kabul river at Nowshera than that (132,000 cusecs) at Kabul river at Warsak on 29 July 2010,

2) it took the flood peak 3 days to travel from Nowshera to the Taunsa Barrage, 9 days before it reached the Guddu Barrage and 28 days before it reached the Kotri Barrage (due

to the longer travel time of the floods, the response time to evacuate in Punjab and Sindh is longer than that in KP),

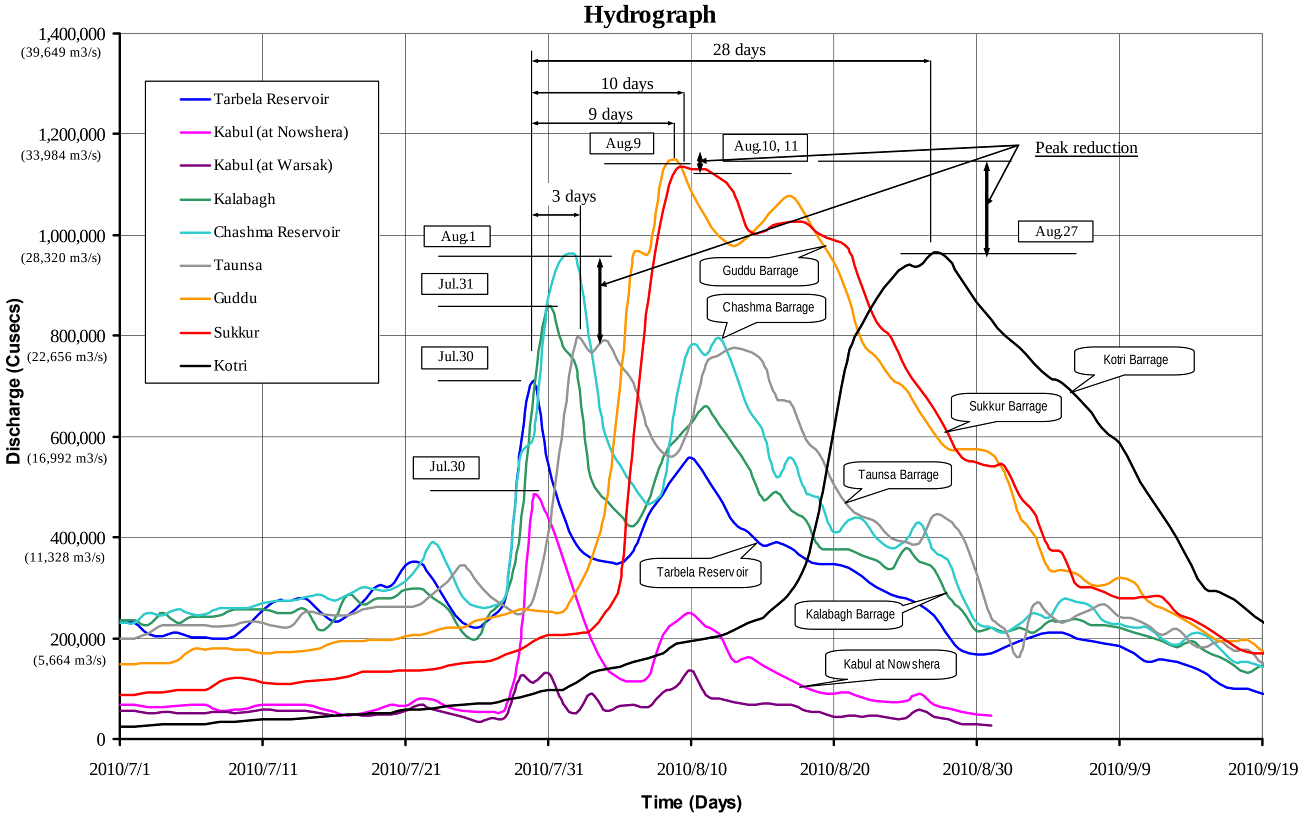
3) two flood wave peaks between a period of about 9~10 days at Kalabagh, Chashma and Taunsa barrages,
4) only one peak but long period wave (about two weeks) at Gudu and Sukkur barrages,
5) one wave peak at Kotri barrage but for a long period of about 10 days, and
6) three flood wave peaks at the downstream barrage were smaller than that at the upstream barrage like the peaks at Taunsa Barrage were smaller than at Chashma Barrage, Sukkar Barrage smaller than Guddu Barrage, and Kotri Barrage smaller than Sukkar Barrage. These reduced flood wave peaks at the downstream weirs seem to be due to breaches in flood protection embankments at the upstream weirs.

During the 2010 flood, major breaches occurred in the Indus River, but no damages to any barrages in the Indus River were reported as described below[20] (quoted from the report of “DNA, Irrigation, Drainage and Flood Sector, November 2010” and reports from FFC).

In Punjab, the breaches at the Kalabagh (Jinnah) and Taunsa barrages caused the main damages. Four breaches were made by blasting at the left guide bund of the river at the Jinnah barrage. Due to immense pressure of flood water and as a result of embankment breach upstream of the Taunsa barrage, the highest damage in Punjab occurred to the left marginal bund of the Taunsa barrage and then Muzaffargarh canal in Kot Adu and Muzaffargarh districts. Four breaches occurred at Taunsa- Punjnad link and six breaches at Muzaffargarh. The Punjab PID reported 367 damaged structures in seven irrigation zones.

In Sindh, due to heavy pressure on banks, five breaches (one in Punjab and four in Sindh) occurred both at the left marginal bund and at old bunds and loop bunds at the right downstream bank of the Guddu barrage. Three breaches in flood protection embankments – Tori, MS and Sanjrani bunds – caused main damages. The resulting flood from the Tori bund breach inundated almost the entire NW canal command and about 50% of the Beghari Feeder command area and damaged much of the infrastructure on its way back to the Indus River near Sehwan town. Also, the other breaches occurred on 25 August 2010 at the left bank of the Indus River at the downstream of Kotri barrage and inundated the Pinyari canal system and Thatta district.

[20] Report on “Pakistan Floods 2010”, Preliminary Damage and Needs Assessment, ADB, WB, November 2010



Source: Federal Flood Commission (FFC)

Figure 4.3.2 2010 Flood Peaks, Travel Time and Duration at Main Barrages on Indus River

c. Reporting Mechanism

During the data collection for the 2010 flood damages from respective levels of union councils/ tehsils/ districts through DDMAs, a data reporting mechanism that flows upwards to the provincial level of F/G/S/PDMA and federal level of NDMA/ FFC was observed, as illustrated below.

Table 4.3.5 Flood Damages Reporting Mechanism

	Punjab province	Sindh province	Balochistan province	KPK KP province	FANA regional state	FATA regional state	AJ&K regional state
National Level			NDMA – FFC	-	Ministries		
Provincial /State Level	DG, PDMA, Relief and Crisis Management Development, Lahore, /Board of Revenue /PID, PC&WD, etc.	DG, PDMA, Government of Sindh, Karachi, /Board of Revenue /PID, PC&WD, etc.	DG, PDMA, Civil Secretariat Government of Balochistan, Quetta /Board of Revenue /PID, PC&WD, etc.	DG, PDMA, Civil Secretariat, Board of Revenue, Government of Khyber Pakhtunkhwa, Peshawar /Board of Revenue /PID, PC&WD, etc.	DG, GBDMA, (Gilgit-Baltistan Disaster Management Authority) Government of Gilgit -Baltistan, Gilgit /Board of Revenue /PID, PC&WD, etc.	DG, FDMA, (FATA Disaster Management Authority), FATA Secretariat、Peshawar, /Board of Revenue / ID, PC&WD, etc.	DG, SDMA, (State Disaster Management Authority) Relief Commissioner Office, Government of AJ & K, Muzaffarabad, /Board of Revenue / PID, PC&WD, etc.
District Level	DCO, DDMA	DCO, DDMA	DCO, DDMA	DCO, DDMA	DCO, DDMA	DCO, DDMA	DCO, DDMA
Tehsile	Tehsile Najim	Tehsile Najim	Tehsile Najim	Tehsile Najim	Tehsile Najim	Tehsile Najim	Tehsile Najim
Union Council	UC Najim	UC Najim	UC Najim	UC Najim	UC Najim	UC Najim	UC Najim

Notes: DG: Director General, DCO: District Coordination Officer, UC:Union Council, Najim: Administrator
PID: Provincial Irrigation and Power Department, PC&WD: Provincial Communication and Works Department
Source: NDMA

The districts in the country inundated by the 2010 flood were classified, as shown in Table 4.3.6, and shown in Figure A-21. into two categories, namely, severely affected districts and moderately affected districts. The criteria used are mainly numbers of (i) casualties, (ii) damaged houses, and (iii) affected people and/or others, and classification has been made by the respective provincial and regional state governments. NDMA accepted their decision on the affected districts.

Table 4.3.6 District-Wise Affected Areas by Flood

Province/ State	Severely Affected Districts	Moderately Affected Districts
AJK	1	6
GB	0	7
FATA	0	0
KP	10	14
Punjab	7	4
Balochistan	2	10
Sindh	8	9
Sub-total	28	50
Total	78	

Source: NDMA and JICA Study Team

d. Province-Wise Flood Losses/Damages by 2010 Flood

Based on the reporting mechanism process mentioned above, the respective DDMAs reported district level data on the flood losses/damages due to the 2010 flood to the higher level F/G/S/PDMAs and NDMA. Table 4.3.7 summarizes the province-wise flood losses/ damages due to rain/ flood 2010 in Pakistan.

Table 4.3.7 Province-Wise Flood Losses/Damages Caused Due to Rain/Flood 2010 in Pakistan as of October 4th, 2010

Province/ Federal Agency	Villages Affected	Persons Affected (person)	Area Affected (acre)	Cropped Area Affected (acre)	Houses Damaged partially*) (Number)	Houses Damaged fully*) (Number)	Persons Died *) (person)	Persons Injured*) (person)	Cattle Perished (head)	Relief Camps Established (number)
FANA (Gilgit & Baltistan)	347	81,605	0	9,000	0	3,157	183	60	4,669	0
AJ&K	0	131,416	1,800	77,548	5,212	1,631	71	87	288	0
KP	544	3,823,670	0	509,597	162,582	94,712	1,068	1,109	52,750	86
FATA	489	59,080	57,133	50,052	4,178	1,241	88	89	18,866	0
Punjab	1,778	5,038,992	3,471,109	1,914,104	248,151	127,622	110	262	3,572	17
Balochistan	2,896	476,559	4,605	901,463	5,196	74,524	54	104	57,816	3
Sindh	11,988	7,475,685	7,445,658	2,611,305	269,558	610,419	411	1,235	263,703	4,682
Total	**18,042**	**17,087,007**	**10,980,305**	**6,073,069**	**694,877**	**913,306**	**1,985**	**2,946**	**401,664**	**4,788**

Source: NDMA, PDMA, GBDMA, SDMA, FDMA, Provincial Board of Revenue/Relief & Crisis Management Departments, FFC
Note: *) Final figure by DNA Report & NDMA as of basically 04/10/2010 or partly 17 Feb. 2011

The district-wise flood losses/damages data of respective provinces and states are compiled in Appendix.4.3.1. In KP as well as FATA, the number of deaths was severe (1,156 or about 58% of the total 1,985 casualties in the country). In Punjab, Muzzaffargarh District is believed to be the worst-affected district with over 1.78 million people affected (10.5% of those for the country). The total number of affected people in the whole of Punjab is reported to be over 5 million. In Sindh, Qambar Shahdakot District was the second worst with 1.05 million people affected (6.2% of the country's).

5) Floods in 2011

Pakistan suffered from another flood damage in 2011 due to extraordinary rainfall beginning in late August 2011. The flood heavily hit in Sindh Province including eastern Balochistan and southern Punjab in September 2011. The flood was caused by regional rainfall surrounding affected areas. According to the NDMA, the rain/floods have affected approximately 9.2 million people in only Sindh. The overtopping of water from irrigation canals and breaches of irrigation dikes (flood protection bunds) induced the tremendous damages at some parts. This flood effected losses of human suffering and properties in both urban and rural areas resulted.

a. Rainfall

The monsoon heavy rain started in the end of August 2011 due to a well marked monsoon low (strong weather system) lying over Indian Gujarat and adjoining areas of southeast Sindh. Widespread rain/thundershowers with isolated heavy falls occurred in Sindh including Eastern parts of Balochistan. In particular, the rainfalls during 10 days (Sep. 05 – 14) in Sindh Province went far beyond the mean rainfall in areas as shown in Table 4.3.8, the rainfall gauging stations of Dir, Lower Dir, Saidu Sharif, Peshawar, Kohat, Cherat and Risalpur recorded a daily rainfall volume of more than 100 mm on 29 July 2010. The highest volumes were recorded at Risalpur Station at 280 mm/day and 401 mm per the two days of 29 and 30 July.

Table 4.3.8 Daily Rainfall Record During Monsoon 2011 in Sindh

Province	2011									
Station	September									
Sindh	5	6	7	8	9	10	11	12	13	14
Badin	6	8	73	20	11	11	7	22	60	0
Chhor	6	5	55	84	8	28	1	0	56	0
Hyderabad	29	3	2	12	12	0.1	0	0	153	0
Jacobabad	0	2	0	0	0	0	0	0	**	82
Karachi Airport	0.1	0	75	0.1	1	0	24	0	52	50
Larkana	0	1	10	6	0	0	0	0	1	21
Kchi Masaroor	0.1	0	8	0	0	0	1	3	75	69
Mithi	12	17	225	137	100	76	4	49	57	0
Nawabshah	25	0.1	25	37	27	0	0.1	0	75	6
Padidan	0	0	0	18	2	0	0	0	42	0
Rohri	0	4	0	0	0	0	0	0	2	5
Sukkar	0	7	4	0	0	0	0	0	2	7
Moin-Jo-Daro	0	0	6	2	0	0	0	0	**	**
Thatta	6	10	9	6	0	0	0	0	73	4
Dadu	0	0	0.1	66	9	0	0	0	115	108
Mirpur Khas	17	3	1	166	122	0	0	0	190	0

Note: ** : Not recorded

: The day of which Tremendous daily rainfall experienced compared to mean rainfall

b. Flood Losses/Damages of each District Severely Affected by 2011 Flood in Sindh

Based on the NDMA information, Table 4.3.9 summarizes the flood losses/ damages of 13 Districts severely affected due to rain/ flood 2011 in Pakistan.

Table 4.3.9 Flood Losses/Damages Caused of Districts Severely Affected Due to Flood in Monsoon 2011 in Sindh

District	Village Affected (nos)	Persons Affected (persons)	Area Affected (acres)	Cropped Area Damaged (acres)	House Damage		Persons Died (persons)	Persons Injured (persons)	Cattle Perished (head)	Releif Camp established (nos)
					Partially (Nos.)	Fully (Nos.)				
Badin	6,395	1,021,301	984,805	375,718	172,155	210,407	73	10	10,060	8
Hyderabad	681	377,992	113,333	26,227	13,219	7,405	17	27	32	1
Khairour	**	927,953	388,638	182,891	7,138	4,291	9	65	327	52
Matiari	415	109,629	160,970	83,739	23,801	9,002	25	28	1,101	34
Mirpurkhas	3,178	705,151	819,833	171,522	30,627	87,483	60	230	12,280	8
N. Feroz	437	671,499	698,434	73,660	21,300	10,155	26	50	512	-
Sanghar	5,182	1,237,432	927,201	356,473	88,722	125,206	39	93	19,040	560
Sh.Benazirbad	4,104	900,000	**	290,000	**	**	39	82	22,646	-
T.Allahyar	1,609	569,829	369,685	81,645	64,132	6,031	3	5	197	40
T.M.Khan	2,835	585,411	390,997	78,038	47,582	25,353	17	24	187	-
Tharparkar	2,284	907,179	51,782	12,647	96,896	81,460	28	9	30,623	4
Thatta	629	177,758	198,111	164,889	11,257	-	18	15	131	2
Umerkot	1,691	180,851	350,428	108,303	23,198	8,966	23	7	18,824	19

Note : ** Under survey

Source: Summary of Losses/Dmages due to Rain in Sindh – 2011, up to 30 November 2011 at 11:00, NDMA

6) Sediment Disasters

Sediment disasters occur after heavy rains which weaken the ground. Sediment disasters are mainly landslides, mud and rock slides, and debris flows which can wash out houses and infrastructures and cause damage to lives and properties. When heavy rains come in the monsoon season, there occur a lot of landslide disasters in the country. In particular, the northern regions of Pakistan such as GB, AJK and KP provinces are vulnerable to landslide disasters because of their steep hilly/ mountainous topography, weakness in geology, and prolonged heavy rains.

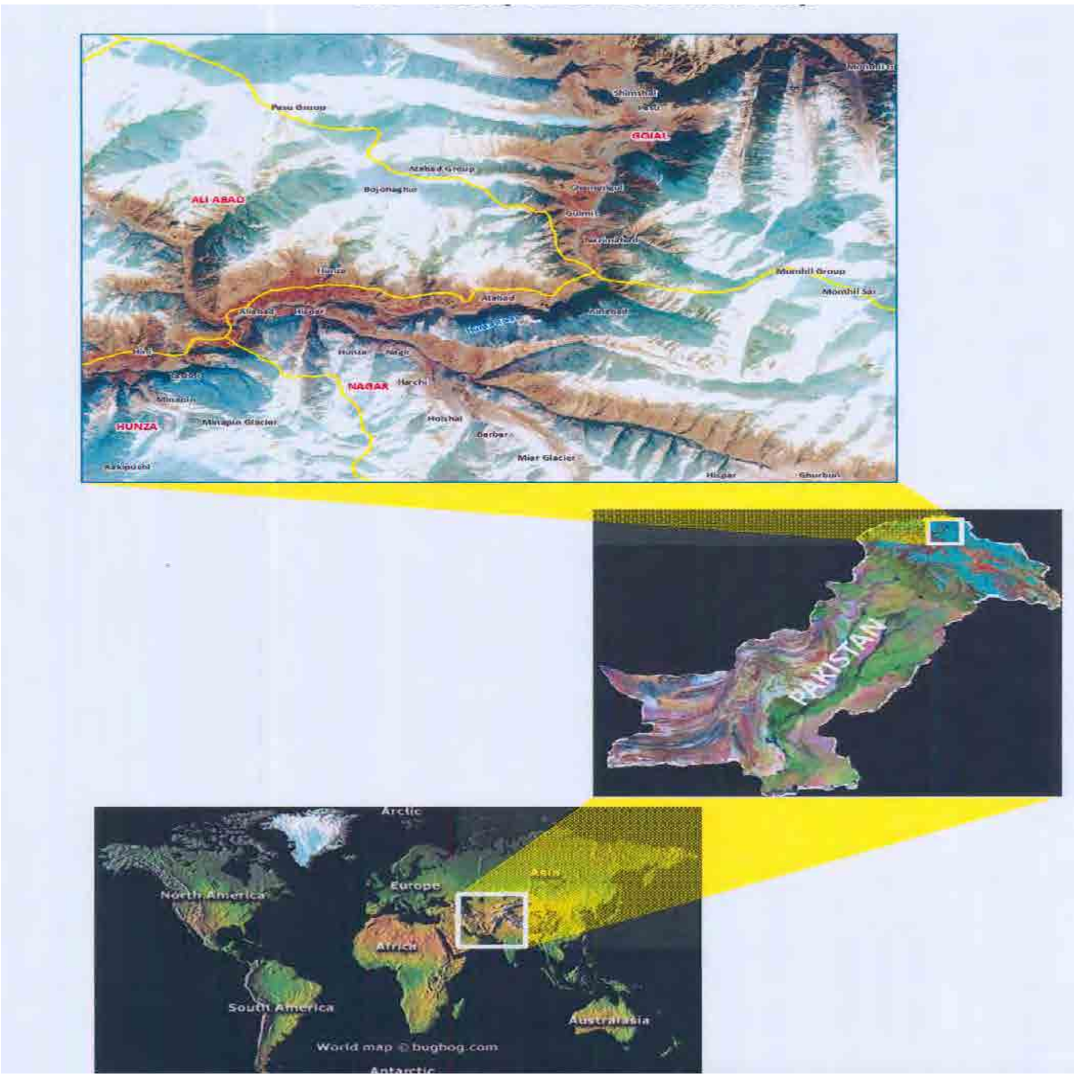
As to collection of the past data on sediment damages like landslides, the JICA Study Team searched the related agencies like GSP, ERRA, and PIDs, and it is revealed that there is no data of past landslide disasters in Pakistan except for the landslide studies and hazard map preparation by GSP in AJK and KP, and the hazard maps prepared by the ERRA in Mansehra and Muzaffarabad.

According to the damage assessment report on large-scale landslide disasters, the landslide of Atabad, Hunza, Gilgit & Baltistan is described below. This is quoted from the Damage Assessment Report of the Atabad, Hunza Landslide of 18 January 2010, prepared by SUPARCO.

> "At least 20 people were killed and several others injured when a massive landslide followed by boulders and rocks slid the Atabad village into Hunza river on 04 January 2009. The debris is blocking water flow and has created a substantial barrier lake which could inundate the low-lying area across the river. The district administration has closed a portion of Karakoran highway between Hunza and Swat for all types of vehicles and declared an emergency in Hunza. The area is about 760 km from Islamabad and 30 km from Aliabad and Gulmit on the west and east bank of the river Hunza, respectively, and Karakoran highway on the east of the river."

In the report above, “it is strongly recommended that landslide debris may be removed from the river on an urgent basis to ensure smooth flow of the river and opening of Karakoram highway.” The location maps of landslides and river blockages caused by landslides are shown in Figure 4.3.3.

During the July-August 2010 floods, according to the local newspapers there were landslide disasters reported in the northern region of KP and some affected districts were reported such as Shangla, Swat, Haripur, and Abbotabad.



Source: SUPARCO

Source: SUPARCO Source: SUPARCO

Figure 4.3.3 Location Maps of Landslides and River Blockages

4.3.2 Hazard and Vulnerability Analysis Results

In this subsection, flood and sediment hazards and vulnerability analysis in Pakistan are discussed. As mentioned in the preceding section, partial data and information on the past flood events have been obtained and discussed with the relevant agencies including FFC, PMD, as well as FFD, WAPDA, PIDs of Punjab and Sindh. Furthermore, the flood 2010 event and the aftermath have been studied through the available data, mapping and documents as of mid-September 2010.

1) Regional Characteristics of Natural Hazards due to Meteorological Condition in Pakistan

The hazard analysis results are summarized as the initial findings of the JICA Study Team in Appendix 4.3.2 to 4.3.7, region-wise in detail, river basin-wise, by type of disasters like flood, sediment, cyclone, etc. and by regional characteristics in terms of topographic and meteorological aspects, causes of floods, and major issues.

2) Districts Vulnerable to Floods in Pakistan

It has been recognized through the discussions with the related agencies that the flood characteristics can be mainly classified into two categories. One is floods or riverine floods which mainly occur in major rivers such as the Rivers Indus, Kabul, Jhelum, Chenab, Ravi, and Sutlej, and major tributaries. For example, the 2010 Pakistan flooding in the Indus River plain, such as southern Punjab and districts along the Indus River in Sindh, is a riverine flood. The other one is flash floods which occur generally in hill torrents from the hill ranges with small to medium scale catchment tributaries due to heavy rainfalls resulting in flooding generated from hill torrent flows/cyclone in Sindh. For instance, the disastrous case of the 2001-flood flash flood in Lai Nullah (joining to Soan River) on 23 July 2001 with a catchment area of 235 km^2 from the Margalla Hills, was due to a very severe cloud-burst. Rainfall of 620 mm (Islamabad) and 150 mm (Rawalpindi) was received in 10 hours of continuous downpour, and with 74 deaths it was the worst flashflood ever experienced in the twin cities. In addition, the 2011 Pakistan Flood which mainly caused the huge damages in Sindh is also categorized as flashflood.

In order to create district-wise flood hazard maps and flood risk maps in Pakistan, there are three (3) work flow steps to be conducted, namely: i) basic data collection of flood hazards and vulnerability, ii) calculation and selection of hazard and vulnerability indices, and iii) creation of hazard and risk maps.

First, the past information and records of riverine flood and flash flood hazard were collected and summarized in Table 4.3.10, and the district-wise flood flash and riverine floods were illustrated in Figure A-28 in sub-chapter 4.8, Data Base Construction and Data Collection. Also, Figure A-29 and A-42 shows the flood districts affected by the recent 2010 and 2011 flood events in Pakistan. In the preparation of Table 4.3.10 above, the original district-wise lists of riverine and flash floods have been prepared by FFC ("Floods" and "Flash Flood Cell"), and possible flash flood risks were reviewed from topographic and meteorological aspects by the JICA Study Team. Secondly, the vulnerability indices of district-wisely population density and principal crop yields (cotton yield, rice yield, wheat yield) were prepared and presented in Figure A-3 (population density), Figure A-14 (wheat yield), Figure A-15 (rice yield), and Figure A-16 (cotton yield). Then, a district-wise flood hazard map, Figure B-1 (flood hazard), was prepared as summed up the flood hazard scores on the past records of riverine & flash floods, the 2010 flood event record, "severely affected district/moderately affected district", and the 2011 flood event record, "affected districts".

Finally, a flood risk map was created multiplying the hazard scores and vulnerability scores (the formula "Risk = Hazard x Vulnerability", as shown in Figure C-1. The detailed procedure with the geographic information system (GIS) and an example case of flood risk calculation is mentioned in Figure 4.8.3 in this report.

Table 4.3.10 Districts Vulnerable to Floods in Pakistan (Riverine Flood/Flash Flood Hazards)

Provinces/ Regions		Districts	River System	Typical Vulnerability in Province		Mountain/Hill Range Basins	Rainfall Gauging Stations (Elev.) & Annual Average Rainfalls
Khyber Pakhtunkhwa (formerly NWFP) & FATA				*flash flood, riverine flood*			
1	◎	Kohistan		flash flood			
2	◎	Shangla		flash flood,	riverine flood		
3		Mansehra		flash flood			
4		Buner		flash flood			
5		Swabi		flash flood			
6		Chitral		flash flood			Chitral (1,498 m): 465.9 mm/y
7	◎	Lower & Upper Dir		flash flood			
8	◎	Swat	Indus river and tributaries, Kabul river and tributaries	flash flood			
9		Malakand Agency		flash flood			
10		Mardan		flash flood			
11	◎	Charsadda		flash flood,	riverine flood		
12	◎	Peshawar		flash flood,	riverine flood		Peshawar (- m): 463.5 mm/y
13	◎	Nowshera		flash flood			
14	◎	Dera Ismail Khan		flash flood,	riverine flood	from Sulaiman Range/Balochistan	D.I.Khan (71.2 m): 295.4 mm/y
15	◎	Tank		flash flood,			
16		Kurram Agency		flash flood			
AJ&K (Azad State of Jammu & Kashmir)				*flash flood, riverine flood*			
1	◎	Neelum		flash flood,	riverine flood		
2		Muzaffarabad		flash flood,	riverine flood		Muzaffarabad (702 m): 1,547 mm/
3		Bagh	Jhelum and Chenab rivers and tributaries	flash flood,	riverine flood		
4		Poonch		flash flood			
5		Bhimber		flash flood			
Northern Area (Gilgit-Baltistan)				*riverine flood, flash flood*			
1		Diamer		flash flood,	riverine flood		
2		Gilgit		flash flood,	riverine flood		Gilgit (1,460 m): 135.2mm/y
3		Ghizer		flash flood,	riverine flood		
4		Chilas (Hunza Nagar)	Indus river and tributaries (Gilgit river, Shimshal river)	flash flood,	riverine flood		
5		Astore		flash flood			Astore (2,168 m): 486.3mm/y
6		Skardu		flash flood,	riverine flood		Skardu (2,317 m): 269.5 mm/y
7		Ganche		flash flood,	riverine flood		
Punjab				*riverine flood, hill torrents/flash flood*			
1		Rawalpindi		flash flood,	riverine flood	from Margalla hills	
2	◎	Miawali		flash flood,	riverine flood		
3	◎	Bakkar			riverine flood		
4	◎	Laylah			riverine flood		
5	◎	Muzaffargarh			riverine flood		Multan (122.0 m): 202.4 mm/y
6	◎	Dera Ghazi Khan		flash flood,	riverine flood	from Sulaiman Range	
7	◎	Rajanpur		flash flood,	riverine flood	from Sulaiman Range	
8	◎	Rahim Yar Khan	Indus river and tributaries: Jhelum, Chenab, Ravi and Sutlej rivers and tributaries		riverine flood		
9		Khushab		flash flood,	riverine flood		
10		Jhang			riverine flood		
11		Gujrat		flash flood,	riverine flood (Chenab)	from Pir Panjal Rang	Jhelum (287.2 m): 902.6 mm/y
12		Sialkot		flash flood,	riverine flood (Chenab)	from Pir Panjal Rang	Sialkot (255.1 m): 1,002.6 mm/y
13		Gujranwala		flash flood,	riverine flood	from Pir Panjal Range	
14		Narowal		flash flood,	riverine flood	from Pir Panjal Range	
15		Sheikhupura		flash flood,	riverine flood	from Pir Panjal Rang	Lahore (214.2 m): 674.3 mm/y
							Khanpur (88.4 m): 103.4 mm/y
Balochistan				*flash flood*			
1		Sibi		flash flood			
2		Bolan		flash flood,	riverine flood		
3	◎	Nasirabad		flash flood			Barkhan (1,097.0 m): 403.8 mm/y
4	◎	Jaffarabad		flash flood			
5		Jhal Magsi		flash flood,	riverine flood		
6		Khuzdar	No rivers exist in the province	flash flood			Khuzdar (1,231.0 m): 265.8 mm/y
7		Lasbela		flash flood			
8		Chagai (Dalbadin town)		flash flood			
9		Kharan		flash flood,	riverine flood		Panjgur (968.0 m): 94.6 mm/y
10		Kech		flash flood,	riverine flood		
11		Gwadar		flash flood,	riverine flood		Pasni (9.0 m): 96.5 mm/y
12		Nushki		flash flood			Quetta (1,719.0 m): 282.0 mm/y
Sindh				*riverine flood, flash flood*			
1	◎	Kashmore			riverine flood		
2	◎	Shikarpur			riverine flood		
3	◎	Jacobabad			riverine flood		
4		Ghotki			riverine flood		
5		Sukker			riverine flood		
6	◎	Larkana		flash flood,	riverine flood	from Kirthar Range	
7	◎	Kamber-Shahdadkot		flash flood,	riverine flood	from Kirthar Range	
8	◎	Dadu	Indus river and tributaries	flash flood,	riverine flood	from Kirthar Range	Padidan (46.0 m): 108.5 mm/y
9	◎	Jamshoro			riverine flood		
10		Khairpur			riverine flood		
11		Sanghar		flash flood,	riverine flood		
12		Badin		flash flood,	riverine flood		
13	◎	Thatta		flash flood			
14		T.M.Khan			riverine flood		
15		Karachi		flash flood,	riverine flood		Karachi-AP (22.0 m): 153.0 mm/y
							Chhor (5.0 m): 246.6 mm/y

Source: NDMA, Each Provincial/State Governments, FFC
Notes: ◎ means Severely Affected Districts by 2010 Flood

3) Damage Assessment Methodology

Market rates (or "composite schedule of rates") updated to August 2010 price levels as presented by the Asian Development Bank (ADB) in the DNA Report[21],were used to estimate the replacement cost. The assessment of flood damages covers the direct damages to irrigation, drainage and flood protection infrastructures. The indirect losses such as damages to land, crops and environment have been included in the damage assessments of "the agriculture sector". The damages were classified into two categories, namely: (i) destroyed or fully damaged—requiring reconstruction and in some cases improvement, and (ii) partly damaged—requiring restoration or rehabilitation. Then, the damage cost was estimated by depreciating the reconstruction cost by 35%. This assessment methodology will be reconsidered for future flood damage assessment in Pakistan, if required.

The estimated damages to irrigation and flood management due to flood 2010 and the summary of province-wise damage estimates by four (4) categories of social infrastructure, physical infrastructure, economic sectors and cross-cutting due to the flood 2010 are presented in Table 4.3.11 and Table 4.3.12, respectively.

Table 4.3.11 Estimated Damages to Irrigation and Flood Management Due to Flood 2010

Province/ State	Damages (Rs. Million)	Damages (US$ Million)
Gilgit-Baltistan	138	1.6
AJK	14	0.2
FATA	255	3.0
Khyber Pakhtunkhwa (KP)	5,810	68.3
Punjab	2,813	33.1
Balochistan	2,516	29.6
Sindh	11,638	136.9
WAPDA	416	4.9
Total	23,600	277.6

Source: DNA Report, WB, ADB, November 2010

Table 4.3.12 Summary of Province-Wise Damage Estimates Due to Flood 2010

Province/ State	Damages* (Rs Millions)	Damages* (US$ Millions)
Gilgit-Baltistan	4,165	49
AJK	7,303	86
FATA	6,271	74
Khyber Pakhtunkhwa (KP)	99,625	1,172
Punjab	219,272	2,580
Balochistan	52,676	620
Sindh	372,341	4,380
Federal/ Cross Cutting Sectors	93,117	1,095
Total	854,771	10,056

Source: DNA Report, WB, ADB, November 2010

[21] Report on "Pakistan Floods 2010", Preliminary Damage and Needs Assessment, ADB, WB, November 2010

4) Sediment Disaster

After heavy rains, the ground may become weak causing a sediment disaster. Basically, sediment disasters are mud and rock slides, landslides and debris flows. In addition, there is a man-induced sediment disaster which includes material erosion, transportation and accumulation by human activities.

a. Type of Sediment Disaster

i) Mud and Rock Slides

Mud and rock slides happen when the ground is weakened by heavy rain or an earthquake. Sliding mud covers the ground widely. It could reach an area two or three times as far as the height of the slope. Compared to other sediment disasters, a lot of areas are vulnerable to mud and rock slides. These are indicators of mud and rock slides, when you see:

- Rocks tumble down the grade of the hill;
- Sudden springs in areas that have not been wet before; and
- New cracks in the hill.

ii) Landslides

Landslides are a phenomenon when the ground slides after it has been saturated from water such as rain. Once a landslide occurs, it widely damages the area including houses and fields and causes traffic problems. The ground could slide several meters more even if it usually slides invisibly. If the landslide breaks a dam at a river, it can bring huge damage to the lower area.

Signs of landslides are as follows:

- Water in a well is not clear;
- New cracks or unusual bulges in the ground appear; and
- Sudden water level change in ponds.

iii) Debris Flows

A massive rainfall makes debris surge down a slope. Fast flowing rivers of an alluvial plain are vulnerable to debris flows.

Signs of debris flows are:

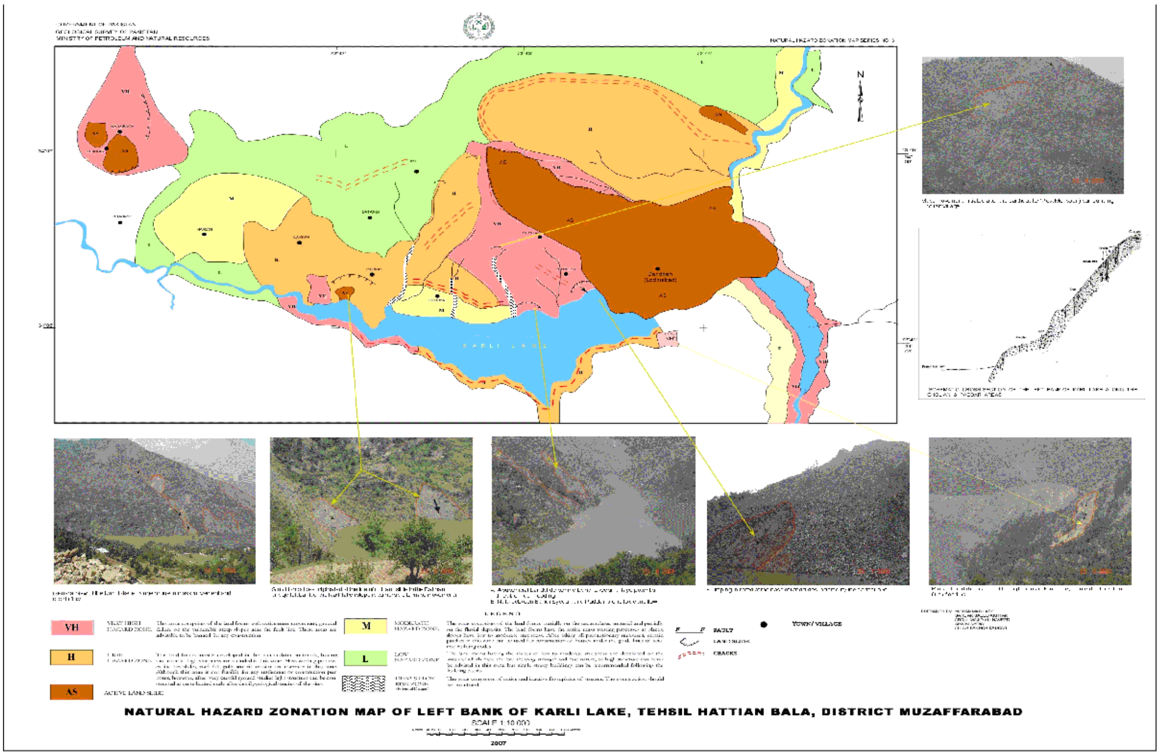
- Unusual sounds from the mountain;
- Streams get muddy and driftwood is in it; and
- If the water level of the river is getting lower even though it is raining.

b. Landslide Zoning Mapping Example in Pakistan

Landslide is a general term for such occurrences as mud and rock slides, landslides and debris flows. In Pakistan, landslides that happen during actual flood disasters are recorded in several documents and information from the Geological Survey of Pakistan (GSP), FFC, and WAPDA. One example of the landslide disaster and landslide zoning mapping in Pakistan is introduced below.

i) Landslides of Karli Lake in District Muzaffarabad

A natural landslide zoning map prepared by GSP is shown below. The location of the landslide is at the left bank of Karli Lake, District Muzaffarabad, AJK.



Source: GSP

Figure 4.3.4 Natural Landslide Zonation Map of the Left Bank of Karli Lake, District Muzaffarabad

Table 4.3.13 Legend for Landslide Zonation Map

Mark	Description
VH	*Very High Hazard Zone*: This zone consists of the land forms with active mass movement, and ground failure on the vulnerable steep slopes near the fault line. These are the areas advisable to be banned for any construction.
H	*High Hazard Zone*: The land forms mostly developed in accumulated materials; those having moderate to high steepness are included in this zone. Mass wasting processes like landslides, rock fall, gully and rill erosion are common in this zone. Although this zone is not feasible for any settlement or construction purposes, after very careful ground studies, light structures can be constructed at quite limited scale after detailed geological studies of the sites.
M	*Moderate Hazard Zone*: The zone consists of the land forms partially on the accumulated material and partially on the fluvial deposits. The land forms have the active mass wasting processes at places; slopes have low to moderate steepness. After taking all precautionary measures, certain patches in this zone can be used for construction of houses under the guidelines of seismic building codes.
L	*Low Hazard Zone*: The land forms having the slopes of low to moderate steepness and developed on the material which has low shear strength and loose nature, so high structures can never be advised in this zone but single storey buildings can be recommended following the building codes.
AL	*Active Landslide Zone* This zone is composed of the land forms with more active mass movement, and more ground failure on the vulnerable steep slopes near the fault line. These are areas are advisable to be banned for entry and for construction.
Debris	*Debris Flow Risk Zone:* The zone comprises active and inactive floodplains of streams. Construction should be prohibited.

Source: GSP

c. Sedimentation in Dam Reservoirs

Since Tarbela Dam in the Indus River was completed in 1974, sedimentation in the dam reservoir has taken place due to riverbed materials (silt, sand and gravel) carried by inflowing river water, which has reduced the gross reservoir capacity from 11.620 MAF to 8.496 million acre feet (MAF) (3.124 MAF difference in gross reservoir capacity). Warsak Dam (completed in 1960) has now completely silted up and there is practically no available storage. Hydropower is being generated by water inflows in the Kabul River like a "run-of-the-river” project. These dam reservoirs also suffer from the same sedimentation problem as any other dam reservoirs in the world. It is noted that WAPDA monitors the sedimentation in the reservoirs and keeps the data records.

5) Districts Vulnerable to Landslide Sediment Disasters

As similarly mentioned in the preceding sub-item 2) Districts Vulnerable to Floods in Pakistan of this sub-sector 4.3.2, the districts vulnerable to landslide disasters in Pakistan are also presented here.

First, the past available information and records were collected, and the district-wise landslide hazards were prepared as shown in Figure A-22 in sub-chapter 4.8, Data Base Construction and Data Collection. In the above mentioned figure, the vulnerable districts where landslides have occurred in the past[22] and during the 2010 flood through an additional reconnaissance survey conducted by JICA Study Team in October 2010, are included as follows:

- KP Province: Kohistan, Shangla, Haripur, Abbotabad, Mansehra, Chitral, Swat
- AJK: Neelum, Muzaffarabad, Bagh, Poonch
- Gilgit-Baltistan: All districts are high hazard area. However, riks against landslides become low due to small population: (Diamer, Astore, Skardu, Ghizer, Gilgit, Ganche, Hunza-Nagar)

Secondly, the vulnerability indices of district-wise population density and the hazard indices of district-wise landslide records, slope, soil, and annual mean rainfall were presented in Figure A-3 (population density), Figure A-22 (disaster records), Figure A-9 (slope), Figure A-11 (soil), and Figure A-11 (annual mean rainfall). Then, a district-wise hazard map of Figure B-2 (landslide hazard) was prepared and summed up the landslide hazard scores based on the past records". Finally, a flood risk map was created multiplying the hazard scores and vulnerability scores (the formula "Risk = Hazard x Vulnerability", as shown in Figure C-2.

After the devastating October 2005 earthquake in Pakistan that resulted in thousands of fatalities and huge loss of infrastructure, landslides are the major secondary geohazard in the earthquake affected area. Technical assistance is ongoing to support the Government of Pakistan in its efforts to minimize the risk and the effects of geohazards, especially landsides, to the affected population in the KP province. The reduction of georisks for the population in the earthquake and landslide zones of northern Pakistan is required. GSP prepares landslide inventory maps and database, landslide susceptibility maps and hazard zoning maps.

[22] (1) "Damage Assessment Report of Atabad, Hunza Landslide", Pakistan Space & Upper Atmosphere Research Commission, 18 Jan. 2010
(2) "Pakistan Landslide Flood Lake Ready to Overflow" U.S. Department of State HIU, 21 May 2010
(3) "Landslide Hazard Management and Control in Pakistan", M.H. Malik and S. Farooq, International Centre for Integrated Mountain Development, Kathmandu, Nepal, 1996

4.4 Cyclone

4.4.1 Existing Condition

Although not a frequent phenomenon, cyclones can cause large-scale damage to the coastal areas of Sindh and Balochistan. The characteristics of cyclones and historical record of their damages are as follows:

1) Definition and Category of Cyclone

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

Table 4.4.1 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

Moreover, the intensity of cyclone with winds of 64 knots or more has been divided into the following five categories:

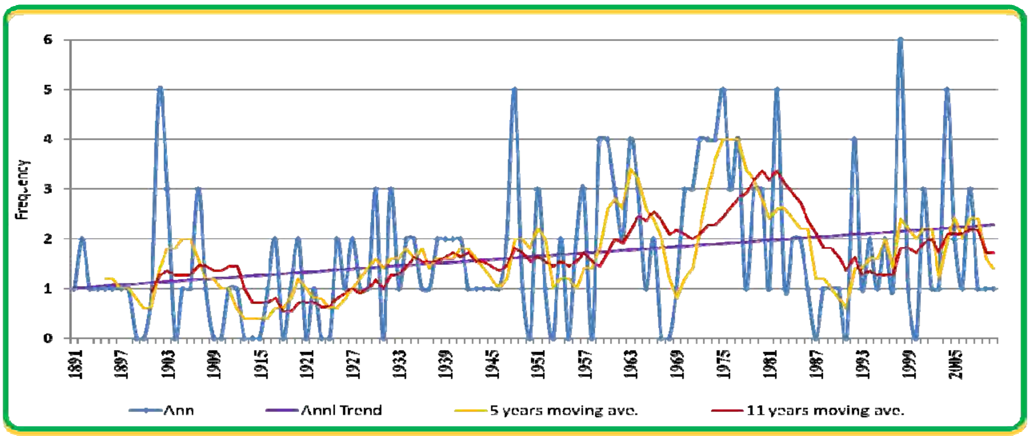
Table 4.4.2 Categories of Cyclone

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

2) Frequency of Cyclones and Affected Areas in Pakistan

About 14 cyclones were recorded during the period 1971-2001. The meteorological data about 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 4.4.1 Annual Frequency of Tropical Cyclones and Depressions over the Arabian Sea (1891-2010)

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

Table 4.4.3 Years Having Cyclone Occurrence in Pakistan

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

Source: PMD

3) Historical Damages in the Past

The cyclonic storms in 1895 struck the Mehran coast near Pasni and Jiwani.

In the early 1900's, 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, did cause 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, southwest 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 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 wind gusting to 120 km/hour. 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 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 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 coastlines of Thatta and Badin, causing heavy rains in the area. The Hyderabad power supply was also disrupted from the downpour.

4.4.2 Hazard and Vulnerability Analysis Results

As described in 4.4.1., the coastal belt of Pakistan (especially coastal areas of Sindh) is highly vulnerable to tropical cyclones and associated storm surges (see Table 4.4.4 attached).

The changing climate is behaving vigorously resulting in an increase in frequency, intensity and changes in tracks of storms. Although the frequency of invasion of tropical cyclones is low along the Pakistani coast, they still cause considerable damage in the area. Such unprecedented damage to lives, property and infrastructure causes adverse impact on the socio-economic development of the region. The coastal belt is mostly low-lying; therefore, storm surges extend several kilometers inland, damaging standing crops and converting the agriculture land into gully lands for a long time. In addition to landfall of tropical cyclones and storm surges, strong winds create havoc by destroying human settlements, electric and communications installation, fell trees and damage seasonal crops. After its departure, cyclones leave the area waterlogged, preventing cultivation for months.

Based on the past damages by cyclones, the districts vulnerable to cyclone disaster are the following:

Table 4.4.4 Vulnerable Districts Against Cyclone Disaster

Province	District
Balochistan	Gawader, Ketch, Lasbella, Awaran
Sindh	Badin, Karachi, Hyderabad and Thatta

Source: JICA Study Team

4.5 Drought

4.5.1 Existing Condition

Pakistan has a long latitudinal extent and the rainfall variability during different seasons is considerably high. The climate of the country in lower southern half is arid and hyper-arid. Some regions of the country in each season remain drastically dry and are always vulnerable to drought. If subsequent seasons fail to generate significant precipitation, the drought conditions emerge in these areas and become more severe. In this way, drought has become an intermittent phenomenon in the country. All the provinces of Pakistan have a history of facing major droughts in the past. In recent years, drought is reported to have brought extensive damages to Balochistan, Sindh and Southern Punjab where average annual rainfall is as low as 200-250 mm. Severe drought episodes in 2000 and 2002 affected livelihoods, resulted in human deaths, pushed tens of thousands people to migrate, and killed large numbers of cattle. This drought led to 120 deaths and affected 2,200,000 people. The main arid rangelands are Thar, Cholistan, Dera Ghazi Khan, Tharparkar, Kohistan, and western Balochistan. Except for Balochistan, all these areas are within the range of monsoon rainfall which, however, is erratic and scattered. Hence, 2 to 3 years in every 10 years in these areas are drought years.

Drought differs from other natural disasters (e.g., floods, earthquakes, tropical cyclones, tornados, etc.) in the sense that the effects of drought often accumulate slowly over a considerable period of time and may linger on for years even after the termination of the event. Because of this, drought is often referred to as a "creeping phenomenon." The impacts of drought are less obvious and are spread over large geographical areas than are the damages that result from other natural hazards. Consequently drought affects more people than any other environmental hazard. (National Plan for MSEWS 2006 by PMD)

1) Introduction

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. It can have a substantial impact on the ecosystem and agriculture of the affected region. Although droughts can persist for several years, even a short, intense drought can cause significant damage and harm to the local economy.

2) Type of Droughts

According to the National Drought Monitoring Centre, PMD, droughts can be classified into the following four types from the engineering and social perspectives:

a. Meteorological Drought

Meteorological drought is the amount of dryness and the duration of the dry period. Atmospheric conditions that result in deficiencies of precipitation change from area to area.

b. Agricultural Drought

Agricultural drought mainly affects food production and farming. Agricultural drought and precipitation shortages bring soil water deficits, reduced ground water or reservoir levels, and so on. Deficient topsoil moisture at planting may stop germination, leading to low plant populations.

c. Hydrological Drought

Hydrological drought is associated with the effects of periods of precipitation shortages on water supply. Water in hydrologic storage systems such as reservoirs and rivers are often used for multiple purposes such as flood control, irrigation, recreation, navigation, hydropower, and wildlife habitat. Competition for water in these storage systems escalates during drought and conflicts between water users increase significantly.

d. Socioeconomic Drought

Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply.

In this report, "drought" refers to the phenomena involving agricultural, hydrological and socioeconomic droughts in multiple crises inspired by meteorological drought.

3) Historical Drought Records in Pakistan

Droughts have perennially been occurring in Southern Asia in the past, including Pakistan. Pakistan has experienced several drought years like in 1899, 1920, 1935, etc., particularly in the KP areas in 1902 and 1951, and in Sindh which experienced its worst droughts in 1871, 1881, 1899, 1931, etc.

As described in section 4.1.2, the El Niño and La Niña phenomena cause drought conditions in Pakistan. For instance, the strongest El Niño on record occurred in 1982-1983 when the monsoons in 1983 failed badly. The period of 1997-98 was the worst El Niño year on record and the climatic conditions were comparable to those in 1982-83. The meteorological droughts occurred in these years.

[23]During recent past (1998-2001), Pakistan has faced one of the worst meteorological droughts in its history due to extremely low rainfall. The recorded rainfall robustly deviated in negative direction throughout the country during these prolonged dry spells. As a consequence, minimum

[23] Hereinafter quoted from "Drought Mitigation Measures: An Overview Under Pakistan's Perspective" by M.S. Pomee, Zaheer-ul-Ikram, M.A. Khan and I. Ali in Pakistan Journal of Water Resources, Vol.9 (2) July-December 2005.

river flows during the post-Tarbela Scenario were recorded and irrigation canals were even operated at 51% reduced water supplies in the country. The extent of drought severity and its adverse impacts on canal supplies during this dry spell are summarized below:

Table 4.5.1 Canal Withdrawals and Shortage in Punjab Province (1999-2002)

Period	Canal Withdrawals (Million ha-m)	% Shortage with respect to historic use
Winter 1999-00	2.01	18%
Summer 2000	3.88	9%
Winter 2000-01	1.40	43%
Summer 2001	3.36	21%
Winter 2001-02	1.19	51%

Source: Haq and Khan, 2002

The drought wreaked havoc in 58 of the total 106 districts of the country, especially affecting the rainfed and rangeland areas. Balochistan was the most affected province where 23 districts were severely hit by the drought. Similarly, Dadu, Thar, and Thatta districts in Sindh, and Cholistan in Punjab were the other main areas adversely affected by the prolonged dry spells. Famine-like situation was faced in severely affected areas and consequently over 3.3 million families had been affected and hundreds of thousands had to migrate to 'safe areas'. Hundreds of people lost their lives due to dust and thirst. Moreover, about 30 million livestock population was affected by the scarcity of water and fodder. The adverse impacts of drought in Sindh and Balochistan province during this particular dry spell are summarized below:

Table 4.5.2 Adverse Impacts of Drought During 1998-2002

Province	Item	Affected Value
Balochistan	Human population affected	1,911,534 (32%) with 51 Casualties
	Livestock population affected	7,916,966 (30%)
	Crops affected	1,973,169 Acres (45%)
	Orchards damaged	20%
	Tubewells dried	320
	Karazes dried	905
	Springs dried	63
Sindh	Area affected	22,000 Sq. km
	Population affected	1.3 million
	Out migration	0.3 million
	Livestock affected	5 million
	Water resources	Shear drop in groundwater levels
		Deterioration of groundwater quality
		Seawater intrusion in delta area due to reduced surface discharges

Source for Balochistan: GoB (2003). Planning & Development Department, Balochistan, Hussain and Pomee (2004).
Source for Sindh: GoS (2000). Revenue Board of Sindh Government,Hussain and Pomee (2004).

The adverse impacts of drought were not limited to affected areas only but were reflected all over the country, and it has caused colossal damage worth billion of rupees to the national economy, apart from disruption of the socio-economic structure. According to GoP (2001), the real GDP was targeted to grow by 4.5% during 2000-01, with agricultural and manufacturing growing by 2.6% and 5.9%, respectively. However, the drought severely affected the performance of major crops. Consequently, the value added in agriculture registered a negative growth of 2.5% as against the positive 6.1% growth rate during the previous year. Furthermore, the lower reservoir levels in both Mangla and Tarbela reduced releases through them resulting in a shortfall of 2.4 billion kWh hydroelectric power production in the country. Provincial estimates suggested that the value added in electricity and gas distribution sector registered a decline of 3.1% as against the year-ago positive growth of 5.3%. Real GDP, which depends a lot on the agricultural, electricity and gas sectors, consequently grew by only 2.6% during 2000-01 as against the target of 4.5%.

4.5.2 Hazard and Vulnerability Analysis Results

Unfortunately, no permanent organization dealing with the drought issues existed in Pakistan. The responses to drought for the distressed economic and social sectors, whenever such situation arose, were taken on emergency and on ad-hoc basis, such as the organization of DERA to address the drought during 1998-2001. However, most of the mandate of DERA had been completed with the consumption of its funds. Such reactions to crisis often resulted in the implementation of hastily prepared assessment and response procedures that lead to ineffective, poorly coordinated and untimely responses. It is, thus, an inevitable and urgent need that a monitoring and EWS be scientifically developed, as one of the major elements of a “Drought Mitigation Program”. Addressing this important issue, the Government of Pakistan has established a National Centre for Drought/ Environment Monitoring and Early Warning System in Pakistan under PMD.[24]

In order to mark the areas vulnerable to drought, a study of the rainfall activity in the country in different seasons is required. Areas that remain dry for more than 50% of the time would be the most vulnerable. There are two marked rainfall periods, namely, winter (December to March) and summer monsoons (June to September). If the seasons go dry, they are apt to bring drought conditions. April to May and October to November are the transition periods. Very little rainfall occurs in Sindh, Southern Punjab and Balochistan during these periods.

[24] Quoted from National Plan for MSEWS 2006 by PMD.

4.6 Other Natural Disasters

4.6.1 Existing Condition

1) Glacial Lake Outburst Flood (GLOF) and Landslides in Northern Area (NA)

The bursts of glacial lakes in the upstream of the Indus River basin due to heat waves, a phenomenon termed as Glacial Lake Outburst Flood (GLOF), are also one of natural disasters to be concerned with. In particular, the Karakoram region is noted for the destructive effects of GLOF from naturally-dammed lakes. The lower parts of large glaciers in the Upper Indus River Basin can severely disrupt and modify river courses in the valleys below. River channels can be diverted or partially blocked by glaciers advancing in the long term or surging in the short time across their paths from tributary valleys. If channels become completely impeded by glaciers then a lake may form upstream of the dam, eventually resulting in catastrophic flooding downstream with incalculable damage to people and property. An associated hazard is the amount of sediment transported during the few hours of such an outburst which can be equivalent to several months of normal sediment transport.

Glacially-dammed lakes are not the only cause of outburst floods in the Karakoram. The steep relief of the region is a major factor contributing to the high frequency of landslides and debris torrents. Some slides and debris torrents are large enough to dam rivers, such as the enormous 1841 landslides which blocked the Indus River and formed a lake upstream. When the dam was breached, a catastrophic flood wave resulted. Similar events occurred from 1852 to 1858 on the Hunza River. In 1977, a landslide dam was formed, possibly in association with a glacier surge (Hewitt, 1968-1969). Appendixes 4.6.1 summarize the historical occurrence of ice- and mass movement-dammed lakes and resulting in outburst floods in the Karakoram region.[25]

On 4 January 2010, a massive landslide in Attabad in Hunza District caused the loss of human lives and property and blocked the flow of the Hunza River converting it into a huge lake (not a glacial lake). It is supposed that such a huge landslide happens once every 200 years in this area. The landslide disaster has displaced 1,163 people from Attabad while the resulting lake buildup has displaced approximately 80 households (around 700 individuals) from three villages in Upper Hunza. Damming of the Hunza River has created issues and challenges for over 25, 000 people stranded in the Gojal valley due to destruction of the Karakurm Highway, the economic lifeline of the region. Cultivable and non-cultivable land, houses and other infrastructure are submerging in the organically expanding lake, resulting in huge loss of livelihood. The lake also poses risks to low-lying parts of villages along the length of River Hunza and River Indus in the downstream areas in case of a lake outburst flood.

[25] Quoted from "Glacial Lake Outburst Flood in Upper Indus Basin on Pakistan Snow & Ice Hydrology Project" of Hydrology and Research Directorate of WAPDA.

2) Avalanche

Gilgit-Baltistan and Kashmir region experience avalanches on seasonal basis. Local communities surrounding the avalanche area are vulnerable to this disaster. Avalanches are a kind of local natural disaster and their impact is localized to the communities living nearby or in the area where avalanches happen on a regular basis. Therefore, the impact of avalanches is minimal.

4.6.2 Hazard and Vulnerability Analysis Results

1) Glacial Lake Outburst Flood (GLOF) and Landslides in Northern Area (NA)

According to Framework 2007 of NDMA, a recent study on the Indus Basin river system-flooding and flood mitigation by H. Rehman and A. Kamal found that, of the 2,420 glacial lakes in the Indus basin, 52 are potentially dangerous and could result in GLOF with serious damages to life and property. The study has also indicated that global warming can increase the potential of GLOF in the future.

2) Avalanche

A study conducted by WAPDA in 1985-89 under the Snow and Ice Hydrology Project, identified the potential avalanche paths.[26]

According to the NDMA Disaster Management Plan 2010, following districts are vulnerable to avalanches based on several previous studies:

Table 4.6.1 Vulnerable Districts Against Avalanche (Disaster Response Plan 2010-NDMA)

Province	District
KP	Chitral
G.B	Astore, Gilgit, Ghanche, Ghizer and Skardu

Source: NDMA

[26] Quoted from NDMA Framework 2007.

4.7 Urban Area

4.7.1 Introduction

The definition of urban area varies by country as it is often determined by density of population. According to NDMA, in Pakistan, areas with a population density of more than 25,000 / Council have been established as urban areas by regulation.

The damage brought by natural disasters in the urban area is quite different than that outside the city. High densification runs the risk of damage increase, and rapid urbanization could enlarge the risk of urban disaster. Therefore, the urban area under study is confined primarily to large cities or areas in terms of demographics.

4.7.2 Existing Conditions of Urbanization

1) Population

The Ministry of Economic Affairs and Statistics of the Pakistan Government published the population Census in 1998. Actually, this data is the latest official census data of Pakistan. The population distribution and growth rates within Pakistan between 1981 and 1998 are shown in Table 4.7.1. Pakistan’s population is growing each year, and its average annual population growth had been recorded at 2.69% between 1981 and 1998. In most major cities, growth rates are higher than this national average. Especially in the nation’s capital, Islamabad, the growth rate stands at a very high 5.76%. The table indicates the population increase is concentrated in major cities.

Table 4.7.1 Population Change in Pakistan and Large Cities

City	Population		Avg. Annual Growth Rate (%)
	1998	1981	1981-1998
PAKISTAN	132,352,279	84,253,644	2.69
1. Karachi	9,339,023	5,208,132	3.49
2. Lahore	5,143,495	2,952,689	3.32
3. Faisalabad M.C.	2,008,861	1,104,209	3.58
4. Rawalpindi	1,409,769	794,834	3.43
5. Multan	1,197,384	732,070	2.93
6. Hyderabad	1,166,894	751,529	2.62
7. Gujranwala M.C.	1,132,509	600,993	3.79
8. Peshawar	982,816	566,248	3.29
9. Quetta	565,137	285,719	4.09
10. Islamabad	529,180	204,364	5.76

Source: Population Census Organization, Government of Pakistan
http://www.statpak.gov.pk/depts/pco/statistics/pop_major_cities/pop_major_cities/html

Table 4.7.2 shows the population data by the World Bank. According to the table, the average annual growth rate of Pakistan is 2.3% between 2000 and 2007. This rate is nearly twice the world average of 1.2%. Drawing a comparison between Table 4.7.1 and Table 4.7.2, it shows the population growth rate in Pakistan has been declining. However, the growth rate is still high at more than 2 %.

Table 4.7.2 Comparison of Population Change Between Pakistan and the World

Country/World	Population (million)	Avg. Annual Growth Rate （%）
	2007	2000-2007
PAKISTAN	162	2.3
World	6,612	1.2

Source: World Development Report 2009, World Bank

2) Urbanization Rate

Table 4.7.3 shows the average annual population growth rates of urban and rural areas[27] between 1951 and 1998. The share of urban population in 1951 was 17.7%; in 1998, it increased to about twice as much at 32.5%, which shows a yearly trend of urban population increase to total population of Pakistan. Comparing average annual population growth rates, urban population growth is higher than rural population at 3.53%. This percentage is higher than the national average of 2.69%. It indicates the growing urbanization along a population increase. Pakistan's cities are expanding much faster than the overall population.

Table 4.7.3 Changes in Urban, Rural and Total Population in Pakistan

Category	Population					Population Density per sq km	Avg. Annual Growth Rate （%）
	1951	1961	1972	1981	1998	1998	1981-1998
PAKISTAN	33,740,167	42,880,378	65,309,340	84,253,644	132,352,279	166.3 / k ㎡	2.69 %
Urban	27,754,670	33,225,806	48,715,689	60,412,173	89,315,875	－	3.53 %
Rural	5,985,497	9,654,572	16,593,651	23,841,471	43,036,404	－	2.33 %
Urban (%)	17.7 %	22.5 %	25.4 %	28.3 %	32.5 %	－	－
Rural (%)	82.3 %	77.5 %	74.6 %	71.7 %	67.5 %	－	－

Source: Population Census Organization, Government of Pakistan
http://www.statpak.gov.pk/depts/pco/statistics/pop_major_cities/pop_major_cities/html

Table 4.7.4 shows urbanization rate and density of population of two major cities and Pakistan. According to census data of Pakistan, Karachi District is divided into 4 districts, namely, Central, East, West and South. In 1998, Pakistan's urban population was 32.5%; Karachi and Lahore had more than 80% of urban population. In Karachi Central, East and South districts, the population per square km is over 10,000. Especially in Karachi Central district, the population density is 33 million/km2. The population density in Karachi West district is slightly lower than the other Karachi districts. However, the average annual population growth rate is more than 5%. Among large, highly populated cities, Karachi is advancing along the road to rapid urbanization.

[27] Urban area in the Census data means a local area of a town municipality or a city

Table 4.7.4 Population Change in Pakistan and Major Cities

Country/City	Population (%)		Population Density per km2	Avg. Annual Growth Rate (%)
	1998		1998	1981-1998
	Urban	Rural	Total	
PAKISTAN	32.5 %	67.5 %	166.3 / k ㎡	2.69 %
Karachi Central District	100 %	0 %	33,013.5 / k ㎡	3.09 %
Karachi East District	100 %	0 %	19,755.5 / k ㎡	3.67 %
Karachi West District	90.7 %	9.3 %	2,266.9 / k ㎡	5.04 %
Karachi South District	100 %	0 %	14,303.6 / k ㎡	1.97 %
Lahore District	82.4 %	17.6 %	3,565.9 / k ㎡	3.46 %

Source: Population Census Organization, Government of Pakistan

3) Economic Growth

According to the World Development Report (2009), Pakistan's average annual GDP growth was 5.8% between 2000 and 2007. This is rated 31st in the world – about 1.8 times higher than the world average of 3.2%. Table 4.7.5 shows figures during this period of high economic growth in Pakistan. Looking at the value added by sector as a percentage of GDP, the service sector accounted for 54%, which is the highest, and agriculture sector registered the least at 20%. It shows that Pakistan's economy is in transition from agriculture sector to industry and services sectors, which should be based in urban areas.

Table 4.7.5 Economic Activity in Pakistan

Pakistan/World	Gross domestic product		Value added as % of GDP		
	Millions of dollars	Avg. annual % growth	Agriculture	Industry	Services
	2007	2000 – 2007	2007	2007	2007
Pakistan	143,597	5.8 %	20 %	27 %	54 %
World	54,347,038	3.2 %	3 %	28 %	69 %

Source: World Development Report 2009, World Bank

4.7.3 Law and Regulations

1) National Housing Policy

In accordance with the National Housing Policy 2001, the Housing and Land Use Planning Standards in National Reference Manual (NRM) was issued by the National Housing Authority (NHA), which is under the Ministry of Housing and Works (MOHW). This guideline has been confirmed by the parliament of Pakistan.

According to NHA, this policy is a national guideline covering city planning, land utilization and building code.

The National Housing Policy 2001 is currently being revised considering the disaster prevention and mitigation measures. It is planned to introduce detailed regulations in detail, for example, road width and public open space standards. The revised guideline is being developed as one of the ministerial strategies on disaster risk reduction (DRR) through mutual consultations among DRR consultants, members of the Ministerial Working Group (MWG), Independent Power Producers (IPP), the Pakistan Engineering Council (PEC), the Pakistan Council of Architects and Town Planners (PCATAP), the National Disaster Management Authority (NDMA) and the United Nations Development Program (UNDP) in Pakistan.

2) Related City Planning Regulations and Land Use Regulations

Pakistan does not have a national urban planning law; urban planning regulations and land use regulations are included in the National Housing Policy 2001 described above.

According to NHA, this National Housing Policy 2001 is adapted with regional and geographical conditions at provinces and district levels.

Table 4.7.6 summarizes some of the relevant city planning regulations of populous provinces and districts. As shown in this table, the relevant regulations lack the disaster prevention and management concept. In some regulations, urban disaster management is mentioned but there are no details or specifics.

Table 4.7.6 Regulations in Urban Planning Aspects

Region/District/City		Establishment date / organization	Summary
Province Level	Punjab	Land Use Rules 2009 (Oct 09) / Punjab Development Authority	Land use change and development regulatory rules. Insufficient description on urban disaster management.
		Poverty Focused Investment Strategy Housing and Urban Development (July 2005) / Punjab Development Authority	Current status and issue of investment for housing and urban development. Insufficient description on urban disaster management.
District Level	Karachi	Karachi Strategic Development Plan 2020 (Aug.07) / City District Government of Karachi	Framework for urban development for 2020. Description of disaster management, insufficient detail or specifics.
		Karachi Building & Town Planning Regulations 2002 (April 02) / Sindh, Housing & Town Planning Department	Urban relevant regulations including zoning regulations. Insufficient description on urban disaster management.
	Lahore	Integrated Master Plan for Lahore 2021 (Oct. 04) / Lahore Development Authority	Framework for urban development for 2021. Description of countermeasures against mainly flood.
		Land Use Convention Rules (March. 08) / Lahore Development Authority	Land use change regulation Insufficient description on urban disaster management.

Source: JICA Study Team

Land use maps are created at district level. The method of creation and legend category are different for each district. Until now, the land utilization programs have been developed with insufficient introduction of the concept of urban disaster prevention.

Although some districts have already an existing land use map and strategic land use map, the concept of urban disaster prevention have hardly been considered for creations of these maps.

There are some districts that are currently preparing land utilization programs and land use maps but hardly introduced the concept of urban disaster prevention in these programs and maps.

Some districts do not have any land use map.

3) Building Code and Relevant Regulations

The Building Code of Pakistan Seismic Provisions 2007 was issued by MOHW. This is a revised edition of the first Building Code 1986 after the earthquake in October 2005. The seismic provisions in the Code are founded on broad-based principles that make possible the use of new materials and new construction systems. The National Engineering Services Pakistan (Pvt.) Limited (NESPC) was in charge of the task of developing the seismic provisions. The final draft has been vetted by PEC. Unless there is a special need, this code is reviewed once every five years.

The Building Code is adapted with regional and geographical conditions at provincial and district levels. Local relevant building regulations are often issued before the issuance of the revised Building Code Seismic Provisions 2007.

Table 4.7.7 summarizes the building code and some of the relevant building regulations of populous provinces and districts. This table shows that, at Provincial and District level, the specification description on building structure control and quake-resistance standards are not enough in relevant regulations.

Table 4.7.7 Law and Regulations in Construction Aspects

Level	Decree or Law / Establishment date	Summary
National Level	Building Code of Pakistan 1986 / Ministry of Housing and Works	Description of building control, equipment, building materials and structural calculation. Specification and detail are mentioned in the other document. Insufficient description for earthquake resistance.
	Building Code of Pakistan Seismic Provisions 2007 (Sept. 07) / Ministry of Housing and Works	Revision of above building code. Added new standards for materials and building methods.
Province Level	Model Building and Zoning regulations for development authorities in Punjab（July 07） / Government of Punjab and Community Development Department	Model of architectural regulations. Description of building control, equipment, environmental consideration. Insufficient description of construction strength and earthquake resistance.
	Model Building and Zoning By-Laws for Town Municipal Administrations in Punjab （July 07） / Government of Punjab and Community Development Department	Model of architectural local regulations. Same contents with above model.
	Sindh Building Control (Amendment) Ordinance, 1979 (March. 01) / Government of Sindh	Guidelines of architectural design. Description of qualifications, applications procedures and capacity of qualified person.
	Sindh Building Control (Amendment) Ordinance, 2001 (Dec. 01) / Government of Sindh	Revision of above Sindh Building Control Ordinance in 1979.
District Level	Karachi Building & Town Planning Regulations 2002 (April 02) / Sindh, Housing & Town Planning Department	Maintain 5 separate categories by building scale and use. Description of applications procedures, fire resistance standards for each category. Insufficient description for specification and detail, and earthquake resistance. Volume of contents for urban regulatory description is more than for structure specification.

Source: JICA Study Team

4.7.4 Existing Condition of City Administration Including Urban Disaster Management

1) City Administration Regarding Urban Development

a. City Administration

City administration system is different by province and district. There are cases that the provincial authorities take charge of overall city administration. In other cases, they are responsible for overall city administration including its implementation. In addition, some districts leave the role of implementation of city administration to the tehsil level.

In terms of the implementation of city administration regarding city planning, the vertical linkages between national level and the implementation authorities are not very strong. The implementation authorities determine the scope of city management standards and building regulations.

At District level, the names of authority who are involved in city administration are different depending on each District, for example, City District Government, Development Authority. There are several other organizations involved in the city administration regarding city planning, land utilization and building structure control. Each organization should have different management domain but the boundary of activity areas is not very clear. This situation causes some confusion among organizations to the various city management activities.

b. Building Construction

With regards to new public buildings over a certain size, districts implement a building structure control in line with the Building Code. Meanwhile, the building structure control for small-scale buildings such as private housing is not enforced enough. As for existing buildings, the evaluation of building structure and the strengthening of existing structure are often delayed. These buildings have been neglected in most cases and most of them seemed not well built to withstand an earthquake.

2) Relation Between City Administration and Urban Disaster Management

Until now, the relation among the organizations carrying out city planning and urban disaster management is not tight enough. The urban disaster management organizations have been hardly involved in the creation of city planning and land use regulations.

In terms of creation of guideline for city planning, until now, the cooperation between the city administration government and urban disaster management organizations is not enough.

4.7.5 Risk Analyses of Natural Disaster in Urban Areas

In Pakistan, no specific data on disaster exists for urban areas. The JICA Study Team has made the hazard maps of Pakistan using the existing disaster records and considering other factors. Based on these hazard maps, the study team has made risk analyses. Following is an analysis of potential damages of each natural disaster in urban areas using the risk analyses by the JICA Study Team as reference. Please refer to the Chapter 4.8 for risk assessment methods.

1) Earthquake and Tsunami

Table 4.7.8 summarizes the seismic risk level for 10 major cities in Pakistan based on the JICA Study Team's hazard and risk analysis. Most populous city of Karachi and the nation's capital Islamabad are designated to have a very high risk of earthquake due to medium/high hazard and high population densities. Every major city is considered to have a high or very high risk of earthquake. If an earthquake occurs in Pakistan, physical damage and consequential economic loss would be huge. As further elaboration of risk analysis, the consideration of vulnerabilities for buildings and structures in the cities should be incorporated in the assessment.

Table 4.7.8 Relative Severity of Earthquake Risk Per District of 10 Major Cities in Pakistan

District	Risk level	District	Risk level
1. Karachi	Very High	6. Hyderabad	High
2. Lahore	High	7. Gujranwala M.C.	High
3. Faisalabad M.C.	High	8. Peshawar	Very High
4. Rawalpindi	Very High	9. Quetta	Very High
5. Multan	High	10. Islamabad	Very High

Source: JICA Study Team

Table 4.7.9 shows the tsunami risk level. It is a concern that Karachi has a very high risk of tsunami. If Karachi is affected by earthquake, not only the direct damage of the earthquake, but also the damage of tsunami would bring a serious impact on Karachi.

Table 4.7.9 Relative Severity of Tsunami Risk Per District of 10 Major Cities in Pakistan

District	Risk level	District	Risk level
1. Karachi	Very High	6. Hyderabad	No data
2. Lahore	No data	7. Gujranwala M.C.	No data
3. Faisalabad M.C.	No data	8. Peshawar	No data
4. Rawalpindi	No data	9. Quetta	No data
5. Multan	No data	10. Islamabad	No data

Source: JICA Study Team

2) Flood and Landslide

Table 4.7.10 shows the flood risk level for 10 major cities in Pakistan. According to this table, the risk of flooding is very high for Peshawar, Hyderabad and Gujranwala. More than four-fifths of the major cities are medium or more risk of flooding. In terms of the risk levels of the three largest cities, Karachi is High, Lahore and Faisalabad M.C. are Medium. However, these cities have a high population density; chaotic situation caused by flooding would be a concern.

Table 4.7.10 Relative Severity of Flood Risk Per District of 10 Major Cities in Pakistan

District	Risk level	District	Risk level
1. Karachi	High	6. Hyderabad	Very High
2. Lahore	Medium	7. Gujranwala M.C.	Very High
3. Faisalabad M.C.	Medium	8. Peshawar	Very High
4. Rawalpindi	High	9. Quetta	Medium
5. Multan	High	10. Islamabad	Low

Source: JICA Study Team

Table 4.7.11 shows the landslides risk level for 10 major cities in Pakistan. The landslides in Pakistan occur mainly in slope areas with a lot of annual rainfall. In the 10 major cities shown in the table below, there is a very high risk for Rawalpindi. Every 10 major cities are concerned medium or less risk of landslides except for Rawalpindi.

Table 4.7.11 Relative Severity of Landslide Risk Per District of 10 Major Cities in Pakistan

District	Risk level	District	Risk level
1. Karachi	Very Low	6. Hyderabad	Very Low
2. Lahore	Very Low	7. Gujranwala M.C.	Low
3. Faisalabad M.C.	Medium	8. Peshawar	Medium
4. Rawalpindi	Very High	9. Quetta	Very Low
5. Multan	Very Low	10. Islamabad	Medium

Source: JICA study team

As shown in Section 4.3.2, the risk levels shown in the table have been calculated by a formula "Hazard x Vulnerability Factor(s)" utilizing a mean district value for each factor. However, related agencies shall conduct small scaled vulnerability assessment since "landslides" is localized disaster. The risk may be reviewed by the NDMA utilizing new factor.

3) Cyclone

Table 4.7.12 shows the cyclone risk level for top 10 major cities for population and three major cities along coastal areas, such as Thatta, Badin and Gwadar, in Pakistan. Karachi, Hyderabad, Badin and Thatta, as shown in this table, are either at high or very high risk of cyclone. Karachi is facing a coast and according to Table 4.7.12, it has also very high risk of cyclones. If a cyclone hits Karachi, it would spawn a high storm surge like a tsunami. Regarding Gwadar City, the hazard level is classified in "Very High" but the risk level falls into "Medium" due to the low population density compared to that of Karachi or other major cities.

Table 4.7.12 Relative Severity of Cyclone Risk Per District of 10 Major Cities in Pakistan

District	Risk level	District	Risk level
1. Karachi	Very High	6. Hyderabad	High
2. Lahore	Low	7. Gujranwala M.C.	Low
3. Faisalabad M.C.	Low	8. Peshawar	Low
4. Rawalpindi	Low	9. Quetta	Low
5. Multan	Low	10. Islamabad	Low
11. Thatta	High	12. Badin	Very High
13. Gwadar	Medium *1	Note: *1: Hazard Level is "Very High"	

Source: JICA study team

4.8 Data Base Construction, Data Collection and Preliminary Risk Assessment Results

The Geographic Information System (GIS) is one of the most powerful tools for decision making and planning. Its capability to handle large volumes of spatial and attribute information has made it an essential tool for disaster management planning.

A comprehensive data base is being developed to understand current conditions of the study area covering whole of Pakistan. The database covers, in varying levels of detail, the administrative, natural, social, land conditions and every natural disaster records (flood, landslide, earthquake, tsunami, cyclone and drought) of the study area.

4.8.1 Existing Conditions

1) Objectives

The objectives of data base construction and data collection are: 1) to sum up various spatial data (getting for free) and disaster records data in the whole Pakistan, 2) to understand characteristics of natural hazard at every district, and 3) to identify the district which are considered to be high-hazard and at risk of natural disasters for National Disaster Management Plan.

2) Collection of existing data

To assess trends in disaster hazard and risk throughout whole of the country (130 districts plus 7 tribal agencies, as of Oct. 2010), it is necessary to use data that is organized in same precise and uniform way across the country. Thus, maps and statistical data being used and adopted are assessed on a country-wide basis. In order to develop the data base for this study, many kinds of both graphical and statistical data have been collected from relevant agencies or specialty Internet sites. Much of those data are very few and old, but we could collect the data necessary to conduct minimum evaluation. The characteristics of collected data are shown in Table 4.8.1. All collected data was entered into the computer after necessary modification, adjustment and updating. Sets of original data were stored into every natural hazard maps and risk maps.

3) Characteristics of collected data

Collected data is divided into several categories: foundational, socio-economic, geographical, weather, observatories, agriculture, and disaster records and other related data. Characteristics of those data are given below. In addition, each map created by GIS is summarized in Appendix 4.8.1.

Table 4.8.1 Collected Spatial Data and Statistics

Category		Item	Type of data	Resolution, scale or level	Source
Foundational		District administrative boundaries	Polygon	about 1/1,000,000 scale	*MapCruzin.com http://www.mapcruzin.com/index.html*
		Location of cities	Point	Coordinates are to minutes.	
		Road, Railway	line	about 1/10,000 scale	*FFC.*
		River, Canal, Lake	Line	about 1/500,000 scale	*MapCruzin.com http://www.mapcruzin.com/index.html*
		Ground surface (Satellite Data)	Raster	Path:250 m Row:250 m	*NASA*
Socio-economic		Population	Txt	per district	*1998 Census Report of Pakistan*
		Housing units By period of construction, material used in outer walls, roofs	Txt	per district	
Geographical		Elevation	Raster	ASTER GDEM Path:30 m Row:30 m	*NASA&METI*
				SRTM Path:90 m Row:90 m	*NASA*
		Depth of Arabian Sea	Point	Points are 5 min. intervals	*NOAA*
		Soils	Raster	about 1/2,500,000 scale	*Soil Survey of Pakistan 1988*
		Glacier, Glacier lakes and lakes	Polygon		
Weather		Mean annual rainfall Based on 1971 - 2000	Raster	about 1/1,000,000 scale	*PMD*
Agriculture		Yields of principal crops: wheat, rice, cotton	Txt	per district	*Agricultural Statistics of Pakistan 1995*
		Irrigation density	Polygon	Mesh size is 5 min.×5min.	*FAO*
Disaster records & related data	Earthquake	Seismic zoning map	Raster	about 1/2,500,000 scale	*Building code of Pakistan 2007*
		Locations of past earthquakes	point	Coordinates are to minutes.	*PMD*
		lsoseismals of earthquake of 2005	Txt	-	*IIEES reconnaissance team (Nov. 2005)*
		Death and Injured, Houses, Health facilities, Education facilities, Water and sanitation facilities damaged during the 2005 earthquake	Txt	per district including , Transportation and Trade sector damaged	*ADB-WB.2005. Preliminary Damage and Needs Assessment - Pakistan 2005 Earthquake.*
	Tsunami	lsoseismals of earthquake of 1945	Txt	-	*India Meteorological Department*
	Flood	Disaster record per district	Txt	per district	*NDMA FFC PMD*
		Districts Affected by 2010 flood	Txt	per district	
		Death, Injured, Persons Affected, Houses, Health Facilities, education facilities, Teacher/Students affected, during the 2010 Flood per District	Txt	per district including Agricultural Crops, Water and Sanitation Facilities, Private Sector Damaged and No. of relief camps	
		Districts Affected by 2011 Flood		per district	
		Death, Injured, Persons affected, Houses affected and etc. during 2011 Flood	Txt	per Districts incl. Crop Area Damaged and No. of relief camps	
	Landslide	Disaster record per district	Txt	per district	
	Cyclone	Disaster record per district	Txt	per district	
	GLOF	Location of Glaciers	Polygon	per district	EM-DAT
		Location of Glacier Lakes/Lakes	Polygon	per district	
	Avalanche	Disaster Record	Txt	per district	
Observatories		Radar locations River & Rainfall Station Structures (Dam, Weir)	Point	Coordinates are to seconds.	*PMD WAPDA Lai Nullah*

Note: ASTGTM: The ASTER Global Digital Elevation Model NASA: U.S. National Aeronautics and Space Administration
METI: Japan's Ministry of Economy, Trade, and Industry, SRTM: The Shuttle Radar Topography Mission
PMD: Pakistan Meteorological Department FAO: The Food and Agriculture Organization of the United Nations

Source: JICA study team

a. Foundational

The base map shows the outline of the study area created from foundational data. The kinds of data are district administrative boundaries, city location, road, railway, river, lake, and ground surface, all collected from specialty Internet sites. Vector type data is in ESRI Shapefile (polygon, line, point data) format. For ground surface, data used is satellite data provided by the National Aeronautics and Space Administration (NASA). The satellite data is also used for the 2010 flood analysis.

- A-1 Base Map
- A-2 Administrative Boundaries

b. Socio-economic

Socio-economic data is used for every disaster risk assessment. Generally, disaster risk analysis is used as indicators of the degree of economic activity, the importance of transportation, and the number of hospitals and schools. But the data covered all low-risk districts in Pakistan. In this study, population and housing unit density per district are used based on the 1998 Census Report of Pakistan.

- A-3 Population density per district
- A-4 Housing unit density per district
- A-5 Housing units by period of construction
- A-6 Housing units by material used in outer walls
- A-7 Housing units by material used in outer roofs

c. Geographical

Data on elevation, sea depth, and soils are collected as geographical data to be used for every disaster hazard assessment. For the elevation data, there are two kinds of model adopted: ASTER GDEM and SRTM. The ASTER Global Digital Elevation Model (ASTER GDEM) is observed by optical remote sensing sensor mounted on Terra satellite; resolution of this data is 30 m, both path and row. ASTGTM is very high resolution data and include flat terrain while the noise level of ASTER acquisition is high. While the Shuttle Radar Topography Mission (SRTM) is observed by radar mounted on a space shuttle. SRTM is common around the world and has relatively low level of noise. But the region having steep topography is not observed. In this study, ASTER GDEM is used for landslide hazard analysis while SRTM is used for tsunami or cyclone hazard analysis.

- A-8 Elevation & Depth of Sea
- A-9 Slope with City/Town Locations
- A-10 Coastal Elevation

- A-11 Soils

d. Weather

Average annual rainfall data based on 1971 – 2000 is used for analysis of landslide and for drought hazard assessment. In the analysis of landslide, the study team is unable to obtain accurate data on maximum amount of rainfall, so daily rainfall data is used.

- A-12 Average annual rainfall

e. Agriculture

Data on irrigation density with minimum mesh size 5 mm × 5 mm is obtained from the UN's Food and Agriculture Organization (FAO). Underdeveloped irrigation rate is used for one of drought hazard indices. Agriculture data obtained from the National Agro-Ecological Resources Database (Ver.1.0.0) is used for flood and cyclone disaster risk assessment. The collected data pertains to yields of major crops, namely, wheat, rice, and cotton.

- A-13 Irrigation area density per district
- A-14 Wheat yield
- A-15 Rice yield
- A-16 Cotton yield

f. Disaster records

Disaster records are used as a key element of every hazard assessment. Seismic zoning map, earthquake and tsunami records are obtained by examining the history of literature. Flood, earthquake, landslide, cyclone and avalanche records per district have been collected from PMD, FFC, ERRA and PMD. Coherent information about drought damage is available nationwide. Results of the damage assessment during 2005 earthquake, the 2010 flood in Pakistan conducted by the World Bank, ADB and NDMA, and 2011 flood in Sindh conducted by NDMA are also considered.

- A-17 Earthquake Locations
- A-18 Death during the 2005 Earthquake per District
- A-19 Injured during the 2005 Earthquake per District
- A-20 Houses Damaged by 2005 Earthquake per District
- A-20a Houses Completely Damaged by 2005 Earthquake per District
- A-20b Houses Partially Damaged by 2005 Earthquake per District
- A-21 Health Facilities Damaged by 2005 Earthquake per District
- A-21a Health Facilities Completely Damaged by 2005 Earthquake per District
- A-21b Health Facilities Partially Damaged by 2005 Earthquake per District
- A-22 Education Facilities Damaged by 2005 Earthquake per District

- A-22a Education Facilities Completely Damaged by 2005 Earthquake per District
- A-22b Education Facilities Partially Damaged by 2005 Earthquake per District
- A-23 Water and Sanitation Facilities Damaged by 2005 Earthquake per District
- A-24 Road Damaged by 2005 Earthquake per District
- A-25 Damaged to Trade Sector Caused by 2005 Earthquake per District
- A-26 Seismic Intensity (1945, 2005 Earthquake)
- A-27 Seismic Zoning
- A-28 Flashflood and Riverine Records
- A-29 Affected by 2010 Flood
- A-30 Death during the 2010 Flood per District
- A-31 Injured during the 2010 Flood per District
- A-32 Persons Affected by 2010 Flood per District
- A-33 Villages Affected by 2010 Flood per District
- A-34 Houses Damaged by 2010 Flood per District
- A-34a Houses Completely Damaged by 2010 Flood per District
- A-34b Houses Partially Damaged Houses by 2010 Flood per District
- A-35 Health Facilities Damaged by 2010 Flood per District
- A-35a Health Facilities Completely Damaged by 2010 Flood per District
- A-35a Health Facilities Partially Damaged by 2010 Flood per District
- A-36 Education Facilities Damaged by 2010 Flood per District
- A-36a Teachers Affected by 2010 Flood per District
- A-36b Students Affected by 2010 Flood per District
- A-37 Agricultural Crops area Affected by 2010 Flood per District
- A-38 Cattles Perished Caused by 2010 Flood per District
- A-39 Water Supply and Sanitation Damaged during 2010 Flood per District
- A-40 Damages to Private Sector Caused by 2010 Flood per District
- A-41 No. of Relief Camps Established during 2010 Flood
- A-42 Affected Districts by 2011 Flood
- A-43 Death during 2011 Flood per District
- A-44 Injured during 2011 Flood per District
- A-45 Person Affected during 2011 Flood per District
- A-46 Villages Affected by 2011 Flood per District
- A-47 Houses Damaged by 2011 Flood per District
- A-47a Houses Completely Damaged by 2011 Flood per District
- A-47b Houses Partially Damaged Houses by 2011 Flood per District
- A-48 Landslide Records
- A-49 Cyclone Records

- A-50 Location of Glaciers and Glacier Lakes
- A-51 Districts Affected by Avalanche

g. Observatories Location

Observatories Locations data are used in planning the Multi Hazard Early Warning System. The data consisted of current locations and new locations planned.

- A-52 Locations of Radars
- A-53 Locations of River and Rainfall Observations
- A-54 Locations of Structures (Dam, Weir)
- A-55 Locations of Seismographs and Tide Gauges
- A-56 Flashfloods Location

4.8.2 Calculation Method of Damage and Loss Caused by Disaster

This section discusses methodologies for the creation of hazard maps and risk maps for the whole of Pakistan for 1) flood, 2) landslide, 3) earthquake, 4) tsunami, 5) cyclone, and 6) drought, 7) avalanche, and 8) GLOF.

1) Definition of Risk, Hazard and Vulnerability

According to "Living with Risk" published by the Inter-Agency Secretariat of the International Strategy for Disaster Reduction (UN/ISDR) in 2004, risk is defined as "the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions" and can be indicated by the formula below.

<u>Risk = Hazard x Vulnerability</u>

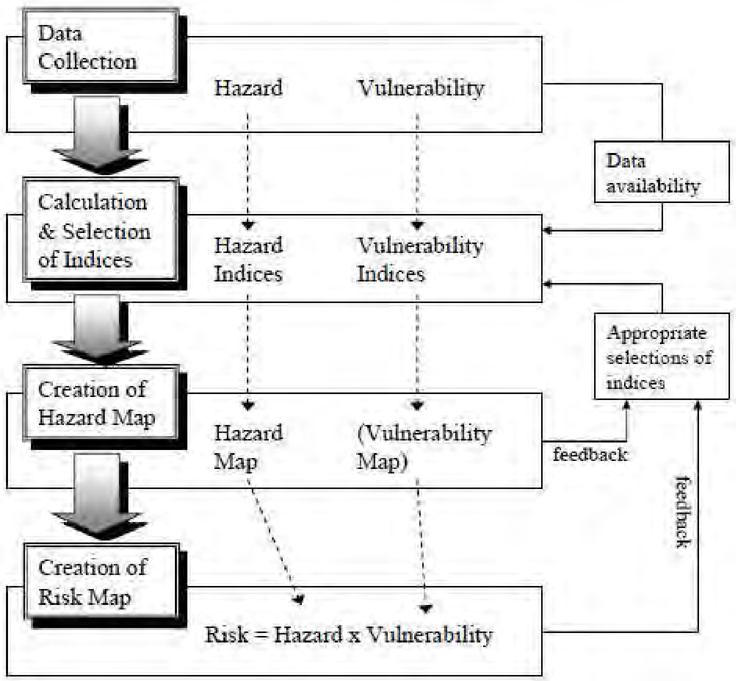
- Hazard: A potentially damaging physical event, phenomenon or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.
- Vulnerability: The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

2) Flow Chart for Creation of Hazard Maps and Risk Maps

The conceptual flow chart for the creation of hazard maps and risk maps is shown in Figure 4.8.1 below. There are three steps to producing a hazard map, namely: 1) data collection, 2) calculation and selection of indices, and 3) creation of hazard map. Further, a risk map is derived based on the formula "Risk = Hazard x Vulnerability" with the hazard map and the vulnerability indices (or possibly a map representing "Vulnerability"). At data collection stage, the base data in terms of hazard and vulnerability will be collected (e.g., affected disaster district, damage amount, rainfall, soil, slope condition, surface ground condition, population, housing units, principal crops yield, etc.). Then, the indices for hazard and vulnerability will be calculated during the calculation and selection of indices stage; they will be referred to as the candidate indices. The most appropriate indices for hazard and vulnerability can be selected among the candidate indices after the trial derivations of the hazard map and risk map. After the selection of indices, the hazard map is created as the summation of the indices at the stage of creating hazard maps. The vulnerability map, consisting of the relevant selected indices, can also be created if necessary. Finally, the risk map will be created with the use of the formula "Risk = Hazard x Vulnerability", which is the result of the "Creation of Risk Map" stage.

Total Risk Map of Pakistan can be calculated by summing up the disaster risk maps of flood, landslide, earthquake, tsunami, cyclone, and drought. In addition, risk areas identified by the respective Provincial/State/Regional Disaster Management Authorities are considered in the calculation of the total risk map. P/S/R DMAs identified the most vulnerable districts in each Province/State/Region for high risk against disasters from their respective point of view. On the other hand, Avalanche and GLOF risks are not included in the derivation of the total risk map since these are localized disasters and the scale(s) of the said two (2) disasters are limited. The formula for the computation of Total Risk Map is as follows:

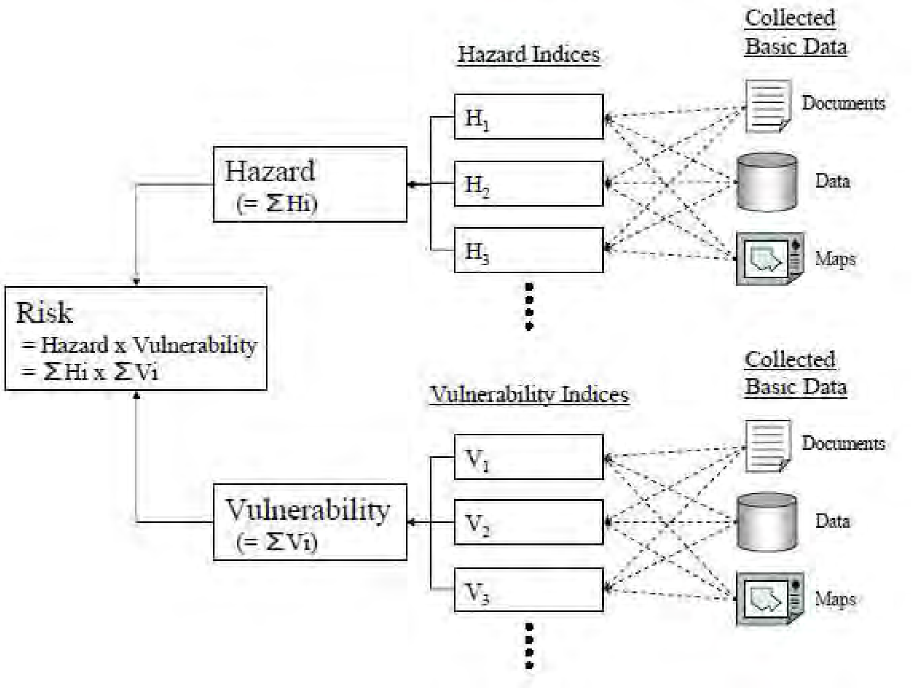
Total Risk Map = Flood Risk Map + Landslide Risk Map + Earthquake Risk Map + Tsunami Risk Map + Cyclone Risk Map + Drought Risk Map + Considertation of P/S/R DMAs Policy"



Source: JICA study team

Figure 4.8.1 Conceptual Flow Chart for Creation of Hazard Maps and Risk Maps

Figure 4.8.2 shows the relation among risk, hazard, vulnerability, indices and basic data. Risk is composed of Hazard and Vulnerability. Hazard and Vulnerability consist of their respective indices. Hazard is simply the summation of the hazard indices. Vulnerability can also be estimated in the same manner. Each index is derived or calculated based on the collected basic data from various information sources. The indices used for creation of hazard maps and risk maps are shown in Table 4.8.2 below. And Figure 4.8.3 shows an example of the flood risk calculation.



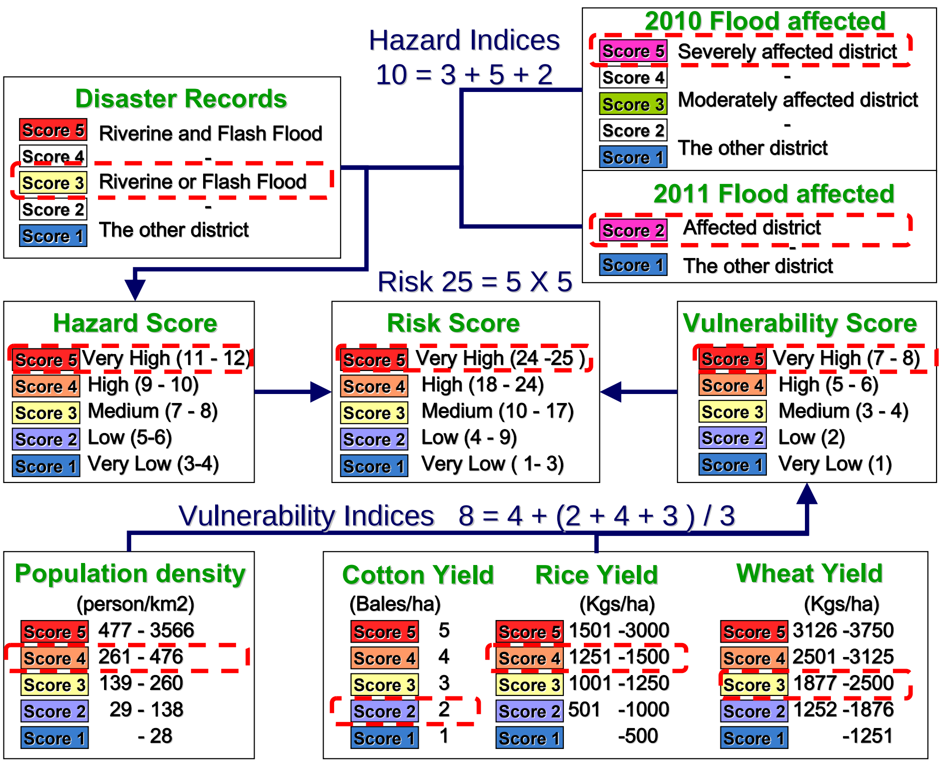
Source: JICA study team

Figure 4.8.2 Relation Among Risk, Hazard, Vulnerability, Indices and Basic Data

Table 4.8.2 The Indices Used for Creation of Hazard Maps and Risk Maps

Disaster Type	Hazard Indices	Vulnerability Indices
Flood disaster	- Disaster Records per district - Affected district by 2010 Flood - Affected district by 2011 Flood	- Population Density - Principal crops yield
Landslide disaster	- Disaster Records per district - Slope - Soil - Mean annual rainfall	- Population Density
Earthquake disaster	- Seismic zoning	- Population Density
Tsunami disaster	- Coastal Elevation	- Population Density
Cyclone disaster	- Disaster Records per district - Coastal Elevation	- Population Density - Principal crops yield
Drought disaster	- Mean annual rainfall - Irrigation Density	- Population Density - Principal crops yield
Avalanche	- Geographical location - Disaster Records - Elevation - Slope	- Population Density
GLOF	- Glacier - Glacier Lakes	- Population Density
Whole Disasters	-	- F/G/S/PDMAs Decision *1

Source: JICA study team
Note: *1: Each P/S/R DMA identified the most vulnerable five (5) districts in their jurisdictions.



Source: JICA expert team

Figure 4.8.3 Example Case of Flood Risk Calculation

3) Results of Hazard and Risk Analysis

The hazards and vulnerabilities are overlaid for analyzing the risk with the use of GIS software. Basically, the values of each layer were divided into five classes indicating relative hazard/risk classifications. “Red” means high hazard/risk and “Blue” shows low hazard/risk. Results of creation of hazard assessment are shown in Figures B-1 to B-8 and Table B-1, B-2 of Appendix 4.8.1, and results of risk assessment are shown in Figure C-1~C-8 and Table C-1, C-2 of Appendix 4.8.1.

4.8.3 Recommendation for Accumulation of Disaster Records

1) Necessity of Disaster Damage Records

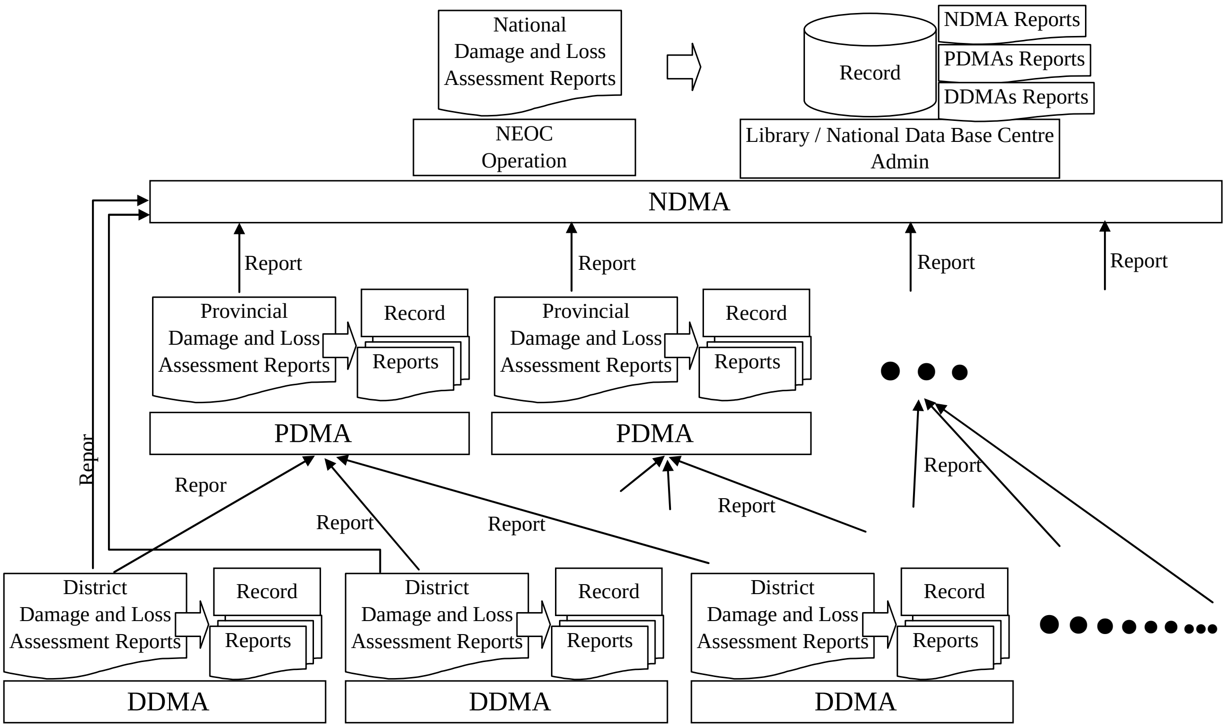
As described in the previous sub-sections, it is indispensable for the identification of true and fair hazards and risks against disasters in Pakistan to precisely recognize and record the extents, scales and amounts of damages due to disasters in the past through the accumulation and recording of each district government. In this regard, the NDMA has already prepared the Damage and Loss Assessment Format and published it as Annex H in the National Disaster Response Plan (NDRP) issued in March 2010. As shown in Appendix 4.1.1, the hazards, vulnerabilities and their magnitudes of the whole of Pakistan could not be correctly assessed among provinces, regions, districts, cities or tehsils since the current damage formats reported and prepared by district governments are far from united.

2) Recording System of Damages by Disaster

As described in previous paragraphs, each district government should collect the damages of every disaster that occurred within their jurisdiction and NDMA/ F/G/S/PDMAs shall record, accumulate and preserve the damage reports to analyze the vulnerabilities and risks against disasters in the whole of Pakistan. In this regard, all related agencies and governments should distinguish between the actual damage (amounts) and rehabilitation/ reconstruction/ compensation/ subsidy costs. In case the budgets of national and provincial governments and residents are insufficient for the repair of infrastructures and private properties, they would dispense the quick-fix needs as well as compensation and subsidy money. Therefore, damage reports should also been discriminated with rehabilitation and reconstruction amounts after the disasters.

All of the damage reports to be prepared by the district governments (DDMAs) shall be reported to the upper authorities and recorded by each authority respectively.

The overview flowchart of the reporting and recording system of the damage and loss assessment can be explained as follows:



Source: JICA Study Team

Figure 4.8.4 Reporting and Recording System of Damage and Loss Assessment

These damage and loss assessment reports should be counterchecked and compared with other damage and loss reports prepared by related departments and agencies, such as the NHA for national roads, PIDs for major infrastructures for irrigation systems, WAPDA, and the Ministry of Railways or Pakistan Railways.

As for a reconstruction and rehabilitation system, DDMAs, F/G/S/PDMAs or responsible departments/agencies affected by disasters shall prepare the reports and requests for the reconstruction and rehabilitation differently from the damage and loss assessment reports in accordance with the NDRP or other related manuals.

These reports and requests for the reconstruction and rehabilitation shall be verified by the comparisons with the damage and loss assessment prepared by each district government.

3) Enhancement and Strengthening of the Preparation of Damage and Loss Assessment Reports

In the JICA Project, the NDMA format attached in the NDRP for the damage and loss assessment has been reviewed and introduced to the local government officials in the activities of the Project, such as activities of the "Assistance to pursue ahead the implementation of the priority activities for Human Resource Development" and "Workshops for Disaster Management in target communities". Through these activities, the disaster records would be collected and accumulated and shall be utilized for the hazards and risks assessment and vulnerability analysis. The recommended damage and loss assessment Format has been attached hereto as Appendix 4.8.2 and revised points of the original format shown in the NDRP are as follows:

- Clarification of Gender Type for the Number of Casualties
- Additional Column for the Location of Relief Camps in the Table of Format
- Additional Column for “Type of Crop” and Type of Damage” of Relief Camps in the Table of Format

4.8.4 Recommendation of Further Elaborate Assessment

The results attained in this Study can be utilized as basic information of district-wise hazard and risk classification. Each government of provincial level and district level can comparatively identify their hazards and risks posed against each disaster. Based on the risk assessments in this study, each local government shall conduct the detailed hazard and risk assessments in its jurisdiction area, in particular for the disaster(s) categorized in “Very High” and “High” in collaboration with technical agencies related to the targeted disaster(s).

The national risk assessment(s) shall also be updated in regular intervals for the confirmation of current risks. The vulnerability as main factor of risk assessment will have been changed, diverted or created newly due to the life pattern of people, the increments and accumulation of properties and etc.

In addition, the implementation of mitigation measure(s) will reduce the hazard condition as another essential factor for risk assessment. In this connection, the review of national risk assessments utilizing updated GIS techniques shall be conducted at appropriate intervals regularly.

4.9 Execution of Information and Evacuation Drills

4.9.1 General and Introduction

All the existing warnings, alerts and evacuation orders for the disasters have been issued to the focal federal and provincial agencies including district governments concerned by PMD. On the other hand, the dissemination systems from district governments to the residential peoples as end beneficiaries of each EWS have depended upon the history, culture and customs of the communities. Basically, the usual tools for the dissemination from district governments have been land phones and/or by word of mouth. Recently, SMS and sirens installed for the established EWS have also been adopted in accordance with their SOPs.

In this regard, it is essential for the appropriate operation of dissemination activities during the actual disasters to confirm and evaluate the current systems through the information and evacuation drills. In the JICA Project, the information and evacuation drills have been conducted as a part of the activities in the improvement of CBDRM. The drills have been executed to:

- Confirm the communication system between PMD and DCO offices with concerned agencies and Communities during the disaster event as based on the designated manual(s) and/or plan(s), such as the Flood Relief Plan, SOP of PMD and Districts and/or District Disaster Management Plan, if any,
- Monitor the necessary time to communicate the Alert, Warning and/or Evacuation Order(s) to reach the main concerned agencies in District and City Governments and other important organizations involving communities.
- Verify the accurate information of communication between PMD and DCO office with concerned agencies and communities.

The features of the drills are as follows:

Table 4.9.1 The Indices Used for Creation of Hazard Maps and Risk Maps

Name of Community	Targeted Disaster	Dissemination Tool from PMD to District	Dissemination Tool from District to Community
Javed Colony, Union No.45, Tehsil Rawalpindi	Flash Flood	FAX (main tool) and Land Phone	FAX (for Other Agencies), Siren, Land Phone, Cell Phone and SMS
Union Khangarh Doma, Tehsil Alipur, Muzaffargarh	River Flood	FAX (main tool)	Cell Phone, Conversation, SMS

Source: JICA Expert Team

4.9.2 Procedures

All drills were conducted in accordance with each procedure previously designated by the JICA Expert Team in advance. The procedures designated prior to the drills are described below:

1) Javed Colony for Flash Flood

a. PMD will send FAX to DCO-City District Government of Rawalpindi (CDGR) (at the same time send FAX to DDO (Revenue) and Rescue 1122 and other focal agencies in accordance with Flood Relief Plan 2010) about the Warning of Evacuation Level. (**Step 1**),

b. Rescue 1122 or DDO (Revenue) will issue the Evacuation Order and inform all the concerned agencies (20 offices) by phone. Time and contact person shall be recorded in the **Form 1**. (**Step 2**)

c. The office that received the Evacuation Order (EO) should write the time received and content of EO on **Form 2**. (**Step 3**)

d. With **Form 2** approved by the office in charge or person in charge of the office, it is then singed and Faxed to the Rescue 1122 office (the Leader of Task Force) (**Step 4**)

e. Instead of a Siren, the City Police have communicated with UC and Communities through the phone, FAX or SMS. Time and contact person shall be recorded on **Form 3**. (**Step 5**)

f. With **Form 3** approved by the office in charge or person in charge of the office, it is then singed and Confirmed in the Workshop (**Step 6**)

The flow of the procedure for the dissemination drill has been illustrated in Appendix 4.9.1 and an actual drill was conducted on February 14, 2011 at 12:00 p.m.

2) Khangarh Doma for River Flood

a. FFD_PMD will send a FAX to DCO-Muzaffargarh (0661-423959) and PDMA about the Early Warning (EW) or Routine Daily Flood Forecast (RDFF) (for a DRILL) regarding the Evacuation Level. In addition, PMD will also send the same FAX to Deputy District Officer Revenue (DDOR)-Muzaffargarh (0662-700116) for this drill as a special case (**Step 1**)

b. The Responsible Person in the Muzaffargarh will order the Drill of the Evacuation Order (EO) and inform all the concerned agencies by FAX/Phone. Time and contact person shall be recorded on **Form 1**. (**Step 2**)

c. The office receiving the Flood Situation (**as a DRILL**) should write the time received and content of the EO on **Form 2**. (**Step 3**)

d. With **Form 2** approved by the office in charge or person in charge of the office, it is then singed and FAXed or Phoned to the Responsible Person in the Muzaffargarh District (**Step 4**)

e. In accordance with the SOPs (Flood Contingency Plans) or the Meeting held prior to the Workshop, all the information (EO etc.) (**for the DRILL**) will be transferred to the Drill participants (Tehsil (Alipur)/Union (Khangarh Doma)/Community through the phone, FAX or SMS. Time and contact person shall be recorded on **Form 3**. (**Step 5**).

f. With **Form 3** approved by the person receiving the EO, it is then singed and Confirmed in the Workshop (**Step 6**)

g. In addition to the steps aforementioned, FFD_PMD will send messages through SMS utilized in the system to the Focal Persons listed below (**Additional Step**). The utilization of SMS in the EWS shall be discussed in the Workshop.

The flow of the procedures for the dissemination drill has been illustrated in Appendix 4.9.2 and an actual drill was conducted on March 01, 2011 at 12:00 p.m.

4.9.3 Results

Most of the participants of the drills for each community have understood well the points of their evacuations and sources of warning messages except for some misunderstandings and confusions. The Results are summarized below:

1) Javed Colony

PMD sent a FAXor the drill for evacuation to DCO Office and Rescue 1122 on time (12:00 p.m.). (See Appendix 4.9.1 (3/3) attached at the end of this report.).

Secondly, the staff of Rescue 1122 sent or forwarded the contents of the drill or the sheet sent by PMD by land phone, FAX or cell phone as shown in Table 4.9.2.

Table 4.9.2 Communication List by Rescue 1122 for the Information Drill

Agency	Communication Tool succeeded	Time of Communication
DFCC	By Land Phone	12:02
Civil Defence	By Land Phone	12:10
Agriculture	By Land Phone	12:08
XEN IESCO	No One answered (12:06)	-
TMO	By Hand	12:02
Army	No One answered (12:04)	-
City Police	Number Changed	-
WASA	By Hand	12:07
Social Welfare	By Land Phone	12:07
DHQ Hospital	By FAX and By Land Phone	12:10
TMA	By Hand	12:02
Fire Fighting	(by Hand, (Rescue 1122))	12:02
EDO-MS	By Land Phone	12:09
Agriculture	By Land Phone	12:08
NDMA	By Land Phone	12:09
DEO (R1122)	By Land Phone	12:03
UC 45	By Cell Phone	12:03

Note: DFCC: District Flood Control Centre, XEN IESCO: Executive Engineer Islamabad Electrical Supply Company, TMO: Tehsil Municipal Officer, DHQ: District Head Quarter, EDO: Executive District Officer, DEO: District Emergency Officer

Source: JICA Study Team

The staff of Rescue 1122 promptly initiated the dissemination activities to other focal agencies by land phone, cell phone and FAX. In addition, the Rescue 1122 also disseminated the information drill through a speaker and siren from the nearest warning post located around the Javed Colony at 12:30 p.m.

All participants were supposed to evacuate to the designated location based on the information from the secretary of UC 45. However, they evacuated and turned out based on the announcement from the speaker by the staff of Rescue 1122 since the secretary of UC 45 had not informed them of the evacuation drill. After the evacuation activity, a Workshop was held at the building as a part of the improvement of the CBDRM.

2) Khangarh Doma

FFD-PMD sent a FAX for the drill for evacuation to PDMA, DCO Office (DDMA) and DDOR Office (at Alipur) on time (10:30 a.m.). Simultaneously, FFD sent SMS messages of the contents of the drill to focal officers and community leaders at 11:00 a.m.

Table 4.9.3 Communication List by FFD and DDOR for the Information Drill

Agency	Communication Tool succeeded	Time of Communication
FROM FFD to Focal Agencies and Community		
PDMA	FAX	10:35
	SMS	11:00
DDMA (DCO)	FAX	10:39
	SMS	11:00
DDOR (Tehsil Alipur)	FAX	10:43
	SMS	11:00
Union Secretary	SMS	11:00
Community Leader	SMS	11:00
Community Sub-Leader	SMS	11:00
Local JICA Expert	SMS	11:00
UNDP Officer	SMS	11:00
From Tehsil Office (DDOR) to Union Secretary		
Union Secretary	FAX	11:30

Source: JICA Study Team

Basically, actual formal warning messages have been disseminated by FAX because information and data to be informed regarding river floods are a quite copious amount, such as rainfall amounts at related locations, weather predictions, observed flow data at designated locations (at weirs), assumed date of floods and etc. In addition, actual evacuation areas for residents who are living in low-lying areas and along riverine areas are designated at far distance places. In the drill, participants evacuated to the building where the workshops of the CBDRM were held as a matter of convenience. Based on the situations explained above, all participants of the drill turned out in the tentatively designated evacuation locations on time after they received the SMS messages.

4.9.4 Evaluation and Recommendations

The information and evacuation drills at two (2) communities were conducted correctly and most of the participants were evacuated to the designated locations without extreme delay of evacuation activities. However, some considerable and concerned issues to be improved have been pointed out and are summarized below:

1) Dissemination Activities by SMS

Except for the Tsunami Warning System, dissemination activities for warning of disasters by SMS have been utilized as secondary tools because capacity of information by SMS are limited and insufficient comparing with the amounts of information to be disseminated related to the likely disasters, such as meteorological and hydrological data for floods and sediment disasters. Therefore, it is recommended that the main resource for the communication of warnings should still be FAX from PMD to focal agencies and officers.

On the other hand, residential people as the end beneficiaries of the EWS are anxious to get earlier, quicker and more precise information about warning of disasters.

In the EWS of Lai Nullah Basin, an alert system using a siren and voice message through warning posts has already been established and properly operated. However, the dissemination system should consist of as many as possible redundant and alternative methods.

In this regard, the dissemination system by SMS shall be adopted as one of the redundant and alternative methods in each warning system.

2) Execution of Information and Evacuation Drill involving Mass Media

In the drills in the Project, evacuations were conducted based on formal information procedures with dissemination by SMS. In case of actual early warning activities, the transmission of warnings through the mass media has played an important role as a dissemination and information route for alerts and warning in the system. In fact, PMD has concluded agreements for early dissemination of alerts and warnings with media in each system. Electronic media & cable operators as well are now coming into common as the populous has cable network within their homes. However, it is difficult to involve the roles and activities of media in the small workshop(s) and drill(s) since the area of broadcasting services cannot be limited and determined.

In this context, the executions of massive public and national drill(s) utilizing the Disaster Risk Reduction Day/Week and relevant events are highly recommended as described in the National Disaster Management Plan (Draft) proposed in the Project.

3) Frequent Updating and Confirmation of Dissemination Routes

Most of the dissemination route(s) of the current EWSs are based on the government organization system from PMD to citizens/communities passing through DDMA, Tehsil and Union Council. However, officers in charge of DRM in all offices/levels, especially officers in F/G/S/PDMAs and DDMA and focal officers of Tehsil and Union Council, frequently used to change their position(s). Taking into account these conditions, frequent information and evacuation drills for which communities take initiative with focal officers of Civil Defence, Fire Office (Rescue 1122) and/or City Police shall be strongly recommended.

It is strongly recommended that periodic and frequent drills shall be executed by the initiative of each community. Accordingly, the NDMA and F/G/S/PDMAs should promote these activities as responsible agencies.

4) Language to be used for the Evacuation Order

The language of most of the information has been in English. It is more helpful if SMS messages or some announcements are in the local language or national language because people can understand the meaning of the alerts and warnings. In the drills, some community people could not read the messages since they were written in English.

In this connection, PMD and F/G/S/PDMAs/DDMAs should consider sending the alerts and warning as well as the evacuation order messages in the local or national language(s).

5) Enhancement and Strengthening of Education and Training for EWS against Disasters

Related to language to be used in EWS, education and training for EWS are the most essential activities to reduce the suffering of the people in disasters. Officers in all levels of government offices can direct and lead the people along with the situation and status of disasters. In addition, people can also prepare and commence evacuation by themselves prior to the official order and onslaught of disasters if they know the mechanisms and phenomena of disasters.

NDMA and F/G/S/PDMAs shall promote the Education and Training for EWS in collaboration with human resources development and the Enhancement and Strengthening of CBDRM activities.

CHAPTER 5 PRIORITY ACTIVITIES FOR HUMAN RESOURCE DEVELOPMENT

5.1 Background

The Project for the National Disaster Management Plan has supported the formulation of basic plans for disaster risk management including the National Disaster Management Plan at the national level. As a part of the Project activity, a “Human Resource Development Plan on Disaster Management” has been prepared.

The Project also covers the implementation of highly-prioritized activities in the plan as a pilot this year and the “Disaster Risk Management Training for TMA Staff (DRM training for TMA Staff)” and “Enhancement of coordination among organizations which conduct capacity building in the field of disaster management” were selected as those activities for the following reasons.

5.1.1 Disaster Risk Management Training for TMA Staff

TMA staff members are the closest government staff to disaster sites and the community and therefore they are the key to implement local and community level DRM activities both in the mitigation and preparedness phases and in case of emergency. However, it would have to be said that the knowledge of TMA staff on DRM is not sufficient to implement DRM activities in a proper manner. In this context, the need for capacity enhancement of TMA staff members in DRM is very high. Despite the strong need for capacity enhancement of TMA staff, DRM training for them is not sufficiently implemented at present.

Therefore, relevant training contents and implementation structure have been examined as a pilot activity. The result of the pilot activity has been integrated into the “Human Resource Development Plan on Disaster Management” when finalising the plan.

5.1.2 Enhancement of coordination among organizations which conduct capacity building in the field of disaster management

Human resource development activities are conducted by various organisations in Pakistan. In order to utilise the limited resources efficiently (trainers, teaching materials, etc.) and avoid duplication for promotion of human resource development, it is necessary to have good coordination among the organisations which conduct capacity building in the field of disaster management. However, it has been identified that there is no such type of coordination at present. It can be said that most of the organisations isolate themselves in terms of human resource development activities.

It is required to set up a coordination mechanism for that purpose and to create a system to collect information regarding human resource development activities conducted by different organisations in a regular way.

The first coordination meeting is planned to be held in February 2012 as the priority activity by inviting major organisations that are engaged in human resource development in the field of DRM, whose purpose is to set roles and members of the coordination meeting.

5.2 DRM Training for TMA Staff

5.2.1 Framework of the Priority Activity

This priority activity is listed as “Training of TMA Staff through DDMA Staff” in the NIDM Operation Plan in the Human Resource Development Plan on Disaster Management. As mentioned above, TMA staff are in the key position for implementing the effective DRM activities, therefore, the target of the training is TMA staff members who are in charge of DRM activities. On the other hand, capacity enhancement and knowledge transfer to TMA staff is generally done by the higher level government staff. To enhance the DRM capacity and knowledge of TMA staff, DRM knowledge and teaching skill of district officers who are responsible for training for TMA staff is also required. In addition, there is no doubt that the effect of the training will not reach to the ground level without actual implementation of DRM activities.

Considering the situation mentioned above, “DRM Training for TMA Staff” is broadly divided into two parts, “Training of TMA Staff” and “Action Plan Implementation”, and Training of TMA Staff is further divided into “Training of Trainers (TOT) for the DRM Training for TMA Staff” to district level government officers and “Implementation of TMA staff training” by the district level government officers who were trained in the TOT.

1) Implementation Schedule

The DRM Training for TMA Staff started in June, 2011 with the three-day TOT program for district officers (June 21 to 23, 2011 at NIDM). The DRM Trainings for TMA Staff are scheduled in July, 2011 and action plans were implementwed after the DRM Trainings. Overall schedule of the activity is shown in the following table.

Table 5.2.1 Overall Schedule of DRM Training for TMA Staff (2011)

	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan
Development of contents									
Training of Trainers (TOT)									
Preparation of TOT in ISB									
TOT in ISB									
DRM Training for TMA Staff									
Preparation of DRM training in districts									
DRM training for TMA Staff in the districts									
Action Plan Implementation									
Action Plan by TMA Staff/Follow-up of Actions by District officers									
Collection of training implementation reports									

2) Implementation Structure

The program, DRM Training for TMA Staff, was implemented with the following implementation structure.

Table 5.2.2 Implementation Structure of DRM Training for TMA Staff

Item	Arrangement
- TOT Program:	The JICA Expert Team and NIDM took the initiative to hold the TOT program for DRM Training for TMA Staff.
- DRM Training for TMA Staff:	The DRM Training for TMA staff was held at the initiative of the trained district officers (participants of the TOT program). Follow-up of implementation of action plans at TMA level is also the responsibility of the trainers. The JICA Expert Team and NIDM will support and supervise organizing the training program and implementing activities.
- Follow-up of implementation of action plans in TMAs:	
- All logistical support	Sub-contracted NGO (Muslim Aid)

5.2.2 TOT for "DRM Training for TMA Staff"

The TOT for "DRM Training for TMA Staff" was held June 21 to 23, 2011 at the NIDM lecture hall with about 20 participants from 5 districts. Following is a summary of the TOT. More details shall be referred to in the TOT Completion Report, which is attached to this report.

1) Objectives of the TOT Training

The objectives of the TOT training are as follows:

- Participants obtain proper knowledge regarding DRM.
- Participants understand the training contents and become able to conduct the training to TMA staff.

As the specific outcomes, the participants will be able to;

- explain the basic concept of DRM,
- explain roles and responsibilities of TMA staff in disaster management,
- explain what kinds of activities TMA can do for mitigation and preparedness,
- explain about the EWS and emergency response and what TMA staff should do,
- explain the basic concept of CBDRM, and
- conduct the training course to TMA staff.

2) Selection of Target District and Participants

As a part of the Project, Community Based Disaster Risk Management (CBDRM) activities were being implemented in the disaster prone districts of Rawalpindi, Bhakkar, and Muzaffargarh in Punjab, Thatta and City District of Karachi in Sindh, and those CBDRM activities should also be expanded by local level government officers. Considering the effectiveness of the priority activity and maximizing the Project effects, the same districts were targeted for implementing "DRM Training for TMA Staff".

A total of 20 participants were selected from various departments and organizations of the target districts to share their knowledge and capacity as widely as possible in the district (refer to Table 5.2.3).

Table 5.2.3 Composition of the Participants

Province	District	Participants
Punjab	Rawalpindi Bhakkar Muzaffargarh	2 district officers 1 officer of Rescue 1122 1 officer of Civil Defence
Sindh	Thatta City District of Karachi	3 district officers 1 officer of Civil Defence

3) TOT Program and Activities Implemented

The TOT program is summarized as follows.

Contents	• Concept of DRM • Roles and responsibilities of TMA staff in disaster management • Mitigation and preparedness at Tehsil level • EWS and emergency response at Tehsil level • Community Based Disaster Risk Management (CBDRM) • Preparation of action plan • Facilitation and teaching skills
Trainers	Staff of NIDM, JICA experts
Duration	Three days
Venue	Islamabad

TOT was conducted as a 3-day program as shown below.

Table 5.2.4 TOT Program Agenda

Day 1 (June 21, 2011)

Time	Session	Facilitator
9:00-10:30	Opening Session - Recitation of the Holy Quran - Opening remarks (JICA, NIDM) - Introduction of participants - Explanation of framework of the training - Pre-training knowledge evaluation	JICA Expert Team
10:30-10:45	Tea Break	-
Module 1: Introduction to Disaster Management		
10:45-12:00	1.1 Disasters	Mr. Falak
12:00-12:30	1.2 Disaster Risk Management	Mr. Falak
12:30-13:45	Lunch	-
13:45-14:30	1.2 Disaster Risk Management (Cont'd)	Mr. Falak
Module 2: Roles and Responsibilities of TMA Staff in Disaster Management		
14:30-15:20	2.1 Relevant organizations and their roles at DRM	Mr. Harir
15:20-15:40	Tea Break	-
15:40-16:30	2.2 Roles and responsibilities of TMA	Mr. Harir

Day 2 (June 22, 2011)

Time	Session	Facilitator
Module 3: Public Awareness		
9:00-10:00	3.1 Measures for mitigation and preparedness	Mr. Harir
10:00-10:30	3.2 Public awareness	Mr. Harir
10:30-10:45	Tea Break	-
10:45-11:10	3.2 Public awareness (cont'd)	Mr. Harir
Module 4: Early Warning System and Emergency Response at Tehsil Level		
11:10-12:10	4.1 Early warning system in Pakistan	PMD
12:10-13:30	Lunch	-
13:30-14:25	4.2 Emergency headquarters	Mr. Harir
14:25-15:15	4.3 Evacuation and camp management	Mr. Harir
15:15-15:35	Tea Break	-
15:35-16:30	4.4 Damage assessment and reporting	Mr. Harir

Day 3 (June 23, 2011)

Time	Session	Facilitator
Module 5: Community Based Disaster Risk Management (CBDRM)		
9:00-10:30	5.1 CBDRM objectives 5.2 Tehsil and communities 5.3 CBDRM activities 5.4 Outcome of CBDRM	Ms. Shaw
10:3010:45	Tea Break	-
10:45-11:45	5.5 Community involvement in DRM planning 5.6 Up-scaling CBDRM	Ms. Shaw
Module 6: Preparation of Action Plan		
11:45-12:45	6.1 Explanation of Action Plan 6.2 Development of Action Plan 6.3 Presentation of Action Plan	Mr. Matsumaru
12:45-13:45	Lunch	-
13:45-14:45	Adult learning and teaching/facilitation skills	Mr. Falak

14:45-15:30	Explanation of activities after the training at each district	Dr. Matsumaru
15:30-15:45	Tea Break	-
15:45-16:15	Evaluation of the training - Post-training knowledge evaluation - Evaluation (NIDM, JICA)	JICA Expert Team
16:15-16:45	Closing Session - Certificate distribution - Closing remarks (NIDM, JICA)	JICA Expert Team

In this three-day TOT program, lectures on DRM, and discussions and presentations by participants were held in order for the participants to obtain proper knowledge of DRM. During the lecture, how to teach the subject was also covered by the lecturer. In addition, lectures on teaching/facilitation skills were especially presented as the program aimed to foster the trainers for TMA staff training.

As shown in the photos below, participants actively participated in the program and successfully completed the program.

Group work Session

Presentation of Discussion

Figure 5.2.1 Scenes in the TOT

4) Materials for TOT Program

As the program was designed for TOT, materials were also prepared by trainers as teaching material for the TMA staff training program.

Two volumes of material, namely, “Presentation Materials” and “Teaching Plans/Reading Materials” were prepared and distributed to the participants.

“Presentation Materials” is a book that contains all presentation material presented in the training program, while “Teaching Plans/Reading Materials” is a book containing useful material for conducting the future programs in TMA such as detailed teaching plans with teaching tips for each session and additional reference material for the participants to obtain further knowledge on disaster management by themselves. “Presentation Materials” were prepared both in English and in Urdu.

Digital copies of the material were also distributed to the participants as CDs for actual use in TMA staff training programs.

5.2.3 DRM Training for TMA Staff

1) Training Overview

The following table summarises the overview of DRM training for TMA staff at each target district.

Table 5.2.5 Summary of DRM Training for TMA Staff

Target of Training	1-2 TMA staff members in charge of DRM from every TMA in each target district
Objective	TMA staff will understand their roles for disaster management and implement necessary measures after the training.
Outcomes	• The participants will be able to explain the basic concept of DRM. • The participants will be able to explain roles and responsibilities of TMA staff in disaster management. • The participants will be able to explain what kinds of activities TMA can implement for mitigation and preparedness. • The participants will be able to explain the EWS and emergency response and what TMA staff should do. • The participants will be able to explain the basic concept of CBDRM.
Contents	• Concept of DRM • Roles and responsibilities of TMA staff in disaster management • Mitigation and preparedness at Tehsil level • EWS and emergency response at Tehsil level • Community Based Disaster Risk Management (CBDRM) • Preparation of action plan
Trainers	Trained district officers of each target district
Duration	Three days
Venue	District centre in each target district

2) TMA Staff Training

TMA staff trainings were conducted in five districts according to the schedule shown in Table 5.2.6 below. Almost all TMAs in each district have participated in the training, despite the exception in Karachi; where the attendance rate was relatively low because re-allocation of district officials was going on, and officers were busy coping with the flood that occurred in August and September, 2011.

Trainings in each district have been completed by mid September, which is two months behind when it was originally planned, due to difficulties regarding selection of trainees in the Tehsil level and determination of the schedule. This was caused by following reasons; firstly, the structural change in the government organization in Sindh, secondly, relatively low motivation of TMAs to this training and to DRM itself, and finally, appropriate selection did not go smoothly since often times there is no position at TMA level which is directly related to disaster management.

The district officers who were trained in the TOT became lecturers in each district at this time, and they conveyed the training for TMA staff with a three-day schedule. However, not all participants in TOT became lecturers at TMA level; only those who are relatively highly-motivated took the responsibility as trainers. Also the transfers of trained officers affected this result.

As for the training materials, although the contents were generally based on that of TOT, in order for the TMA staff to fully understand and also to learn the contents related to the scope of work of TMA staff, the lecturer modified the contents of lectures and training materials so that they focus more on the role of TMA staff, and disasters and their coping methods in their own areas. Language used in all lectures and in the materials was Urdu.

Table 5.2.6 Schedule of DRM Training for TMA Staff

	District	Date	Venue	Trainers	No of Participants	No of Participating TMAs	No of TMA in District
1	**Bhakkar**	12-14 July 2011	District Government Hall, Bhakkar	1) Mr. Syed Akhlaq Shah(District officer, Civil Defence) 2) Ms .Azara Shahid (Community safety Officer, Rescue 1122 Punjab)	22	4	4
2	**Muzaffargarh**	18-20 July 2011	Aghosh Hotel, Muzaffargarh	1) Dr. M Irshadul Haq (District Emergency officer, Rescue 1122 Punjab) 2) Mr. Shakiab Ahmad (District officer ,Civil Defence)	22	4	4
3	**Rawalpindi**	13-15 Sep 2011	Shalimar Hotel, Rawalpindi	1) Mr. Nadeem Ahmad Cheema (ATO, TMA Rawal Town) 2) Mr. Tayamman Raza (District Officer, Civil Defence) 3) Mr. Sajid Minhas (Instructor, Civil Defence) 4) Dr. Abdul Rehman (District Emergency Officer, Rescue 1122 Punjab) 5) Ms. Deeba Shahnaz (Public Relations Officer, Rescue 1122 Punjab)	14	7	8
4	**Karachi**	8-10, Sep 2011	Regent Plaza Hotel, Karachi	1) Mr. Naeem Yousuf (Team Leader, Urban SAR Municipal Services City Government Karachi)	13	10	18
5	**Thatta**	7-9, Sep 2011	Piaman Guest House, Makli Thatta	1) Mr. Abdul Latif Barohi (Deputy Revenue officer) 2) Mr. Mirza Khurshid Biag (Deputy Officer Civil Defence)	08	06	07
Total					79	31	41

Lecture Session

Group work Session

Figure 5.2.2 Scenes from TMA Training in Rawalpindi (left) and Thatta (right)

5.2.4 Implementation of Action Plan in TMAs

After the training at each district, participating TMA staff members were asked to implement their action plans, which had been developed during the training. However, many action plans could not be completed during the training due to the time limitation. These activities were followed-up by the trainers (district officers) with the support of the Project. This action plan making and its implementation were completed, and the plans and results of their implementation from all Tehsils were collected by January 2012. Examples of action plans submitted or discussed in the training include the following topics which are mainly focused on public awareness: public awareness of dengue fever; public awareness of tsunamis; public awareness of environmental issues; staff training on DRM; preparedness against draught; and rescue training for the community in cooperation with Rescue 1122. Action plans prepared by TMAs are listed in Table 5.2.7 below.

Table 5.2.7 List of TMA Action Plans Submitted in each District

District	Title of the Plans Collected from TMAs
Rawalpindi	• Removal of encroachment on both sides of Nullah Lai • Mitigation of drought in the area of Potohar Town • Prevention / Control over Dengue Fever • Awareness against environmental pollution • Awareness campaign regarding Safe Drinking Water
Bhakker	• Public Awareness Campaign against Dengue Fever • Flood Awareness among the residents of Kacha Areas • Public Awareness for Drought Mitigation • Awareness among the Public of the EWS
Karachi	• To Combat Earthquake hazards in Baldia Town of Karachi • Disaster Risk Management Training in Karachi • Public Awareness Campaign in villages of coastal areas on Typhoons • To take Safety Measures against Various diseases like Dengue caused by poor drainage systems and trapped rain water in various places • Awareness Raising on Environmental Pollution and tree plantation in the towns • Rain Emergency in New Karachi Town.
Muzaffargarh	• Public Awareness campaign for use and benefits of Clean Drinking Water • To raise awareness among the community to reduce water born diseases due to bad drinking water • To prepare School Children for Flood safety during the flood conditions • Fire Fighting and First Aid Training for 5 high Schools in Muzaffargarh city
Thatta	• Training for Disaster Risk Management (Awareness of DRM among the people of Taluka Ghorra Bari) • Training for Disaster Risk Management (Awareness of DRM among staff of Taluka Jati) • Training for Disaster Risk Management (Awareness of DRM among the people of Taluka Sajawal) • Training for Disaster Risk Management (Awareness of DRM among staff of Taluka SAKRO) • Training for Disaster Risk Management (Awareness of DRM among staff of Taluka Shahbandar) • Training for Disaster Risk Management (Awareness of DRM among the people of Taluka Thatta)

5.2.5 Lessons Learned from the DRM Training for TMA Staff

In order to learn from the training conducted and make use of these lessons for future activities, evaluations for the TOT and the TMA training were done. To evaluate the effectiveness and efficiency of the TOT program, pre- and post- knowledge assessments of participants, and general evaluations of the whole TOT program by the participants were conducted. Also, for the purpose of collecting opinions from the participants of the TOT and the TMA training, follow-up meetings were held in Karachi, Muzaffargarh and Rawalpindi. Furthermore, a completion report titled "Assistance for Implementation of DRM Training for TMA Staff" was prepared by Muslim Aid, the logistic support provider in this whole training program, to review the activities in TOT and TMA trainings, which was also referred to as a source of the reviews in this report.

The following sections describe the lessons learned based on the results of the above mentioned evaluations. Nonetheless, it has to be born in mind that the following evaluation derives from our limited sources of information.

1) Common lessons learned to the TOT and TMA Training

The overall descriptions of lessons learned common to both the TOT and the TMA training are as follows.

a. The general reactions to the training are highly favourable

Since it was their first DRM training for most of the district and TMA staffs, many of them said that it was very useful for them, for they did not even know the definitions of disaster, risk, hazard and DRM (opinions raised in the follow-up meetings in Karachi, Muzaffargarh and Rawalpindi).

b. The implementation structure of the whole training scheme generally worked well

The implementation structure of the whole training scheme, that is, to hold TOT by calling up district officers to be trained as a trainer and then have them deliver training to TMA staff, has functioned to a certain extent. Instead of calling trainers for TMA staff from outside, district officers were chosen as trainers to improve the sustainability of this activity. Through the implementations at this time, it was found that this method can work well with the highly motivated officers who are proactive in delivering lectures to TMA staff. Meanwhile, it also turned out that there are also some officers who are less willing to participate in this training scheme.

c. Training time was short for both the TOT and the TMA training

Participants from all districts commented that the three-day duration was too short compared to the highly condensed contents which they said were suitable for 5 day-training. Also, however, the training hours per day were too long and it was difficult for the participants to keep themselves concentrated on training for long hours (opinions raised in the TOT evaluation, and follow-up meeting in Rawalpindi).

d. The level of contents of the TMA training was higher than it was supposed to be

In TOT, although some topics which were relatively theoretical, conceptual or technical were not well understood by the participants, the general level of the contents was basically suitable for the participants. However, in the TMA training, it has turned out that it is not realistic to use the same contents as the TOT training, for the participants' level of understanding does not equal that of the TOT (opinions raised in the follow-up meeting in Rawalpindi).

e. The level of training materials was higher than it was supposed to be especially for TMA training

The level of training materials was a little too high especially for the TMA training, in both content and quantity. Although comprehensive or conceptual/ technical knowledge is not always necessary in coping with disasters at Tehsil level, these contents were fully included in original training materials (the ones before being revised by trainers for TMA training) for TMAs, which made them complicated and lengthy. At the same time, however, for the TOT, to enable participants to gain sufficient knowledge to be a trainer in each district, the level of the contents should be maintained as the current one. Though there would be no need for a drastic revision for the materials of TOT, explanations on some technical terms are required.

f. Appropriate selection of the trainees was not fully successful

Although the trainees were selected from district/ TMA staff as trainees who are engaged in DRM in their daily work as much as possible in order to make the trainings efficient, some district officers did not act as they were supposed to and they did not participate in the TMA training as trainers. Also, the nomination of TMA staff to TMA training did not go smoothly. This might derive from the fact that, firstly, there are no positions which are directly related to disaster management in some districts/ Tehsils; and secondly, the motivation of staff differs from person to person.

g. Further cooperation from DCO is necessary for effective training

In order to conduct training for a longer period and to allocate sufficient budget for implementation of the DRM training, further cooperation and understanding of DCO is necessary (opinions raised in the follow-up meeting in Muzaffargarh). Although sufficient cooperation and understanding were provided by DCO this time to hold three-day training sessions for district and TMA staff, it turned out that a three-day duration is too short for both kinds of training and it needs to be extended. At the same time, in order to secure the sustainability of the activities, budget allocation is required, and to allocate a sufficient amount of budget, awareness among

DCOs regarding the importance of DRM activities is essential. In this regard, further cooperation and understanding is required by the side of DCO.

2) Lessons Learned from TOT

a. Sessions evaluated as difficult or less interesting should be reconsidered

According to the results of knowledge assessment in the TOT, it turned out that many participants do not know about 1) the concept of disaster, 2) the organization structure of NDMA, 3) the roles of TMA in DRM, or 4) CBDRM. Therefore, the sessions on these topics should be constructed with consideration of this fact and with sufficient focus (issues found in the TOT knowledge assessment).

Also, according to the results of the program evaluation of the TOT, the following sessions were frequently evaluated as least interesting: 1) relevant organizations and their roles in DRM; 2) Measures for mitigation and preparedness at Tehsil level; 3) Emergency headquarters and EWS dissemination at Tehsil level; 4) Evacuation and camp management system; 5) Damage assessment; and 6) CBDRM. The reasons why these sessions were raised can be assumed that, first, these topics are rather new to the participants, second, English used in the lecture was not understandable, third, some contents were highly technical, and fourth, some lectures were very lengthy.

Another issue is that some participants commented that there were too many sessions on conceptual/ theoretical topics, which was a little boring (opinions raised in the follow-up meeting in Karachi, Muzaffargarh and Rawalpindi).

b. Session on teaching skill should be extended

The session on teaching skill was evaluated as very useful and necessary, and it was suggested that one whole day should be spared for this topic, by explaining teaching methods for each session if possible (opinions raised in the follow-up meeting in Muzaffargarh).

3) Lessons Learned from TMA Staff Training and Action Plan Implementation

a. The training materials were difficult and complicated for the participants to understand

The training materials for TMA staff should be simplified so that they would be understandable for them. Also, if possible, particular kinds of disasters which frequently occur in each district should be included (opinions raised in the follow-up meeting in Rawalpindi).

b. The training contents were too theoretical and practical contents were insufficient

It was found that, firstly, in order to understand conceptual/ theoretical contents well, discussions are necessary at each time, and therefore sufficient time for that should be provided (opinions raised in the follow-up meeting in Rawalpindi).

Secondly, to prevent participants from getting tired and bored of lectures, practical activities such as damage assessment, visits to evacuation camps and the DRM storehouse can be added (opinions raised in the follow-up meeting in Muzaffargarh, and through observation by JICA Expert Team).

c. Sufficient support by trainers and adequate budget should be provided for action plan creation and implementation

In some districts there are delays in creating and implementing their Action plans. This is due to the following facts. Firstly, sufficient support was not provided by the trainers. Secondly, the trainers themselves did not understand action plan creation and its implementation well because adequate time was not provided for explanations of action plan creation and its implementation in TOT. Finally, additional budget allocation is needed for the implementation of action plans (opinions raised in the follow-up meeting in Muzaffargarh)

d. Voluntary and prompt work for preparation of arrangements for TMA training is difficult to be expected

In preparation of the TMA training, voluntary and prompt arrangements from the side of TOT participants are difficult to be expected (opinions raised in the observation by JICA Expert Team).

e. Involvement of higher rank officers is needed

Since there are no staff in TMA who are solely in charge of DRM, the fields of work of the participants were not directly related to DRM (i.e. infrastructure or engineering). Moreover, the positions of these participants are relatively low in TMA, and they do not have power for decision making, budget allocation, or action plan approval. Therefore, it was suggested to invite higher echelon officers such as TMOs or TMA administrators, to implement further effective training (opinions raised in the follow-up meeting in Muzaffargarh).

f. Daily allowance payment for the participants is not necessary to call them to the training

No daily allowance or accommodation fees were paid to the participants of the TMA training this time. In spite of that, sufficient numbers of participants have joined the training. This arrangement can be applied to the activities in other districts in the future. However, certain incentives should be paid to the trainers whose role is significant (opinions raised in the observation by JICA Expert Team).

5.2.6 Revised Program for DRM Training for TMA Staff

1) Suggestions and Recommendations for Revision of the Training

In this section, suggestions and recommendations for future revisions of the contents, materials, schedules and other general arrangements of TOT and the TMA training are described. The suggestions below are made based on the findings summarised above in 5.2.5.

a. Suggestions and Recommendations for Both for the TOT and the TMA Training

i) Schedules and hours

The length of the entire training of both the TOT and the TMA training should be extended from the current three-day schedule. In addition to this, training hours per day should be shortened from the current schedule if possible.

ii) Contents of the training

For both the TOT and TMA training, the list of lectures should not be changed. However, efforts to make the lectures easier to understand should be made in the following ways.

Firstly, for the TMA training, contents of the lectures and materials should be made simpler than the current ones, by putting only the important points or by summarizing the contents, so that they can be understood by the participants. Considering that TMA training sessions are lectured by the participants of the TOT, the same materials should be used in TOT. However, since it is necessary for the TOT trainees to acquire sufficient background knowledge to teach in the TMA trainings, supplemental materials and lectures should be added in the TOT which teach relatively theoretical or technical topics.

Secondly, for theoretical, conceptual and technical contents, discussions or Q & A session should be held for better understanding of the contents, and adequate time for it should be allocated in both the TOT and TMA training.

Some participants suggested the importance of practical training such as emergency response (opinions raised in the follow-up meeting in Karachi, Muzaffargarh and Rawalpindi). However, the JICA Expert Team consider that not only emergency response or other practical measures, but also other factors such as mitigation and preparedness, or knowledge of disaster and disaster organizations etc. are highly significant for DRM. Practical training can be conducted during other opportunities; and in this training, focus should be put on mitigation and preparedness, or knowledge of disaster and disaster organizations etc.

iii) General Arrangements

As for the selection of trainees, all necessary efforts should be made so that appropriate staff should be chosen from those who are engaged in DRM in their daily work as much as possible, so that the training would be fruitful.

At the same time, adequate cooperation and understanding by DCO should be promoted in order to dedicate more training days in the training period, and to secure adequate budget for the sustainability of DRM activities at the TMA level.

b. Suggestions and Recommendations for TOT

i) Schedules and hours

With regard to the opinions that the training hours are too short compared to the number of sessions and one day should be spent for the teaching skill session, the length of the entire training should be extended to five days.

ii) Contents of the training

Regarding the contents of the training, firstly, almost a whole day should be spent solely for the session on teaching skill, and some practical exercises on how to facilitate lectures and discussions. Secondly, as for the action plan creation, more detailed lectures should be delivered on how to create plans, for example by showing examples. This step is necessary so that they will be able to give adequate support to TMA staffs in creating their action plans. Third, as for the teaching materials, all the lectures and materials should be in Urdu. They were given in English this time. And finally, a session for the participants to create training agenda of TMA training in their district should be included.

iii) General Arrangements

In order to select appropriate participants for the TOT, it is necessary to find those who have adequate capacity and motivation from the participants of regular DRM training sessions. In selecting TOT participants, these staff should be invited for better results in the TMA training.

c. Suggestions and Recommendations for TMA Training

i) Schedules and hours

With regard to the opinions that the training hours are too short compared to the number of sessions, the length of the entire training should be extended to four days.

ii) Contents of the training

In order for the TMA staff to learn that there are certain DRM measures which can be operated at Tehsil level, sufficient time should be allocated for action planning, with adequate support from the trainers. Plans should be created and presented during the training. Also, after the training, implementation of action plans should be followed up by the trainers.

Also, if possible, the contents should be modified to focus on the topics or disasters particular to each district. This revision should be made by the trainers of the TMA training.

iii) General Arrangements

In preparation for the TMA training, encouragement should be given to promote the district officers' work for smooth arrangements (an issue observed by JICA Expert Team).

At the same time, in order to make the activities sustainable, TMA staff in higher positions should be invited to the training, so that the awareness among them on the importance of DRM and DRM training at TMA level can be enhanced.

2) Revised TOT Program

Following is the proposed TOT program agenda revised based on the above observations.

Table 5.2.8 Revised TOT Program

Day 1

Session
Opening Session - Recitation of Holy Quran - Opening remarks (JICA, NIDM) - Introduction of participants - Explanation of framework of the training - Pre-training knowledge evaluation
Module 1: Introduction to Disaster Management
1.1 Disasters 1.2 Disaster Risk Management

Day 2

Session
Module 2: Roles and Responsibilities of TMA Staff in Disaster Management
2.1 Relevant organizations and their roles at DRM 2.2 Roles and responsibilities of TMA
Module 3: Public Awareness
3.1 Measures for mitigation and preparedness 3.2 Public awareness

Day 3

Session
Module 4: Early Warning System and Emergency Response at Tehsil Level
4.1 Early warning system in Pakistan 4.2 Emergency headquarters 4.3 Evacuation and camp management 4.4 Damage assessment and reporting

Day 4

Session
Module 5: Community Based Disaster Risk Management (CBDRM)
5.1 CBDRM objectives 5.2 Tehsil and communities 5.3 CBDRM activities 5.4 Outcome of CBDRM 5.5 Community involvement in DRM planning 5.6 Up-scaling CBDRM
Module 6: Preparation of Action Plan
6.1 Explanation of Action Plan 6.2 Development of Action Plan 6.3 Presentation of Action Plan

Day 5

Session
Module 7: Teaching Skills
7.1 Adult learning and teaching/facilitation skills 7.2 Lecture practice 7.3 Group work practice
Agenda Development and Closing
Agenda Development - Explanation of activities after the training at each district - Development of program agendas for TMA training
Evaluation of the training - Post-training knowledge assessment - Program evaluation
Closing Session - Certificate distribution - Closing remarks (NIDM)

3) Revised DRM Training Program for TMA Staff

Following is the proposed TMA training program revised based on the above observations.

Table 5.2.9 Revised TMA Training Program

Day 1

Session
Opening Session - Recitation of Holy Quran - Opening remarks (JICA, NIDM) - Introduction of participants - Explanation of framework of the training - Pre-training knowledge evaluation
Module 1: Introduction to Disaster Management
1.1 Disasters 1.2 Disaster Risk Management

Day 2

Session
Module 2: Roles and Responsibilities of TMA Staff in Disaster Management
2.1 Relevant organizations and their roles at DRM 2.2 Roles and responsibilities of TMA
Module 3: Public Awareness
3.1 Measures for mitigation and preparedness 3.2 Public awareness

Day 3

Session
Module 4: Early Warning System and Emergency Response at Tehsil Level
4.1 Early warning system in Pakistan 4.2 Emergency headquarters 4.3 Evacuation and camp management 4.4 Damage assessment and reporting
Module 5: Community Based Disaster Risk Management (CBDRM)
5.1 CBDRM objectives 5.2 Tehsil and communities

Day 4

Session
Module 5: Community Based Disaster Risk Management (CBDRM)
5.3 CBDRM activities 5.4 Outcome of CBDRM 5.5 Community involvement in DRM planning 5.6 Up-scaling CBDRM
Module 6: Preparation of Action Plan
6.1 Explanation of Action Plan 6.2 Development of Action Plan 6.3 Presentation of Action Plan
Evaluation of the training - Post-training knowledge assessment - Program evaluation
Closing Session - Certificate distribution - Closing remarks (NIDM)

5.2.7 Recommendation for DRM System in Pakistan

So far we have looked through the lessons learned and recommendations for these lessons regarding the trainings. However, through implementing the trainings, challenges for the enhancement of the Pakistani DRM systems itself were recognized. Following section describes these challenges learned through the trainings.

1) Improvement of the knowledge level of staff engaged in DRM is needed.

In order to participate in TOT or TMA training, a certain amount of basic knowledge of DRM is needed. In view of the fact that even the district officers do not have sufficient knowledge, the JICA Expert Team suggests that NIDM should hold further basic training to district officers in addition to TOT.

2) Roles of TMAs in DRM should be clarified

Through the arrangement of training and the follow-up meetings, it has turned out that the roles of TMAs in DRM are not clearly defined, even though they are the closest government organization to the people. Moreover, due to this situation, the higher and the highest officials of TMA do not recognize the importance of DRM, making the time and budget allocation to DRM difficult. In order to improve this situation, the JICA Expert Team suggests that, firstly, the roles of TMA should be clarified by NDMA, and secondly, to raise awareness on DRM of higher TMA officials, basic DRM training for them should be held.

3) Frequent transfer of district officers and TMA staff should be reconsidered.

The frequent transfers of officers and staff engaged in DRM prevent them from acquiring sufficient knowledge and practical skills, which causes difficulties in DRM and human resource development activities regarding DRM. Even though some officers get trained or gain experience through operations, they can be transferred to other government divisions in two or three years, making it difficult to accumulate the individual and organizational DRM capacity. This transfer system needs to be reconsidered for effective DRM activities.

5.3 Enhancement of Coordination among Organizations which Conduct Capacity Building in the Field of Disaster Management

5.3.1 Framework of the Priority Activity

The second priority activity consists of holding of the First Coordination Meeting between actors involved in capacity development regarding DRM. As mentioned above, although human resource development activities are conducted by various organisations in Pakistan there has been a lack of coordination among these entities. This priority activity contributes to make the first step to set up a mechanism for this purpose. The implementation actors and implementation schedules are shown in the table below.

Table 5.3.1 Framework of the Priority Activity

Implementation Actors	• JICA Expert Team • NIDM • NDMA
Implementation Schedules	• September-October: Examination of the contents • January: Preparation for implementation • February: Implementation of the First Coordination Meeting

5.3.2 Implementation of the Priority Activity

Originally, it was planned to implement the First Coordination Meeting around October 2011. However, it was postponed because the director of NIDM resigned at that time. Therefore, only the draft contents of the meeting were prepared in September and October 2011.

When the new director of NIDM was appointed in January 2012, the more detailed preparation was started. NIDM and JICA Expert Team discussed on the draft contents of the meeting and elaborated them. Also, logistical aspects of the meeting were discussed to materialise the meeting.

The elaborated contents of the First Coordination Meeting are summarized in the table below. The meeting is planned to be held in February, 2012.

Table 5.3.2 Contents of the First Coordination Meeting

Objective	• To start initiative of coordination between relevant stakeholders on human resource development on disaster risk management and to establish National-level working group on human resource development on DRM	
Major Participants	• Ministry of Disaster Management • NDMA • NIDM • PDMAs • Civil Defence • PMD • NSPP	• Higher Education Council • National Curriculum Wing • Rescue 1122 • National Rural Support Program • NGOs • Universities • International Organizations
Major Agenda	• Presentation of Disaster Management System in Pakistan • Presentation of Importance of Coordination on Human Resource Development on DRM and HRDP on DRM • Presentations of Human Resource Development Activities by Several Organizations • Discussions on a Framework of Working Group on Human Resource Development on DRM	

CHAPTER 6 COMMUNITY BASED DISASTER RISK MANAGEMENT ACTIVITIES

6.1 General

6.1.1 Necessity for Community Based Disaster Risk Management (CBDRM)

Immediately after the Great Hanshin Awaji Earthquake of 1995 many people were rescued from the debris by their neighbours. Statistics show that 85% of the people were either self-evacuated or were rescued by their neighbours. This indicates the importance of the community immediately after disasters. 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 CBDRM has been stressed and recognized widely. In the JICA project, CBDRM approach has been applied as the importance and necessity for CBDRM were regognized.

6.1.2 Objectives of CBDRM

The objectives of the CBDRM activities are:

- To establish a system of reflecting lessons learned from the CBDRM activities to the disaster risk management plans; and
- To create best practices to be models for other areas of CBDRM activities.

6.1.3 Existing Conditions of CBDRM

1) Status of CBDRM in Pakistan

In Pakistan, public organizations are taking leading roles regarding public administration. The general public is also expecting to carry a greater portion of the 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 have started to function gradually. Until recently, the DRM approach had been more on emergency response and recovery, but it has been demonstrated that more proactive efforts are more productive and therefore, focus is shifting to preparedness and mitigation. In this trend, CBDRM is also highlighted and efforts are being made to put it into practice. Currently, it is at a stage of securing human resources and budgets at the local government level to implement CBDRM.

2) Turning Point of CBDRM in Pakistan

It was only after the 2005 Kashimir earthquake that CBDRM has been taken into serious consideration and started to be put into practice. Until recently, the focus was more on recovery and emergency responses, say, delivering practical trainings, for example, on first-aid, and less on mitigation and preparedness such as community DRM plans, and small scale measures. Some of the international nongovernmental organizations (INGOs) started CBDRM projects when international donor agencies allocated funds for CBDRM, but unfortunately the impact of those projects has been on a small scale.

3) Activities regarding CBDRM in Pakistan

Within the last few years, there have been two notable holistic approaches by UNDP and the Pakistan Red Crescent Society (PRCS). UNDP is supporting the NDMA to train officials of PDMAs and DDMAs, to formulate District Disaster Management Plans and conduct CBDRM activities. Within the One UN Disaster Risk Management Joint Programmes, which supports implementation of the National Disaster Risk Management Framework for Pakistan, CBDRM tools were prepared in close collaboration with the Asian Disaster Preparedness Center (ADPC). One is the "Training Manual on Community Based Disaster Risk Management", and the other one is the "Trainer Manual on Community Based Disaster Risk Management". Pilot CBDRM activities have been conducted for earthquake, tsunami, flood, cyclone, and drought. PRCS has recently started Community Based Disaster Risk Reduction (CBDRR) activities in different parts of Pakistan with the help of the International Federation of Red Cross (IFRC) and other national Red Cross/Red Crescent societies. PRCS is not only providing practical training but also working on developing training manuals on CBDRM. PRCS has also started developing district disaster response teams who can respond to disasters at the district level and link with the communities. Both UNDP and PRCS have started from several pilot communities and envision to upscale CBDRM to other areas in the nation.

6.1.4 Current Issues in CBDRM

1) Lessons Learnt from the 2010 Flood

There are two main issues on CBDRM with regards to the 2010 Flood in Pakistan; one is that People did not evacuate, and the other is that timely information did not reach the general public. Thus, the main lesson learnt, related to CBDRM is to link early warning information flow from public organizations to the general public under all circumstances.

2) Current Issues on CBDRM

NDRMF, being the first comprehensive strategy for the short term five years until 2012 was a significant step to take. DRM plans for districts and for communities have been prepared. By reviewing such newly developed Provincial and District DRM plans, current issues on CBDRM can be summarized as shown below for the longer scope of ten years from now.

- Vision, goals, necessity, actors, and responsibilities of actors in CBDRM need to be justified in the national level DRM plan.
- Clear roadmaps of how to conduct CBDRM need to be shown in the provincial and district level DRM plans, including formation, timeline, and budget.
- Responsibilities of the community, CBOs, and local leaders in relation with local public authorities need to be concretely laid out and demarcated in district DRM plans.
- Still, emergency management activities are focused on CBDRM. A mechanism of incorporating CBDRM into development plans needs to be sought as the pilot activity to be a model for other CBDRM activities.

6.2 Methodology of CBDRM Activities by JICA Team

6.2.1 Hypothesis

The CBDRM activities have been conducted in an effort to confirm and demonstrate the following hypothesis: Disaster management systems become more effective by linking the communities and local governments effectively.

6.2.2 Basic Philosophy of CBDRM

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

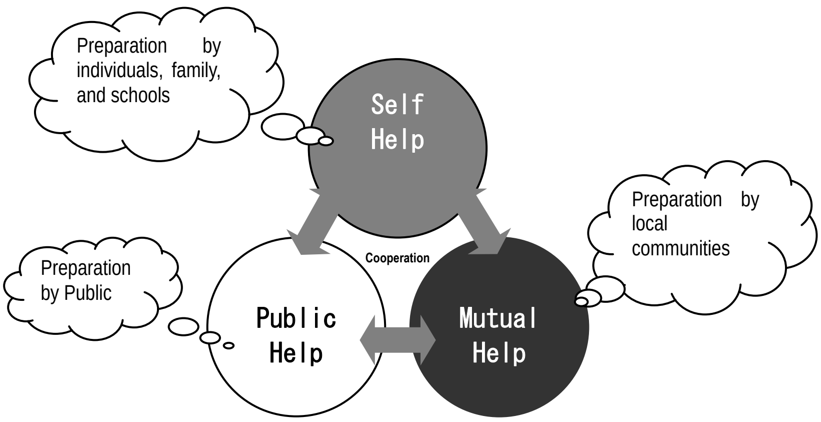


Figure 6.2.1 Image of Collaboration

Mitigation measures along with enhancing preparedness should be planned. Joint efforts of public authorities and communities regarding both mitigation and preparedness should be promoted to maximize resources and capacities. At national level, necessary legal and budgetary provisions must be made and implementing supporting systems to encourage CBDRM should be authorized.

6.2.3 Preconditions

1) Community Unit

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 community.

2) Actors of the Community

The actors are the community leaders, community residents, school principals, teachers, parents, religious leaders, leaders and constituents of local organizations, health workers, and social workers who live within the community.

3) Actors of CBDRM

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

4) Roles of CBDRM

Members of the community in the first place, have to nourish the basic notion that their own community needs to be protected by themselves. To react properly toward disasters, community residents need to have regular communication and cooperation with each other during ordinary times. Community mobilization and institution are very effective. Through community organizations, community based DRM plans are developed, and various training programs and drills are conducted to enhance the community capacity. Regular communication and linkage with public authorities need to be strengthened to ensure structural and non-structural mitigation and preparedness measures for the community.

5) Target Groups for Enhancing Capacity of conducting CBDRM activities

In the CBDRM activities of the JICA project, District officials such as DRM coordinators, civil defence, and Rescue 1122 are the main target groups for enhancing the capacity for conducting CBDRM activities. However, Tehsil and Union Council officials are also invited to join CBDRM activities.

6.2.4 CBDRM Model

The community activities have taken the following major three steps.

1) Recognizing Disaster Risk Perception

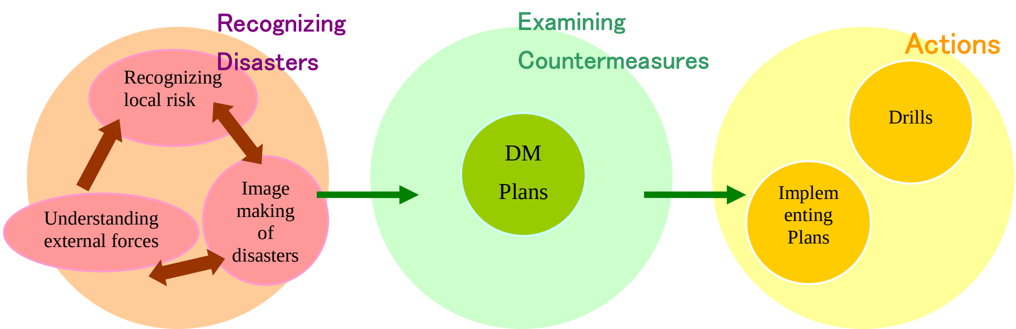
The first step is to recognize and have a clear image of the past and possible future disasters in the community and understand the external forces that create disasters. For this, visual materials are shown. Town watching and hazard mapping exercises can help in understanding hazards and risks in the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

2) Examining Countermeasures

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

3) Actions

CBDRM Plans are implemented. CBDRM 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. CBDRM Plans are revised accordingly.



- **Understanding External Forces**
  Results of damage estimation
- **Image Making of Disasters**
  Understanding past damage situations
  (Visual image, photo)
  Visualizing disasters (DIG)
- **Recognition of Local Risks**
  Town watching
  Preparing DM maps

- **Preparing DM Plan**
  Plan for formulating DM organizations,
  Plan for preparing DM equipments
  Plan for conducting Drills

- **Implementing Plans**
  Establishing DM organizations
  Stabilizing furniture
  Preparing emergency kit bag
  Furnishing DM equipments
  Awareness raising activities
- **Drills**
  Evacuation, rescue, fire extinguish, community kitchen, registration of evacuees, notice boarding

Figure 6.2.2 CBDRM Model

6.2.5 Planning Methodology

The process of developing CBDRM plans is shown in the following chart. Pilot activities were conducted at five pilot sites for five different disasters, namely flood/flash flood, earthquake, tsunami, drought, and cyclone. In these pilot communities, a series of activities were conducted; vulnerability and capacity assessment, awareness raising activities, knowledge development, CBDRM plans, practical training, and drills. CBDRM 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 learned by the CBDRM activities were compiled. Finally, by including these experiences, Policy 5 regarding public education and awareness is prepared in NDMP.

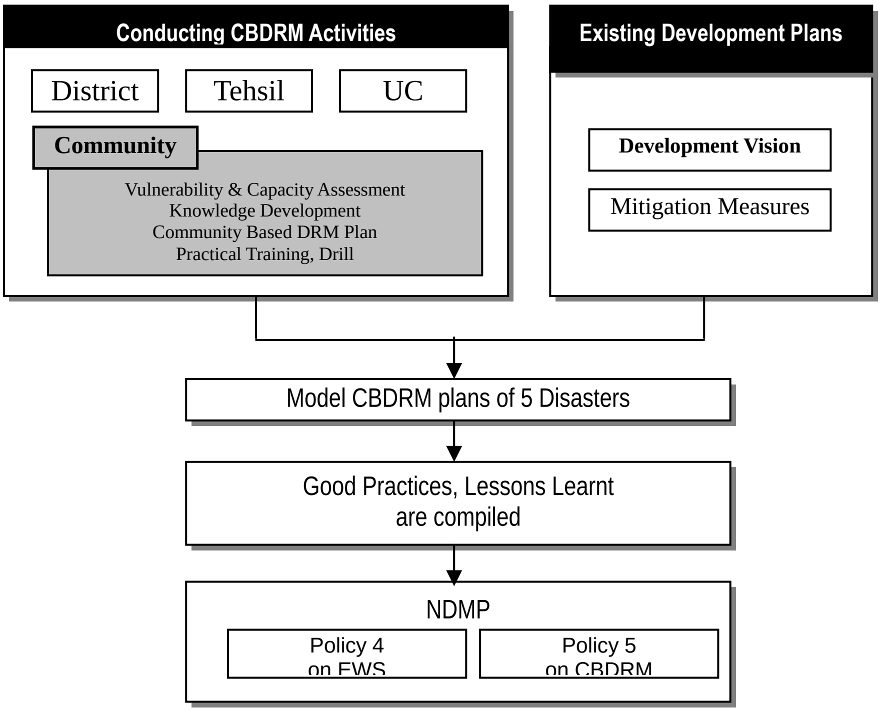


Figure 6.2.3 Planning Methodology

6.3 CBDRM Activities

6.3.1 Target Disasters

Target disasters for the CBDRM activities are 1) flood, 2) flash flood, 3) earthquake and tsunami, 4) drought, and 5) cyclone. In each pilot site, at least one primary disaster is identified to highlight during the CBDRM activities. For some areas, a few more disasters were identified, in addition to the primary target disaster.

6.3.2 Target Groups

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

6.3.3 Selection Process

1) Selection Criteria

Criteria were set to select communities for the CBDRM activities to be conducted. It was decided beforehand that due to security reasons, pilot communities have to be selected from Sindh and Punjab provinces. First of all, vulnerabilities were studied by referring to a list of fifty vulnerable districts issued by NDMA and available risk maps and indexes issued by different organizations. Then accessibilities were checked. If there were alternative districts, more accessible districts were selected. After that, existence and quality of DRM plans were examined. If the districts have perfect DRM plans already, it was planned to exclude those districts. Once districts were selected, communities were recommended by district. Finally, communities were selected by 1) social cohesion, 2) leadership of the community leaders, and 3) willingness of the community people.

Table 6.3.1 Selection Criteria

Parameters	Items
Vulnerability	Disaster Risk
Accessibility	Distance
	Frequency of Air Service
	Access Road
Initiatives of Public Officials	District Initiatives
	Local Initiatives
DRM Plan	Province DRM Plan
	District DRM Plan
Community	Social Cohesion
	Leadership
	Willingness

Source: JICA Study Team

2) Selection of Communities

One community is selected for one target disaster. For some communities like Rawalpindi, due to requests and necessity, a few more disasters were added. Five selected communities and their target disasters are summarized inTable 6.3.2.

Table 6.3.2 Five Selected Communities

#	Province	District	Thesil Township	Union Council	Community	Population	Literacy Rate	Target Disasters
1	Punjab	Rawalpindi	Rawalpindi	UC 45	Javed Colony	15,000	65%	Flash Flood (Earthquake) (Fire)
2		Bhakkar	Mankera	Hyderabad 42	Dar Boola	5,000	40%	Drought
3		Muzaffargarh	Alipur	Aliabad	Khangarh Doma	(2,000HH)	45%	Flood
4	Sindh	Thatta	Keti Bandar	Keti Bandar	Keti Bandar	22,000	40%	Cyclone (High Tide) (Tsunami)
5		Karachi City Urban Area	Saddar Town	Punjabi Club UC 3	Kharadar	616,151 (Saddar	65%	Earthquake (Tsunami)

Source: JICA Study Team

6.3.4 Activities and Schedule

The CBDRM activities and schedule are shown inTable 6.3.3.

The activities start with conduct of 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. These activities were subcontracted to Focus Humanitarian Assistance, Pakistan (FOCUS).

Table 6.3.3 CBDRM Activities and Schedule

#	Agenda	Activities	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)	Endline	Endline Survey																	
(16)	Common Activities	Study Visit and Forum									SV	Forum							
(17)	Reports	Progress Reports, Final Report			24 Dec		10 Feb			15 May	30 June								

Source: JICA Study Team

6.3.5 Preparation of CBDRM activities

1) Preparation of CBDRM Instructor's Guidelines

Before conducting the actual activities, the Draft CBDRM Instructor's Guidelines were prepared. Afterwards, ToT and the actual training were conducted along these guidelines. These guidelines were improved based on the lessons learnt from the activities. The CBDRM Instructor's Guidelines are attached as a separate volume named "CBDRM Instructor's Guidelines".

2) Training of Trainers (TOT) for Facilitators of Sub-contractors

Three day ToT sessions were conducted for facilitators of the FOCUS team along the following schedule, so that they can implement the CBDRM trainings by themselves.

Table 6.3.4 Schedule of TOT

No.	Date	Time	Topics
1	31st Jan, 2011 Monday	10:00-11:30	CBDRM overall activities, schedule, target groups Involvement of public officials
		11:30-13:30	Reviewing Baseline Survey Results and Targets
		14:30-16:30	Reviewing Scientific Knowledge
2	1st Feb, 2011 Tuesday	10:00-13:00	Town Watching and Mapping
		14:30-16:30	DIG and Planning Session
3	2nd Feb, 2011 Wednesday	10:00-11:30	Reviewing Practical Training
		11:30-13:30	Reviewing Drill Scenarios and Drills

Figure 6.3.1 Pictures of TOT (DIG and Mapping)

6.3.6 CBDRM Activities on the sites

1) Stakeholders Meeting

Before the actual activities on the sites, Stakeholders Meetings were held three times to advocate the importance of CBDRM activities and to encourage participation. A few Districts were jointly conducted as follows.

Table 6.3.5 Conducted Stakeholders Meetings

No.	Date	Venue	Target Sites	Participants
1	7th Feb, 2011	Focus Office, Islamabad	Rawalpindi	NDMA, Civil Defence, PMD, Rescue 1122, FOCUS, JICA
2	22nd Feb, 2011	Ramada Hotel, Multan	Muzaffaragarh, Bhakkar	DCO, DRM coordinators, Tahsil, UC, Civil Defence, Rescue 1122, NGO, Community, FOCUS. JICA
3	17th Mar, 2011	Beach Luxury Hotel, Karachi	Thatta, Karachi	DCO, DRM coordinators , CDGK, PDMA Sindh, FOCUS, JICA

Figure 6.3.2 Pictures of Stakeholders Meetings (at Islamabad and Multan)

2) Baseline Survey

For the baseline survey, types of vulnerability and capacity are set into 5 categories, namely: 1) social, 2) economic, 3) physical, 4) attitudinal, and 5) political and administrative. Parameters for each category and methodology of data acquisition are summarized in Table 6.3.6.

Table 6.3.6 Parameters of Vulnerability and Capacity

Types of Vulnerability and Capacity	Parameters	Methodology
Social	Social safety nets and institutions Representatives and leadership Discrimination of gender, ethnic groups, age, occupation, ownership of resources Conflicts between communities Degree of participation Decision making structure Discriminatory perceptions and relations	FGD (Personal Interview)
Economic	Income Savings Employment Industry	Personal Interview
Physical	Conditions and locations of human settlements Condition of livelihood Access to infrastructure (water, electricity, gas, sewage, road, public transportation) Access to assets, properties Access to information, education Access to service facilities (schools, clinic, hospital, library etc.)	Direct Observations FGD
Attitudinal	Dependency Fatalism Superstitions Resistance to change Willingness to participate in DRM activities	Personal Interview (FGD)
Political and Administrative	Voice in political decision making Access to power structures Access to public authorities Governance	FGD (Personal Interview)

Note: FGD means Focus Group Discussion.
Source: JICA Study Team

There are two important subjects for CBDRM: individuals and communities. As for individuals, the questionnaires were developed in six categories, namely, 1) disaster experience, 2) risk perception, 3) knowledge regarding disaster risk management, 4) attitude, 5) willingness/motivation, and 6) preparedness. Forty samples will be taken for both baseline and end surveys to measure the differences before and after the CBDRM activities. The results are presented in a diagram of the six categories. Parameters of each category are shown in the table below.

Table 6.3.7 Individual Questions

Categories	Parameters
Disaster Experience	Experience regarding target disaster Experience regarding other types of disaster Kind of responses toward experienced disasters
Risk Perception	Degree the disaster affected your life Types of disaster that affected your life Disaster occurrence in your life Consequence of target disasters Safety of own house
Knowledge	Scientific cause of target disasters Vulnerable areas of target disasters Evacuation route Activities of local NGOs, CBOs engaged in DRR Countermeasures to protect against target disasters Knowledge of emergency numbers
Attitude	Dependency Fatalism Superstitions Resistance to change
Willingness / Motivation	Effectiveness of DRR / CBDRM activities Effectiveness of countermeasures Willingness to participate in DRR / CBDRM activities Kinds of activities willing to participate in
Preparedness	Preparation of emergency kit at home Countermeasures taken at home against target disasters Participation in DRR / CBDRM activities

Source: JICA Study Team

Results were compiled in two profiles: Individual Profile, and District, Tehsil, UC and Community Profiles. Results for Individual Profiles are shown in the diagrams in Figure 6.3.8 and those of District, Tehsil, UC and Community Profiles cover the categories shown in table below. The final outputs of District, Tehsil, UC and Community Profiles are attached in the Appendix 1 of the CBDRM Instructor’s Guidelines. Data were compiled using secondary data, results of semi-structured interviews and focus group discussions for community leaders, representatives of the community, and residents.

Table 6.3.8 Contents of Community Profile

Categories	Parameters
Demography and Economy	Population Household size Youth and aged ratio Industry Income level Culture Accessibility of services CBOs, NGOs
Characteristics of Disasters	Types of hazards prevalent in the area Most frequently recurring hazards/disaster in the last few years Frequency and intensity of most prevalent hazards Recurring effect of the disasters on the community and local resources
Collaborative Networks with Local Public Administration	Visits by public officials Project experience of public administrations Experience of having any inputs by communities into projects Experience of any DRM activities Experience of receiving disaster relief Types of assistance by local authorities Trust of the people in the public administration Level of satisfaction toward public authorities Types of collaboration expected in the future
CBOs	Types of activities Types of DRM activities Frequency of activities Experience regarding DRM plans, drills, small scale countermeasures
Livelihood	Livelihood activities Income patterns of households Social security/welfare benefits
Local Leaders	Ethnic groups of leaders Selection criteria and process of community leaders Roles and responsibilities of community leaders Level of their interaction with community members Decision making and followership structure Level of satisfaction of community people with the performance and initiatives of community leaders
Community Participation	Participation of women Participation of people in collaborative works Types of collaborative activities Consequences if some individuals do not participate
Development Needs and Interests in DRR Activities	Need for community development Need for DRR activities Interests in DRR activities Types of activities of interest

Source: JICA Study Team

3) Disaster Awareness Raising Activities (Development of Knowledge regarding DRM)

First of all, the lectures on the basic disaster knowledge for each disaster were conducted to raise the individual disaster awareness and knowledge development regarding DRM in general. These lectures were conducted through showing many visual materials such as videos and pictures.

Figure 6.3.3 Pictures of lecture on disaster knowledge (at Karachi and Muzaffargarh)

4) Town Watching

Community people conducted town watching, which aimed to find the risk and recourses in their community such as vulnerable narrow streets, dangerous buildings, hospitals, schools, parks, mosques, and useful places. They walked around in the town with satellite maps and input their findings on it. Afterwards, these findings were integrated into the CBDRM plan prepared by the community. Participants were divided into smaller groups with five to six people and given their roles and responsibilities.

Figure 6.3.4 Pictures of Town Watching (at Rawalpindi and Thatta)

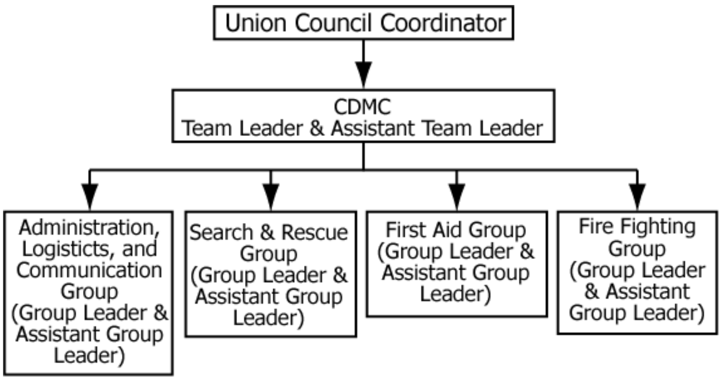
5) Risk and Resource Mapping

After Town watching, their findings and pictures were put on satellite maps by the community itself. They have confirmed the evacuation sites and routes on the map. Finally, presentations about their findings were made by each group to share their findings.

Figure 6.3.5 Pictures of Hazard and Resource Mapping (at Rawalpindi and Bhakkar)

6) CBDRM Planning

After the above mentioned activities, Community Based Disaster Risk Management Plans were prepared by each community. In the plans, methodology, vision, mission, objectives, structure of CDMC, major responsibilities of CDMC, responsibilities of each group, introduction of the site (economy, infrastructure, education, administrative system), vulnerability and capacity assessment of the community, seasonal calendar, strategies for DRM, standard operating procedures, rules and regulations, contact list of stakeholders and CDMC members, evacuation and safe place, and action plan for year 2010 were included. An example of the structure of a Community Disaster Management Committee (CDMC) and action plan for this year is shown in Figure 6.3.9 and Table 6.3.9.



Source: CBDRM Plan prepared by community

Figure 6.3.6 Structure of CDMC

Table 6.3.9 Action Plan for 2011 (Example of CDMC of Rawalpindi)

Month	Activity
March	In House meeting of CDMC with UC, Civil Defense, Rescue 1122
April	2 hrs one day Refresher by Civil Defense
May	2 hrs one day Refresher by Rescue1122
June	In June Pre flood safety arrangement meeting
June-Aug	From June to Aug Awareness raising by CDMC & Response agencies
Aug	In July Post flood safety arrangement meeting
Sep	In House meeting of CDMC with UC, Civil Defense, Rescue 1122
Oct	2 hrs one day Refresher by Civil Defense
Nov	2 hrs one day Refresher by Rescue1122
Dec	In House meeting of CDMC with UC, Civil Defense, Rescue 1122

Source: CBDRM Plan prepared by community

7) Response Type Drill

Based on the CBDRM plans, Response Type Drills were conducted in each site. A Response type drill is one in which some incidents such as fire, flood, and injury were simulated within the community. Community people assumed the disaster situation and conducted the Drill for responding to the target disaster along with the procedures and their roles and responsibilities as determined in the CBDRM plan.


Figure 6.3.7 Pictures of Response Type Drill (in Muzaffargarh and in Thatta)

* Flood situation was assumed in Muzaffargarh, and Tsunami situation was assumed in Thatta.

8) Installing DRR Equipment

Muzaffargarh was selected as the site to install DRR equipment through discussions with stakeholders based on their vulnerability, economic situation, and willingness. After the actual CBDRM training activities had been conducted, DRR stockpiles were procured in Muzaffargarh. These stockpiles are maintained by CDMC.

The list of the contents of the stockpiles is shown in the following table.

Table 6.3.10 List of stockpiles

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 Item)	4	Screw dirver set, Small hammer, wire cutter, plas, saw, chiesel , taster, tin cutter, inchi tape, squash tape
7		Torches	10	
8		Helmets	10	
9		Figure of Eigt	2	
10		D Rings	4	
11	FIRST AID	Polls	8	
12		Blanket	4	
13		Spinal Bpard	2	
14		First Aid Boxes (8 Item)	4	Crape Bandage 4 inch, 3 inch 12 pcs each, Cotton Bandage 12 pcs Triangular Bandage 8 Pcs, Sunny plast 100 pcs , Alcholaic swahab 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 Boy	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	

9) Endline Survey

After the training activities, an endline survey was conducted in each site to evaluate the impact of the CBDRM activities and measure the capacity enhancement of the community. The results are shown in the following tables and figures. The results were analyzed and key findings were summarized.

Table 6.3.11 Results of the Surveys

	Rawalpindi		Bhakkar			Muzaffargarh			Karachi			Thatta		
	Baseline	End	Baseline	Mid	End	Baseline	Mid	End	Baseline	Mid	End	Baseline	Mid	End
Disaster Experiences	2.28	2.30	1.36	1.40	1.60	2.20	2.20	2.50	0.46	0.46	0.96	2.01	2.00	2.00
Disaster Knowledge	1.80	2.37	0.90	1.20	1.80	0.83	0.90	1.60	0.89	1.00	3.17	1.30	1.35	2.00
Risk Perception	2.80	3.34	3.00	3.00	2.70	3.75	3.75	3.50	2.54	2.58	3.95	3.50	3.80	4.00
Attitude	2.02	2.45	2.05	2.08	2.70	2.50	2.50	2.50	0.43	2.00	2.66	2.51	2.57	3.00
Willingness/ Cooperation	3.50	4.15	3.46	4.00	4.30	4.20	4.20	4.30	2.99	4.56	4.96	4.29	5.00	5.00
Preparedness	0.37	0.83	0.63	0.63	1.00	0.35	0.35	0.97	0.14	0.14	1.88	0.51	0.51	2.00

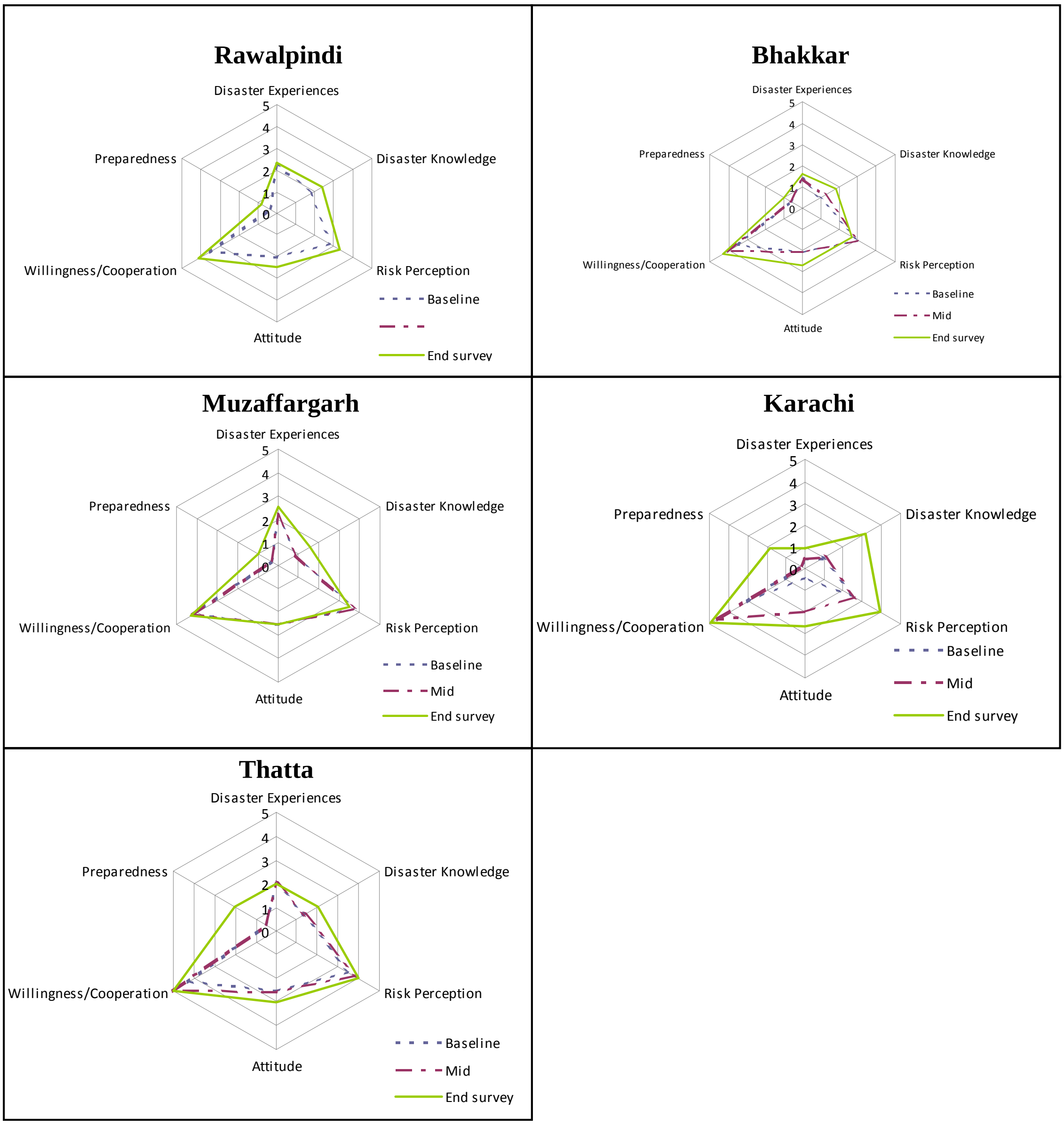


Figure 6.3.8 Radar Chart Analysis

Through reviewing the above-mentioned results, the following findings were obtained.

a. Increase in Risk Perception, Knowledge and Preparedness

To describe briefly, almost all parameters were improved in all communities after implementing CBDRM training, especially in the Risk Perception, Knowledge, and Preparedness. The greatest impact was found in Karachi compared with other communities. The main target disaster was earthquake in Karachi, and the occurrence of earthquakes is a low frequency event unlike cyclones and floods. Therefore, community people in Karachi have not realized the risk of the earthquake disaster; this is due to lack of public information and education. Even governmental officials were not aware of the earthquake risks. After the community activities, the people in

Karachi may have realized the risks of earthquake. Great increase has been observed in preparedness. This tendency is also observed for Thatta targeted on Cyclone and Tsunami disaster.

b. Increase of Risk Perception in Urban Scenarios

Comparing urban Areas (Rawalpindi and Karachi) and rural Areas (Bhakkar, Muzaffaragarh, and Thatta), the Risk Perception was initially quite low in Urban Areas. People in Rawalpindi are transit residents, and in Karachi, too, residents are selling the plots of the apartments from one to another under the Pagri system. Residents of these two areas usually do not settle down over generations. So it is very difficult for such people in urban areas to hand down disaster history from generation to generation. One of the reasons the risk perception of Urban Areas may remain at a low level is because people in urban areas do not have enough opportunity to know disaster history.

c. Similarity among the target communities

There are some similar points in the radar charts among target communities. The Risk Perception and the Willingness are higher than the other parameters. On the other hand, the Disaster Knowledge and Preparedness are lower than others. These similar characteristics were observed in all target communities.

6.3.7 Common Activities for CBDRM

1) Study Visit

A study visit was scheduled in Muzaffaragarh in July, 2011 to share their achievements, lessons learnt among stakeholders (DCO, EDO, DRM Coordinator, Community Leader) of five the pilot sites. A program is shown in the following table.

Table 6.3.12 Program of Study visit

Time	Title of Presentation	Presenter
11:00-11:05	Opening and Welcoming Address	Mr. Syed Sibt-e-Abbas Zaidi, Director DRRII, NDMA
11:05-11:10	Introducing Participants	All Participants
11:10-12:00	Introducing CBDRM Activity and Plan in Khangarh Doma, Muzaffargarh	Mr. AzharBalouch, DRM Coordinator, Muzaffargarh District
	Keti Bandar, Thatta	Mr. Khamiso Ali Muhammad, CDMC Leader, Keti Bandar, Thatta
	Javed Colony, Rawalpindi	Ms. Deeba Shahnaz, Akhter, Emergency Officer, Rescue 1122 Rawalpindi Dist. Mr. M. Altaf Bhatti, S.I Operations, Rescue 1122, Rawalpindi District
	Dar Borla, Bhakkar	Mr. Aslam Baig, CDMC Assistant Leader, Dar Bola, Bhakkar
	Punjabi Club, Kharadar Kharachi	Mr. Istika Ali, CDMC Communication leader, Karachi
12:00-12:10	Baseline and Endline Survey Results	Mr. Ijaz Hussain, Officer M&E, Focus Humanitarian Assistance
12:10-12:15	Introducing Community, UC, Tehsil, and District Profiles	Mr. Salmanuddin, Program Manager, Focus Humanitarian Assistance
12:15-12:40	Discussion	All Participants
12:40-13:00	Future Actions	Mr. Salmanuddin, Program Manager, Focus Humanitarian Assistance
13:00-13:30	Field Visit	Guided by Mr. Allah Ditta, CDMC leader, Khangar Doma, Muzaffargarh
13:30-14:30	Simple Response Type Drill	Khangar Doma Community, Guided by CDMC
14:30-14:50	Review of Drill	Representatives from selected sites Mr. Balouch, DRM Coordinator, Muzaffargarh District
14:50-14:55	Closing Remarks	Mr. Balouch, DRM Coordinator, Muzaffargarh District

2) Forum

Following the Study Visit, a Forum was conducted in Islamabad in July, 2011 to share lessons learned from CBDRM activities among high ranking governmental officials mostly based in Islamabad, along with some from the provinces and districts, INGOs, and donors. A program and presenters are shown in the following tables.

Table 6.3.13 Program of Forum

Time	Title of Presentation	Presenter
11:00-11:10	Welcoming Address	Mr. Kazuto Suzuki, Deputy Team Leader, JICA Team
11:10-11:15	Introducing Participants	All Participants
11:15-11:30	Introducing CBDRM Activity and Study Visit	Mr. Salmanuddin Shah, Project Manager, FOCUS Humanitarian Assistance
11:30-11:45	Baseline Survey and End Survey Results,	Mr. Taichi Ogino, Social Survey, JICA Project Team
11:45-12:00	Insights of CBDRM in Muzaffargarh	Mr. Junaid, DRM Coordinator, Bhakkar District
12:00-12:15	Lessons Learned, Challenges, and Suggestions	Ms. Tomoko Shaw, CBDRM
12:15-12:25	Future Actions and Memorandum of Agreement	Facilitated by Tomoko Shaw, Relevant Districts, Provinces, and NDMA
12:25-12:55	Discussion	All Participants
12:55-13:00	Closing Remarks	Mr. Syed Sibt-e-Abbas Zaidi, Director, Disaster Risk Reduction II, NDMA

3) Completion of CBDRM Instructor's Guidelines

CBDRM Instructor's Guidelines were prepared as draft materials and used for training of the CBDRM facilitators. Based on the field experience of the five pilot sites, and a consultative process of Study Visits, and Forums, the guidelines have been revised after incorporation of the feedback.

These instructor's guidelines were prepared with a view to serve for the needs of the CBDRM facilitators, and disaster management experts of local governments to ensure maximum outreach of CBDRM activities for local people in their communities.

The major differences of these guidelines from the existing CBDRM materials are - 1) Scientific knowledge on different disasters and countermeasures for each disaster are included; 2) Community Based Disaster Risk Management Planning processes are carefully explained, map manoeuvres (known as the Disaster Imagination Game - DIG) is highlighted as a tool for CBDRM planning and 3) Hands on practice is included.

6.4 Lessons Learnt

Key findings on lessons learnt are listed below.

1) Participation

- There should be various efforts from public and private entities to encourage participation in urban areas. Currently, UC Nazim is not functioning fully, and relying only on the public channel is not adequate.

- Encouraging participation in the 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 pay some fees to the participants, but in our project, we dare not to pay for them in the urban areas. Using the contact information of the individuals who have answered the baseline survey, we contacted them to encourage participation, but it provided 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 in their day to day affairs, advocacy for such a community needs to be more aggressive, and well beforehand. Exhibition 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 joining the leadership of the CDMC. This shows that women could be mobilized to take leadership roles related to their affairs in terms of Disaster Management.
- The females of the 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.
- Females were taking more interest to work in female groups.

2) Delivery of Activities

- Practical activities increase and retain the interest and attention of the participants.
- The participants had little scientific knowledge regarding disasters. Considering the low literacy rate, visual materials such as videos and visual demonstrations of experiments draw the attention and interest of the participants.
- For some participants, theory was not so interesting. Method of delivery needs to be interesting and unique and require more interaction.
- Schedule of sessions has to be flexible and as per the ground realities.
- Town Watching and Mapping exercises draw attention, but more facilitators are needed to facilitate the work of each group.
- The contents of the sessions were designed to be tailored to the needs of the community and this was appreciated by the participants throughout.
- Lecture based sessions used white boards; writing on the board was appreciated by the participants.

- The fact that the successful large group drills on the last day were participated in by both males and females in equal numbers stands as towering evidence that the community had comprehended what was told to them in the workshop.

3) Mapping Exercise

- Risk and resource mapping increased the enthusiasm of the participants
- A large number of participants were involved in the group activities regarding risk and resource mapping.

4) 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 within the community. Some intervention by public officials is necessary to monitor their activities. To realize this, budget for travel and technical support needs to be secured.

5) Intervention of Public Officials

- Participation of local government officials adds to the creditability of the program
- Discussion among public officials was effective and also gave local government officials a clear image of the ground reality.
- The communities and the Community Disaster Management Committees (CDMC) wish to have a permanent link with the implementing organizations of this project, so a comprehensive plan of follow up would help retain the cohesion in the newly formed committees and the level of interaction between the government and local stake holders.
- The action plan formulated during this workshop needs serious attention and a full fledged mechanism of follow up to ensure that the activities that were recorded go smoothly by the concerned organizations identified therein.
- Government departments should come up with mechanisms/strategies that keep the committees involved in their activities regarding similar subjects
- The linkage between the government and the CDMC, which till now is only on the papers communicated between the responding agencies, should be strengthened through programs/activities of mutual interest. Budget for such activities needs to be secured at the district level.
- The DRM Plan should be considered seriously by the Government officials to ensure structural and non-structural mitigation measures for the communities.

6) Establishing Mechanism of Incorporating Local Needs into Planning

- DRM plans were effectively discussed among the community and local government officials to move ahead for implementation. However, to establish mechanisms for incorporating village DRM needs into local government development plans needs more time and effort. Establishing community DRM needs into DRM plans in the local governments has been somewhat materialized.

7) Implementing Mitigation Measures

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

CHAPTER 7 CAPACITY ASSESSMENT AND CAPACITY DEVELOPMENT SCHEME

7.1 Capacity Assessment

7.1.1 Introduction

As a background of the capacity assessment, there is assistance for the formulation of the NDMP which is one of the major objectives of this project. To attain the project objective, it has been required to assess what kinds of capacities for the NDMA have to be developed.

The most important factor for the capacity development is to ensure that NDMA officers should have the capacity to formulate and revise the plan. Therefore, the assessment was conducted to clarify what kinds of abilities of NDMA had to be enhanced so that its officers would be able to formulate and revise the plan.

The capacities of NDMA were assessed according to the contents of NDMP, such as Hazard Assessment, Training, Awareness and Education, Community Based Disaster Risk Management, Guidelines for Disaster Management Plan, Formulation of the Plan and Action Plan. Principally, vocational and educational (seminar and training) experiences of the officers towards the above mentioned items were assessed.

7.1.2 Objective of the assessment

The assessment was carried out with the objective of ensuring that NDMA officers should have the capacity to formulate and revise the NDMP. In order to do this, the kinds of abilities to be enhanced were clarified.

7.1.3 Methodology

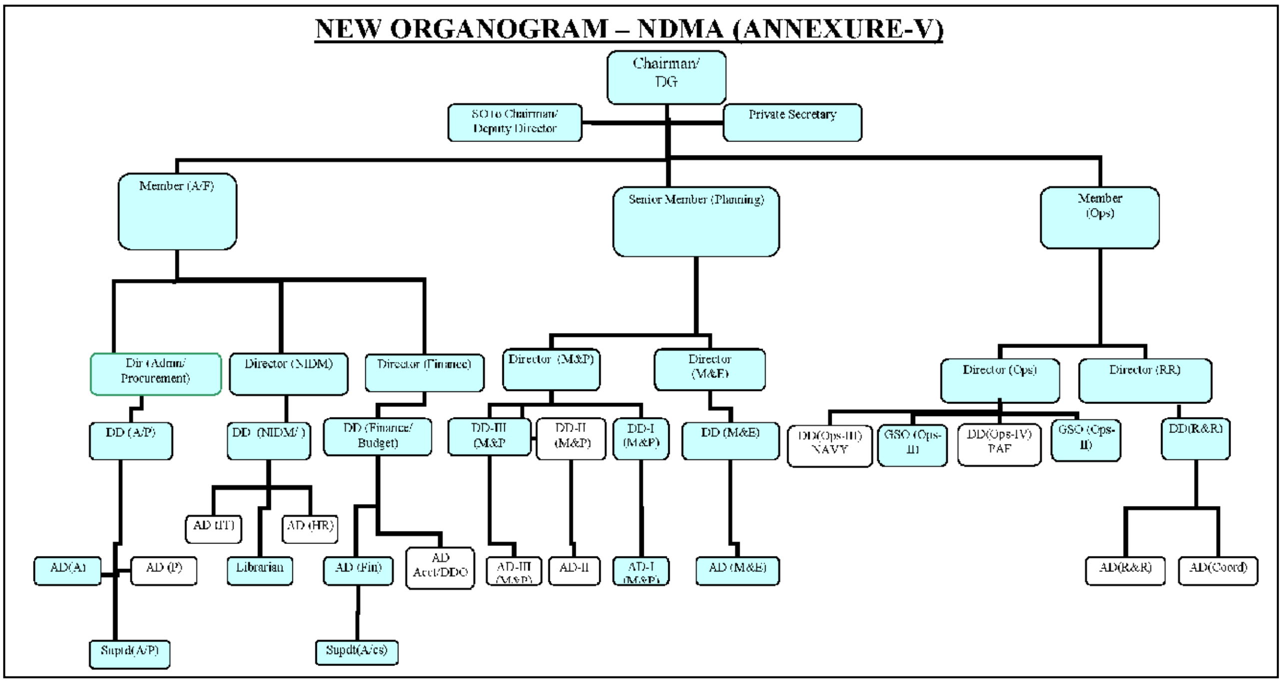
1) Target of the assessment

For the formulation of NDMP, mitigation and preparedness (M&P[28]) officers played a principal role in it. In addition, it was recommended that the capacities of the NDMA officers as a whole were to be assessed. Therefore, the targets are divided into two groups: M&P officers and NDMA officers. With respect to the latter, to equally assess the capacity of NDMA, at least one officer from each department was selected for interview.

Target 1: Mitigation and Preparedness (M&P) officers, 4 persons
Target 2: NDMA officers, 10 persons[29]

[28] After the organizational change in NDMA which occurred in November 2010, M&P department was changed to DRR department.
[29] Breakdown: 4 from Mitigation and Preparedness (M&P), 1 from Monitoring and Evaluation (M&E), 1 from admin/procurement, 1 from Human Resource, 1 from Finance, 1 from Operation, and 1 from Reconstruction and Rehabilitation(R&R)

The organizational chart of NDMA is shown in Figure 7.1.1. This is the organizational chart before an organizational change in NDMA which occurred in November 2010. The organizational chart after the change is shown in Figure 7.3.2. NDMA had a total staff of 101 persons as of 15 October 2010 (111 is the authorized number). There were 24 NDMA officers and 77 persons categorized as general staff.



Source: Human Resource Department of the National Disaster Management Authority (NDMA)

Figure 7.1.1 Organization Chart of NDMA

2) Method of the assessment

a. Questionnaire

The questionnaire used in the assessment is shown in Appendix to chapter 7 of this report.

The questionnaire items pertain to Hazard Assessment, Training, Awareness and Education, Community Based Disaster Risk Management, Guidelines for Disaster Management Plan, Formulation of the Plan and Action Plan. In the questionnaire, the vocational and educational experiences of the officers towards these items were assessed.

b. Interview Methods

The interviews were performed face-to-face using the questionnaire. One interview was planned to be executed in 15 minutes. However, with focus on communication (participatory) approaches, there was more flexibility as regards the time spent per interviewee.

Regarding the analytical method, the results are tallied up and shown in percentage format. The results for M&P officers and NDMA officers are shown separately (see Appendix to chapter 7).

c. Assessment dates

The assessment was carried out on 6 August, 14 and 15 October 2010.

7.1.4 Results of assessment

The results of the assessment are shown below according to the questionnaire items mentioned above; namely, Hazard Assessment, Training, Awareness and Education, Community Based Disaster Risk Management, Guidelines for Disaster Management Plan, Formulation of the Plan and Action Plan. In the results, the vocational and educational experiences of the officers towards these items were assessed.

1) Hazard Assessment

- Many mitigation and preparedness (M&P) officers have a general knowledge of Hazard Assessment (HA). There are some officers who have work experience on hazard assessment, but the rest are doing field work for the first time and do not have plenty of knowledge of how to analyze the previous damage data.
- Regarding the NDMA officers interviewed in all the departments, only few officers have knowledge of Hazard Assessment; therefore, most of them would like to learn the basis of assessment.
- Many NDMA officers opine that they would like to learn the different characteristics of earthquakes because earthquakes are one of the most major disasters in Pakistan.

2) Training, Awareness and Education

- Officers in M&P have comparatively received many trainings or seminars on disaster management. In addition, they implement some seminars regarding disaster management by themselves.
- There are many NDMA officers who have attended seminars or received training on disaster management; however, only half of them have implemented what they have learned from the seminars by themselves.
- Only a small number of the NDMA officers have experience in disaster management school education. Most of them have no experience in school visits nor plan formulation.

3) Community Based Disaster Risk Management

- Many M&P officers relatively have some experience in community based disaster risk management, receiving a lot of training or attending seminars for it.
- Some NDMA officers have experience of having attended seminars regarding community based disaster risk management; however, most of the officers have not experienced taking part in formulation of the plan yet.

4) Guidelines for Disaster Management Plan

- Only a few officers in M&P have some experience in formulating the guidelines. Even if they have, their only experience is in formulating tsunami guidelines.
- Only a small number of the NDMA officers have participated in seminars or planning work of the guidelines for disaster management.

5) Formulation of the Plan

- Only a few officers in M&P have a concrete image of monitoring and revising methods of NDMP.
- Most of the NDMA officers still do not have a concrete image of monitoring and revising methods of the Plan.
- To formulate and revise the plan, many M&P officers said that they need to deepen their knowledge in Hazard Assessment including its basic knowledge.
- Many NDMA officers said that they have no idea how to go about the process of formulating and revising the plan due to the fact that they do not know how to carry out Hazard Assessment.

6) Action Plan

- The same as the formulation of the plan, many officers in M&P still do not have a concrete image of the action plan. However, some officers would have a certain image because they have experience working on the annual activity report.

The results of the assessment with regard to M&P officers are organized and shown in Table 7.1.1.

Table 7.1.1 Results of the assessment for M&P officers in NDMA

Hazard Assessment	1	In formulation of this plan, a hazard assessment would be one of key component. Have you ever received training or seminar regarding the hazard assessment?	Most of the officers have received trainings or attended seminars regarding hazard assessment. However, this has happened only 1 or 2 times for most of them.
	2	Have you ever participated in work regarding the hazard assessment?	Some officers have work experience in hazard assessment, and others are doing it for the first time.
	3	Regarding the Hazard Assessment, What kind of knowledge do you want to complement or need to acquire?	Some officers answered that they need to learn how to analyze previous damage; in addition, they need to understand how it (HA) actually is analyzed.
	4	With respect to characteristics of the disaster, which disaster's characteristics (in knowledge) do you feel you need to deepen (earthquake, tsunami, flood, cyclone, drought etc)?	The answers vary from earthquake, flood, cyclone, landside and all disasters. Regarding earthquakes, floods and cyclones, some answered that they need more experience dealing with these disasters than others because they often occur in Pakistan.
	5	To analyze the characteristics, what kind of information or skill do you need to obtain?	Some responded that they need basic information on HA such as previous damage data, and others answered fundamental reasons of the disasters.
Training, Awareness and Education	6	How many times have you ever participated (received) in trainings or seminars in respect to disaster management?	Most of the officers have received trainings and attended seminars on disaster management many times (from 2 to 10 times).
	7	How many times have you implemented (hosted) trainings or seminars with regards to disaster management?	Most of the officers have plenty of experience of hosting the seminars.
	8	Have you ever visited schools to observe disaster management education?	Majority of the officers answered ‘No’.
	9	Have you participated in work of formulating school education plan with respect to disaster management?	Most of the officers answered ‘No’.
Community Based Disaster Risk Management	10	How many times have you ever participated (received) in trainings or seminars regarding to community based disaster risk management?	Many officers have experienced participating in trainings or seminars a few times (1-3 times).
	11	Have you participated in work of formulating community based disaster risk management plan?	Some have the experience and others do not.
Guidelines for Disaster Management Plan	12	Regarding Earthquake, Tsunami, Flood, Sediment, Cyclone, Drought, or any other natural disaster, have you participated in work of formulating guidelines for disaster management plan?	Most of the officers do not have experience in formulating the guidelines. For those who do have, it is only in tsunami sector.
	13	Have you ever participated (received) in trainings or seminars in respect to formulating the guidelines?	Same as the above, most of the officers do not have the experience. For those who do have, it is only in tsunami sector.
Formulation of the Plan	14	Have you already had methods of monitoring and revise this plan?	Most of the officers answered ‘No’. Even when they have, these are merely images.
Action Plan	15	Have you already had concrete image of action plan?	Some officers have a certain image of the action plan.
Formulation of the Plan	16	To formulate the plan, what kind of ability or knowledge do you need to deepen?	Most of the officers answered HA. Some answered they need to learn to assess all hazards in whole area, and others said basic knowledge of HA.
Formulation of the Plan	17	To revise the plan, what kind of ability or knowledge do you need to deepen?	Same as the above, many officers answered HA including analysis of the existing situation of the disasters.

Source: JICA Study Team

7.1.5 Conclusions

This capacity assessment was conducted under the objective that NDMA officers including M&P officers have capacity to formulate and revise the plan. To achieve the objective, the abilities and knowledge which they need to enhance were assessed.

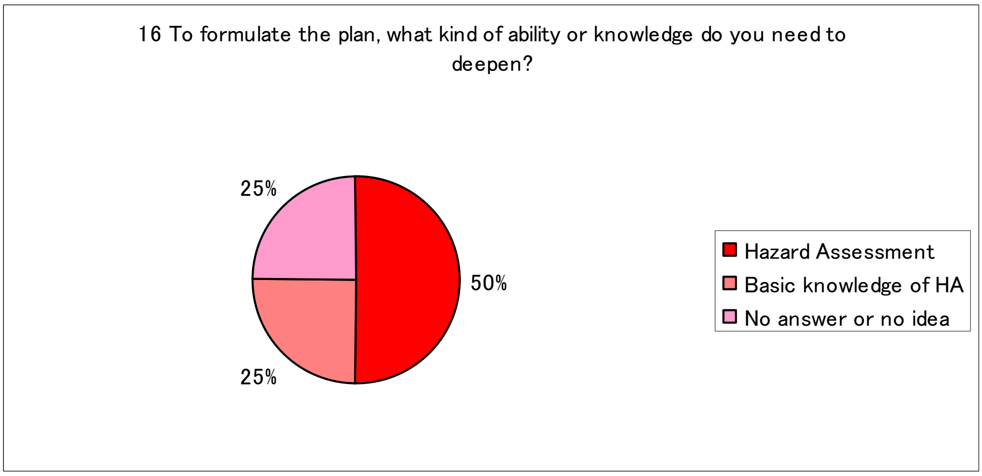
Regarding the Hazard Assessment, only a few NDMA officers of the all department had knowledge of HA. As far as M&P officers are concerned, most of them had a general knowledge of HA; however, some relatively lack knowledge of methods of HA.

On the other hand, NDMA officers had relatively much experience of having participated in seminars regarding disaster management (80% have attended). With respect to M&P officers, they had plenty of experience that they were able to conduct the seminars by themselves.

However, regarding school education, Community Based Disaster Risk Management and guidelines, many NDMA officers did not have the work experience (70-90% do not have it). Moreover, about M&P officers, only half of them had the work experience with regard to these fields.

In addition, with respect to formulating and revising NDMP, almost all NDMA officers did not have a concrete image of this task. The same is true for M&P officers; only few of them had a concrete image of what the revised Plan would look like.

As shown in Figure 7.1.2, on the question regarding what kind of ability or knowledge has to be deepened to formulate the plan, most of the M&P officers answered ‘Hazard Assessment’. Even for M&P officers, some thought that they would like to learn starting with the basics of HA.



Source: JICA Study Team

Figure 7.1.2 Result of the assessment

Therefore, to secure the ability of the NDMA officers to formulate and revise the plan, it is necessary for them to learn starting with the basics of Hazard Assessment. For the M&P officers, it is recommended that not only the basics of HA have to be developed, gradually, but also methods of HA have to be enhanced.

After that, regarding the other items such as school education, community based disaster risk management and guidelines, capacities for these have to be gradually developed by seminars. However, as the first step for the capacity development, it is recommended that the basic knowledge of HA be enhanced.

7.2 Capacity Development Scheme

7.2.1 Introduction

A capacity development scheme was formulated under the objective of securing the enhancement of the NDMA abilities to formulate the National Disaster Management Plan.

The most important factor for the capacity development is to ensure that the NDMA officers have the capacity to formulate and revise the NDMP.

To formulate and revise the plan it is require NDMA officers to understand backgrounds and contents of the NDMP such as Hazard Assessment, Training, Awareness and Education, Community Based Disaster Risk Management, Guidelines for Disaster Management and Action Plan.

As shown in the results of the capacity assessment, to develop the abilities to formulate and revise the NDMP, basic knowledge of Hazard Assessment has to be enhanced. In the capacity development scheme, the Hazard Assessment was also included in the capacity development procedure.

The procedure of the capacity development was carried out in accordance with the procedure of the formulation of NDMP, preceded by the study team’s activities. As the means of capacity development, workshop, seminars and activities in cooperation with NDMA were utilized.

7.2.2 Objective of the scheme

The abilities of NDMA officers to formulate and revise the NDMP are enhanced.

7.2.3 Target of the capacity development

The targets of the capacity development are NDMA officers, especially the M&P officers

7.2.4 Procedure and Capacity development Scheme

The procedure of formulation of the NDMP is shown below.

- Understanding the Current Situation
- Hazard Assessment

- Formulation of the Vision of Disaster Management
- Formulation of the Draft Disaster Management Plan
- Approval for National Disaster Management Plan

The contents of the capacity development activities and its procedure are shown in Table 7.2.1.

Table 7.2.1 Contents of the capacity development activities

	Stages of Plan Formulation	Timing	Capacity Building Activities	Output
			Capacity Assessment in NDMA	
1	Understanding the Current Situation	Until middle of August 2010	1). Workshop This is the first national disaster management workshop. In collaboration with the counterparts, the presentation documents for the workshop on 25th June are to be filed.	Presentation abilities regarding this project are developed
2	Hazard Assessment (HA)	From middle of October to November, 2010	2). Seminar on Hazard Assessment When there is a seminar on HA or progress report submission, general knowledge and abilities of methods of HA are enhanced. Facilitation efforts are to be made by the study team to assess the understanding of the officers.	General knowledge and abilities of the methods of HA are enhanced
3	Formulation of the Vision of Disaster Management	December, 2010	3). Trainings in Japan In sharing the vision, there should be a facilitation process to enhance the abilities to formulate the NDMP and concrete action plan through a discussion of ideas.	Abilities to formulate the NDMP and action plan are improved
4	Formulation of the Draft Disaster Management Plan	From April to May 2011	4). Seminar Through seminar, the abilities of NDMA in formulating and revising methods of the plan are enhanced. Efforts should be made to assess the understanding of the officers.	Abilities of formulating and revising methods of the plan are developed
5	Approval for National Disaster Management Plan	From June 2011 until March 2012	5). Approval conference of the National Disaster Management Plan At the initiative of the counterparts, a presentation of the contents of the plan and its procedure (process) to stakeholders would be conducted. ‘’NDMA’’ In collaboration with NDMA officers, presentation documents which have been started in this project are to be filed up so that these can be referred as a procedure of the plan.	Presentation abilities regarding the NDMP are enhanced Presentation papers are organized, referring to process of the plan

Source: JICA Study Team

7.2.5 Evaluation of the achievement

To formulate and revise NDMP, Hazard Assessment is one of the most important factors to formulate it. Therefore, evaluation assessment will be conducted to assess level of understanding (general knowledge and methods) of the Hazard Assessment. Furthermore, additional assessment will be executed to assess abilities of the NDMA officers to formulate and revise the NDMP.

Levels of the participation in the project like participation in workshops or seminars are also assessed.

One of the important achievements is a presentation of NDMP by the NDMA officers to the relevant stakeholders.

7.3 Monitoring and Evaluation

7.3.1 Disaster Management Workshops

Descriptions of three Disaster Management Workshops are summarized as follows.

Table 7.3.1 Description of the 1st Disaster Management Workshop

Purpose of the WS: to share understanding on NDMP among concerned actors
Date and hours: June 25th, 2010 9:15-12:30
Held by: NDMA, JICA study team
Location: meeting room in NDMA

#	Title	Presenter	Summary
1	Background and Progress of the Project	Mr. Aeshad Nawaz Chheena, Project Director, NDMA	Description of this project and its time line were explained.
2	Structure of Disaster Management System and Components of Central, Prefectural, and Municipal Level Disaster Management Plans (Japanese Example)	Noboru Ikenishi (Institutional Management)	Guidance on disaster management administration was given. Three lessens learned from the Great Hanshin Awaji Earthquake; CBDRM, Hazard Mapping, and Aseismic Retrofiting, were delivered.
3	Approach to the Formulation of NDMP	Yoshihiro Asano, (Deputy Leader / Comprehensive DRM Plan)	The background of development of NDMP was explained. The relations and positions among NDRMF 2007, NDRP 2010 and NDMP which would be designed this time were explained.
4	Example of Hazard Assessment and Risk Analysis	Noboru Ikenishi (Institutional Management)	Visual explanations of disaster analysis and risk analysis with GIS were delivered by showing the examples of Indonesia and Vietnam. The importance of Information collection and accumulation was underlined.
5	Existing Warning System in Pakistan (Tentative)	Mr. Azmat Hayat Khan, PMD	Flood Warning System, Drought Monitoring, Cyclone Warning System, and Lai Nullah Flood Forecasting were explained. The establishment of an information collection system and the EWS for flash floods were raised as the priority issues hereafter.
6	Learning from Disaster Management in the Case of Cyclone PHET	Kazuto, Suzuki (Deputy Leader/ Early Warning System)	The provisional evaluation on the system of NDA and PMD, and lessens learned from their handling of Cyclone PHET were shown. As proposals, the necessity of the disaster-related information collection and the vulnerability evaluation by each disaster were suggested to NDMA, and the necessity of information sharing and the integration of the Forecasting System within PMD were suggested to PMD.
7	Community-based Disaster Management Activities and their Implications to Disaster Risk Management Plans	Tomoko Shaw, (Community-Based DRM)	Actual implementation examples of various CBDRM activities were shown with pictures and video clips, and the importance of reflecting the lessens learned from the CBDRM activities onto the disaster management plans was elucidated. Also, the need of further focus on Mitigation and Preparedness such as CBDRM activities was underlined based on the result of the analysis of the current situations of disaster management in Pakistan.
8	Discussions		A discussion was held after each of the presentations. Mr. Amir stated that the procedures of disaster management should be described in detail per each disaster in NDMP. Mr. Asano replied to the suggestion that there would be many overlaps if the procedures were written by each disaster, and therefore the procedures of disaster management should be merged together in the plan somehow. Mr. Chheena emphasized that the differentiation of the new plan from existing NDRMF and NDRP is needed. The continuation of discussion on the contents of the plan was promised.

Table 7.3.2 Description of the 2nd Disaster Management Workshop

Purpose of the WS: information sharing on EWS, hazard assessment and NDMP
Date and hours: October 28th, 2010 9:15-12:30
Held by: NDMA, JICA study team
Location: meeting room 220-E in NDMA

#	Title	Presenter	Summary
1	Progress of Project	Mr. Arshad Nawaz Chheena, Project Director, NDMA	The whole schedule and the contents of this JICA project conducted so far were explained. Here it was stated that the active involvement of full time employees and part time employees (consultants) of NDMA into the project is essential, and that active discussions on each issue in this WS are required.
2	Issues of the Early Warning System in Pakistan	Kazuto, Suzuki (Deputy Leader/ Early Warning System)	The current EWS for the targeted disasters which had been clarified in the project so far was shown, and its problems and possible solutions were suggested. It was proposed that the improvement of the forecasting equipment and the system, and coordination among the related organizations would lead to the enhancement of the whole forecasting capacity.
3	Earthquake and Tsunami disaster arrangements	Yoshitaka Yamazaki (Earthquake & Tsunami)	The records of the previous earthquake and tsunami disasters in Pakistan and the results of the examination of the current EWS were shown. The current technology in Pakistan is not capable of forecasting earthquakes or tsunamis beforehand. Therefore, installation and improvement of seismograph and tide indicators in order to promptly assume the damage and prepare counter measures were suggested, and a framework for development of an observation network in the future was proposed. Also, especially for tsunami, which has only a short period from initial indications until its actual occurrence, it was suggested that multiple and various kinds of communication systems are necessary.
4	Flood and flash flood hazard assessment	Mr. Azmat Hayat Khan, PMD	The current system of the EWS for meteorological disasters, especially floods, which PMD conducts, was explained in detail. The existing challenges in EWSs were stated, and the flood-vulnerable areas that PMD currently recognizes were shown.
5	Framework of National Disaster Management Plan	Ichiro Kobayashi (Team Leader)	A brief description of NDMP and the project was explained. A comparison was made of the contents of NDMF and its recognition of disaster, which UNDP and NDMA established in 2007, with the actual behavior in the face of disaster mainly done by NDMA. Based on this comparison a suggestion was made on what part was missing and what part was supposed to be added in the plan.
6	Discussion		The JICA Study Team promised the submission of the tentative table of contents at the next WS in response to the request from NDMA to submit the outline of NDMP. Also, it was suggested by FFC that the consensus of the recognition of the flood-vulnerable areas among FFC, NDMA and PMD is important.

Table 7.3.3 Description of the 3rd Disaster Management Workshop

Purpose of the WS: discussion on NDMP
Date and hours: November 12th, 2010 14:15-15:30
Held by: NDMA, JICA study team
Location: meeting room 220-E in NDMA

#	Title	Presenter	summary
1	Progress of the Study	Ichiro Kobayashi (Team Leader)	The current progress status of the project was delivered.
2	Hazard and Risk Assessment Results	Kazuto, Suzuki (Deputy Leader/ Early Warning System)	The Hazard/ Risk Maps compiled with GIS based on the survey of the previous disaster records were explained by showing the outcome and the timeline of the working process. Also, necessary improvement suggestions were made for the Early Warning System Plan according to the maps. The limitation of data for the index was raised as a problem in the current risk assessment, and cooperation in this matter was requested from the concerning organizations.
3	National Disaster Management Plan Formulation	Yoshihiro Asano, (Deputy Leader / Comprehensive DRM Plan)	The current progress of the NDMP was reported.
4	Discussions		Improvement in risk assessment, especially for drought, was requested. With respect to this, the project team assured the attendees that current results should be improved. Also, since there are small gaps between the results of this Disaster Vulnerability Analysis, which the team proposed, and the 50 Vulnerable Districts which NDMA had published, it was agreed that continuous discussions would be held between these two actors. As for the table of contents of NDMP, the following arrangement was decided and will be circulated throughout NDMA, comments from those who are concerned in addition to the participants of this WS will be collected, and the approval from the Chairman of NDMA shall be acquired.

7.3.2 Hazard Assessment Workshop

1) Introduction

The Hazard Assessment Workshop was held on 28th October 2010. It was conducted under the one of the objectives that the capacities of NDMA officers to formulate and revise the NDMP were to be enhanced through the workshop by acquiring the knowledge of Hazard Assessment.

The Hazard Assessment is one of the most important components to formulate the plan. For the formulation, it is required that NDMA officers obtain the knowledge of the Hazard Assessment. In addition, as shown in the capacity assessment 7.1, it is also recommended that NDMA officers acquire the knowledge, at least basic knowledge of the Hazard Assessment.

In this evaluation, level of the comprehension of NDMA officers was to be evaluated. As the evaluation methods, questionnaire was utilized. The questionnaire items included Basic Knowledge of the Hazard Assessment and Methods of the Hazard Assessment. In the questionnaire, the level of comprehension towards the each item was assessed.

2) Objective

Level of the comprehension of NDMA officers regarding Hazard Assessment is evaluated.

3) Target of the evaluation

Participants of the Workshop: 8 NDMA officers (3 from Disaster Risk Reduction (DRR), 1 Disaster Risk Management Officer, 1 from Monitoring and Evaluation (M&E), 1 from Finance, 1 from Operation, and 1 from Reconstruction and Rehabilitation(R&R))

4) Methodology

a. Questionnaire

The questionnaire used in the evaluation is shown in Appendix to chapter 7 of this report.

The questionnaire items pertain to Basic Knowledge of the Hazard Assessment (Definition, Objective Area of the Hazard and Risk) and Methods of the Hazard Assessment (Methods, Calculation Methods and Data Collection). In the questionnaire, the level of comprehension towards the each item was assessed.

b. Interview Methods

As same as the ones shown in the Capacity Assessment 7.1, the interviews were performed face-to-face using the questionnaire. One interview was planned to be executed in 15 minutes. However, with focus on communication (participatory) approaches, there was more flexibility as regards the time spent per interviewee.

Regarding the analytical method, the results are tallied up and shown in percentage format. The results are shown in the Appendix of chapter 7.

c. Evaluation dates

The evaluation was carried out on 24 and 25 January 2011.

5) Evaluation Results

The results of the evaluation are shown below according to the questionnaire items mentioned above; namely, Basic Knowledge of the Hazard Assessment (Definition, Objective Area of the Hazard and Risk) and Methods of the Hazard Assessment (Methods, Calculation Methods and Data Collection). In the results, the level of comprehension towards the each items were assessed.

a. Basics of Hazard Assessment

<u>Definition</u>

- Most of the officers have understood the definitions of the Hazard and the Vulnerability and the Risk (75% of the officers answered they have understood the definitions).

- One officer opined that it was difficult to understand the characteristics and its linkage between Hazard, Vulnerability and Risk.

Objective

- Many officers have grasped the objective of Hazard Assessment (75% of the officers answered they have understood the objective).

Area of the Hazard and Risk

- All of the officers have relatively understood the Hazard and the Risk in each area (in which area the Hazard and the Risk exist) (All of the officers have answered they could understand it more or less).

b. Methods of Hazard Assessment

Methods

- More than half of the officers have relatively understood how the high level Hazard and Risk areas (districts) were decided in the map (50% of the officers have comprehended the areas more or less, 25% of the officers have understood).
- Some officers have felt that it was rather difficult to understand how the data was collected and also the criteria to divide low and high level of hazard and risk.

Calculation Methods

- Large number of officers has felt that it was hard to understand the calculation methods of Hazard and Risk. Only a few officers answered they could understand it to some extent.

Data Collection

- Almost half of the officers have grasped to some extent how the scientific data in the disaster prone was collected (50% of the officers have comprehended the areas more or less, 25% of the officers have understood).

General

- In general comments of this workshop, there were comments that this assessment was very scientific and technical, so it was difficult to comprehend but the workshop itself was informative and fruitful.
- There were suggestions that the scientific data would be collected from CPOs (City Police Officers) and DCOs (District Coordination Officers).

The results of the evaluation are organized and shown in Table 7.3.4

Table 7.3.4 Evaluation Results of the Hazard Assessment Workshop

Basics of Hazard Assessment	Definition	1	Did you understand definitions of the Hazard, the Vulnerability and the Risk?	Most of the officers answered they have understood the definitions.
		2	If you answered Some (More or less) or No in the above, which was difficult for you to understand? Hazard, Vulnerability or Risk?	One officer opined that it was difficult to understand the characteristics and its linkage between Hazard, Vulnerability and Risk.
	Objective	3	Did you understand an objective of the Hazard Assessment?	Many officers replied 'yes'.
	Area	4	Did you grasp the Hazard and the Risk in each area? (in which area the Hazard and the Risk exist?)	All of the officers have grasped the Hazard and the Risk in each area to some extent.
Methods of Hazard Assessment	Methods	5	Did you comprehend how the high level Hazard and Risk areas (districts) were decided? (in the map)	Half of the officers answered 'some (more or less)'.
		6	If you answered Some (More or less) or No in the above, what kind of thing was difficult for you to understand? Freely describe.	The answers varied from how the data was collected, how the areas were analyzed and distinctions between low and high level (of hazard and risk).
	Calculation Methods	7	Did you understand the calculation methods of Hazard and Risk?	Large number of officers could not grasp the calculation methods. Only a few officers answered they could understand it to some extent.
	Data Collection	8	In the Hazard Assessment, collection of scientific data in the disaster prone area is one of the important factors. Did you grasp how the data was collected?	Half of the officers could grasp to some extent how the data was collected.
General	General	9	If any comments on the Hazard Assessment, Freely describe.	There were opinions that this assessment was very scientific and technical, so it was difficult to comprehend but the workshop itself was informative and fruitful.

Source: JICA Study Team

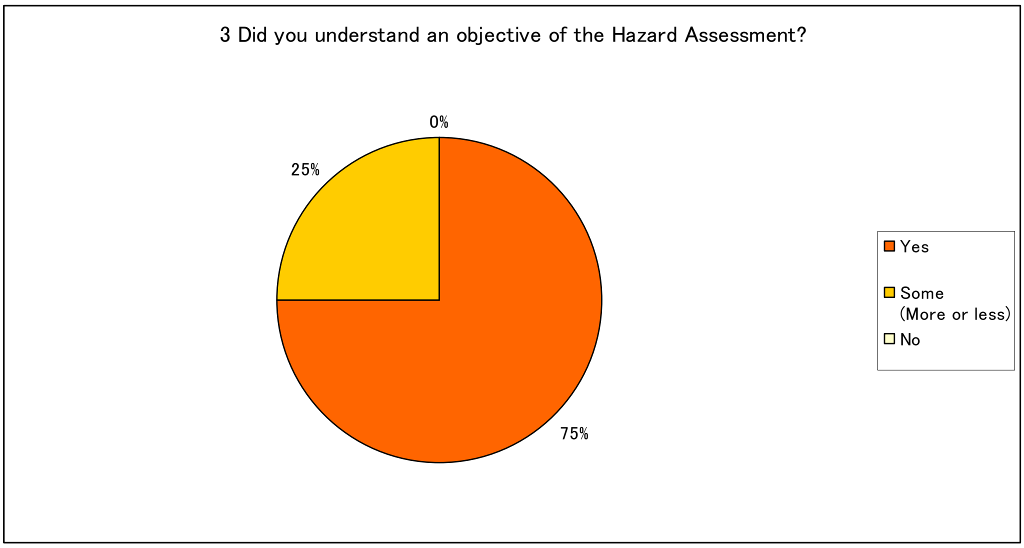
6) Conclusions

This evaluation was conducted under the one of the objective that capacities of NDMA officers to formulate and revise the Plan should be enhanced by ensuring that the officers acquire the knowledge of the Hazard Assessment through the workshop. To achieve the objective, level of the comprehension regarding the Hazard Assessment was evaluated.

Regarding the basic knowledge of the Hazard Assessment, most of the officers have fully understood the definitions, the objectives and the areas of the Hazard and Risk. In terms of the areas, they have relatively grasped where the Hazard and the Risk are located in the map.

With respect to the methods of the Hazard Assessment, compared to the Basics, many of the officers have felt that it was rather difficult to comprehend how the high level hazard and Risk areas in the map were decided and also how the scientific data in the disaster prone areas was collected. In addition, a lot of officers have perceived that it was rather hard to understand the calculation methods of the Hazard Assessment.

However, as shown in Figure 7.3.1, from one of the fact that the objective of the Hazard Assessment has been perceived to be understood by many officers, the officers have understood the concept of the Hazard Assessment.



Source: JICA Study Team

Figure 7.3.1 Result of the evaluation

As the results of the capacity assessment, to formulate and revise the NDMP, it is required that NDMA officers acquire at least basic knowledge of the Hazard Assessment. In the sense, since most of the officers have obtained the basics knowledge, the objective of the workshop was attained.

For the next step, it is recommended that the NDMA officers would deepen their knowledge in the basics and gradually develop their knowledge in the methods of Hazard Assessment.

7.3.3 Trainings in Japan

1) Discussion on the preparation of NDMP

During the training, a discussion on the preparation of NDMP was conducted, various constructive opinions were given by trainees and the level of comprehension of DRM was also improved through the discussions. In particular, the trainees emphasized the integration of DRM into school education and the combination of self-help, mutual-help and public-help through understanding the different situations between Japan and Pakistan. The following challenges to be attacked in Pakistan were opined;

- The operation at the district level is not yet independent in Pakistan.
- While most of the people are already educated in terms of DRM in Japan, the level of education in Pakistan is very low, even the literacy rate is still low.

- The community is not involved yet in DRM in Pakistan, but is already involved in the other fields such as Social Welfare.
- As the resources at the district level are very important, it is necessary to establish the mechanism for securing those resources.
- If DRM is integrated into the school education, the students would bring the knowledge of DRM to their families.
- Mitigation and preparedness can not be realized by only self-help. The combination of self-help, mutual-help and public help is very important.

2) Presentation from NDMA

In the end of the training in Japan, a presentation was made by NDMA at the final session. The representative of NDMA presented what they had learnt in the training. NDMA had a good understanding of the differences of DRM systems between Japan and Pakistan. The following items were presented by NDMA.

- Background : Millennium Development Goals and Hyogo Frame Work for Action
- Managing the Complete Spectrum of Disaster
- A quick Review of Progress of the new System of Disaster Management of Pakistan by 9 priority Areas for DRM under the National Disaster Management Framework.
    1. Institutional and Legal Arrangements
    2. National Hazard and Vulnerability Assessments
    3. Training, Education and Awareness
    4. Promoting Disaster Risk Management Planning
    5. Community and Local Level Risk Reduction Programming
    6. Multi-Hazard Early Warning System
    7. Mainstreaming Disaster Risk Reduction into Development
    8. Emergency Response System
    9. Capacity Development for Post Disaster Recovery
- Japanese Disaster Management System
- Comparison of Japanese and Pakistani DM Systems

3) Sharing the materials and knowledge with NDMA staffs

After the training, the representative of NDMA made a presentation in order to report the achievements from the training to the NDMA staffs in the regular meeting of NDMA. The materials and knowledge from the training were shared within NDMA staffs.

7.3.4 Technical Committee Meeting and Consultative Workshop

1) Technical Committee Meeting

Following is the general description of the Technical Committee Meeting on NDMP.

Table 7.3.5 Description of the Technical Committee Meeting

Purpose of the meeting: to discuss and finalize the 2nd draft of NDMP
Date and hours: May 21st, 2011 9:15-12:30
Participants: Federal Flood Commission (FFC), Pakistan Meteorological Department (PMD), Provincial/ Regional/ State Disaster Management Authorities, JICA, JICA study team
Location: meeting room in NDMA

1	Title	National Disaster Management Plan 2nd draft	Presenter	Mr. Ichiro Kobayashi
	summary	The future submissions schedule was given as follows: (1)Interim Report: June 2011, (2) Progress Report 2: November 2011, (3) Draft Final Report on NDMP: March 2012, (4) Final Report of NDMP: June 2012		
2	Title	Human Resource Development Plan for Disaster Management	Presenter	Ms. Harumi Tsukahara
3	Title	National Multi-Hazard Early Warning Plan submitted as a part of Progress Report 1	Presenter	Mr. Kazuto Suzuki
4	Title	Discussions		
	Summary	- Contents of discussions - The State Disaster Management Authority suggested to add capacity building for all entities of disaster management. - NIDM mentioned at the forum of Research through Universities that NIDM had started, and the work done so far should be reflected in the plan. - FATA Disaster Management Authority (FDMA) pointed out that they had not established their Fire Department, hence steps should be proposed in the plan to fill this gap. - PDMA of Balochistan requested that those who are marginalized and vulnerable living in marginalized areas should be included as targets in the plan with their specific needs addressed. - Sindth Disaster Management Authority suggested that the name of their regional authority should be included in the list of PDMAs together with the FATA DMA and Gilgit-Baltistan DMA. - An appropriate choice of measures in the EWS Plan was suggested in order to improve the scale measures to record the snow melt. - On the issues of the Specialized Medium Range Forecasting Centre (SMRFC), the JICA Study Team requested separate discussions - JICA and NDMA raised an issue about the coordination with ministries “being developed to the provinces under the 18th Constitutional Amendment.” The JICA Study Team proposed their plan to have one on one meetings with the officials of each ministry. - Gilgit-Baltistan Disaster Management Authority requested to give adequate space in the NDMP for G-B disaster management related issues besides indicating appropriate measures to address the vulnerabilities.		

Source: JICA Study Team

2) Consultative Workshop

Following is the general description of the Consultative WS on NDMP.

Table 7.3.6 Description of the Consultative Workshop

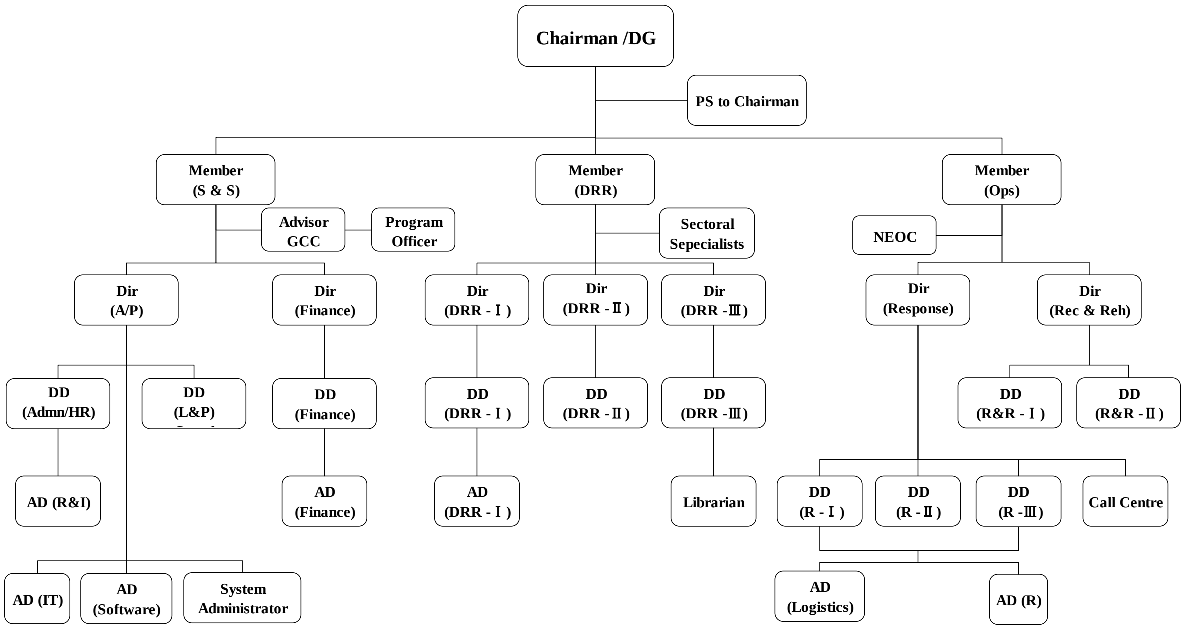
Purpose of the meeting: To discuss with relevant stakeholders the Draft of Pakistan's National Disaster Management Plan (NDMP), and the Roles and Responsibilities of relevant stakeholders
Date and hours: June 30, 2011, 9:30-15:30
Participants: 160 Participants from NDMA, PDMAs, DDMAs, Different Govt Organizations, Donor Agencies, INGOs, and local NGOs,
Location: Conference Room of Margala Hotel

1	Title	New System of Disaster Management in Pakistan, Achievements and Way Forward	Presenter	Mr. Ahmed Kamal, Member (DRR), NDMA,
	summary			
2	Title	Introduction of the Project	Presenter	Mr. Ichiro Kobayashi, Team Leader, JICA study team
3	Title	National Disaster Management Plan	Presenter	Dr. Yoshihiro Asano, JICA study team
4	Title	Human Resource Development Plan	Presenter	Dr. Ryo Matsumaru, JICA study team
5	Title	National Multi-Hazard Early Warning Plan,	Presenter	Mr. Kazuto Suzuki, JICA study team
6	Title	Progress of Community Based Disaster Risk Management	Presenter	Ms. Tomoko Shaw, JICA study team
7	Title	Discussions		
	Summary	<u>Contents of discussions</u> - NDMA and the JICA study team made presentations about the progress of NDMP, EWP, HRDP, and CBDRM activities. The participants could understand the contents and progress of the project. - After the presentation, a Q&A session was held. The participants asked many questions and the study team answered all questions in a careful manner. - The discussions were mainly related to the roles and responsibilities of stakeholders. This was a great opportunity to learn the capabilities and responsibilities. In addition, the JICA study team requested the participants to send back their comments and recommendations by letter. - The UN is a good stakeholder in all DRM interventions and NDMP will also be interfaced with the UN system. The mainstreaming of the NDMP with the UN plan will be considered. - Local governments have no equipment to deal with a big disaster and NDMA would focus on this area. - How this plan will be aligned with the DRM plans of UN. - The rules may be categorized to each stakeholder separately. Role of NGOs and INGOs should be elaborated more and a mechanism to be introduced for NGOs and INGOs. - Monitoring of all the activities should be carried out and a M&E system may be incorporated in the National Disaster Management Plan. - Disaster Management may be integrated with the public sector's ongoing activities and training programs may be introduced in the public sector organizations - There is no role defined for academies, universities or research institutes. The DRR may be incorporated in the syllabus. The students and the staff of the colleges may be trained.		

Source: JICA Study Team

7.3.5 The change of the organization system of NDMA

NDMA's personnel and structure were changed in November, 2010. The organizational chart of NDMA is shown in Figure 7.3.2. NDMA currently has a total staff of 130 persons as of February 2012. There are 32 NDMA officers and 98 persons categorized as general staff.



Source: NDMA, as of Feb 2012

Figure 7.3.2 Current Organization Chart of NDMA

7.3.6 The results of the capacity assessment

In the capacity assessment, 10 NDMA officers participated in assessing their DRM experience. In the assessment, to equally assess the capacity of NDMA, at least one officer from each department was selected for interview. M&P department officers played a principal role in respect to formulation of NDMP. After an organizational change, the principal role was changed to DRR department. After the change, however, most of the M&P officers who had worked with formulating NDMP left their work with NDMA and the JICA study team have worked with new counterparts in DRR department for the capacity building activities. The capacity assessment showed that of the 10 officers who were analyzed in the capacity assessment, only 2 officers have continuously participated in capacity building activities such as seminars and workshops which were held in the study (Table 7.3.7).

After the organizational change, in addition to the DRR department officers, a member of DRR department (Mr. Ahmed Kamal) have actively joined in the study and have collaborated in formulating the NDMP. The formation of the NDMP is performed in collaboration mainly with the member and DRR department officers.

Table 7.3.7 Results of capacity assessment (Feb 2012)

	Name / NDMA officers who participated in capacity assessment	Department before organizational change	Department after organizational change	Current Position	Seminar / Workshop in which NDMA officers participated
1	Mr. Amir Mohyddin	M&P	DRR	No longer in NDMA	
2	Mr. Arshad Nawaz Chheena	M&P	DRR	Not More in NDMA	
3	Mr. Naseer Ahmed	M&P	DRR	No longer in NDMA	
4	Ms. Bushra Hassan	M&P	DRR	DRR-1	・1st Workshop ・2nd Workshop ・Technical Committee Meeting ・Consultative Workshop
5	Mr. Syed Sibt-E-Abbas Zaid	Human Resource	DRR	DRR-II	・2nd Workshop ・Technical Committee Meeting ・Consultative Workshop
6	Mr. Zahid Bhutta	R&R	DRR	DRR-I	Has not participated yet
7	Mr. Hassan Zulfiqar	M&E	M&E	No longer in NDMA	
8	Mr. Saijad Kiani	Administration	Administration	No longer in NDMA	
9	Mr. Muhammad Tahir	Finance & Accounting	Finance & Accounting	Finance & Accounting	
10	Mr. Major Iftikhar	Operation	Response	Response-I	

Source: JICA Study Team

7.3.7 Activities for approval of National Disaster Management Plan

1) Presentation of NDMP to stakeholders

For approval of NDMP, NDMA is supposed to make presentations of NDMP to relevant stakeholders. These presentations would help NDMA staffs to strength the comprehension of NDMP and enhance their capacity for presentations. Mr. Ahmed Kamal, Member of DRR NDMA, made a presentation at the Consultative WS to 160 participants from relevant ministries and authorities. This event was one of the great steps in terms of Capacity Development for NDMA.

2) Participation for Workshops regarding NDMP

The details of the participation in important meetings and workshops can be seen in the following table. From 6 to 8 persons from NDMA attended the workshops and Technical Committee meeting and 16 persons from NDMA attended the Consultative Workshop, in which, the representative of NDMA made a presentation regarding their achievements. Through activities in respect to the above mentioned workshops and Meeting, various personnel of NDMA improved their level of comprehension on DRM and NDMP and their presentation skills.

Table 7.3.8 Participation in Workshops from NDMA

Name of Workshop	Number of participants from NDMA	Name	Designation	Particular role in WSs
1st Workshop	8 persons	Mr. Amir Mohyddin	Director (Preparedness & Mitigation)	Chair
		Mr. Mr. Arshad Nawaz Chheena	Deputy Director/Project Director	Presenter
		Mr. Col Rtd. Aijaz Akram	Consultant	Participant
		Mr. Naseer Ahmed	Deputy Director (Preparedness & Mitigation)	Participant
		Ms. Bushra Hassan	Assistant Director (Preparedness & Mitigation)	Participant
		Ms. Samina Sardar	Consultant (DRR)	Participant
		Mr. Shahida Arif	DRM-PSO	Participant
		Mr. Nazar Fareed Khan	Reporting Officer	Participant
2nd Workshop	8 persons	Mr. Idress Mahsud	Director (R&R)	Chair
		Mr. Wajahat Hameed	Director (Finance)	Participant
		Mr. Hasan Zulfiqar	Director (M&E)	Participant
		Mr. Syed Sibt-e-Abbas Zaidi	Director (HR &IT)	Participant
		Mr. Naseer Ahmed	Deputy Director (Preparedness & Mitigation)	Participant
		Major Iftikhar Ahmed	Deputy Director (Operation)	Participant
		Ms. Bushra Hassan	Assistant Director (Preparedness & Mitigation)	Participant
		Mr. Shahida Arif	DRM-PSO	Participant
3rd Workshop	6 persons	Mr. Ahmed Kamal	Member (Admin &Finance)	Chair
		Mr. Amir Mohyddin	Director (Preparedness & Mitigation)	Participant
		Mr. Arshad Nawaz Chheena	Deputy Director/ Project Director	Participant
		Mr. Naseer Ahmed	Deputy Director (Preparedness & Mitigation)	Participant
		Mr. Shahida Arif	DRM-PSO	Participant
		Mr. Nazar Fareed Khan	Reporting Officer	Participant
Technical Committee Meeting	7 persons	Mr. Ahmed Kamal	Member (Disaster Risk Reduction)	Chair
		Ms. Rana Asad Amin	Member (S&S)	Participant
		Mr. Falak Nawaz	Director (NIDM)	Participant
		Ms. Bushra Hassan	Assistant Director (Disaster Risk Reduction)	Participant
		Mr. Nazar Fareed Khan	Reporting Officer	Participant
		Ms. Reema Zuberi	Media Coordinator	Participant
		Mr. Aamir Ikram Khan	Editor / Reporter Media	Participant
Consultative Workshop	16 persons	Dr. ZafarIqbal Qadir	Chairman	Chair
		Mr. Ahmed Kamal	Member (Disaster Risk Reduction)	Presenter
		Ms. Rana Asad Amin	Member (Support & Services)	Participant
		Mr. Brig. Sajjad Naeem	Member (Operation)	Participant
		Ms. Aaisha Makhdum	Director (Admin)	Participant
		Mr. Syed Sibt-e-Abbas Zaidi	Director (DRR-I)	Participant
		Ms. Bushra Hassan	Assistant Director (Disaster Risk Reduction)	Participant
		Mr. Nazar Fareed Khan	Reporting Officer	Participant
		Mr. Naeem Iqbal		Participant
		Mr. Haroon Rahid		Participant
		Mr. Amir Shahzad		Participant
		Ms. Zeb un Nisa	DRM-PSO	Participant
		Mr. Malik Qasir Majeed		Participant
		Ms. Tanzila Shukat	Librarian	Participant
		Mr. Tariq Mahmood	Stenographer	Participant
		Mr. Zeeshan		Participate

Source: JICA Study Team

3) Sharing of procedure documents regarding National Disaster Management Plan

The JICA study team collected up the documents and presentation materials regarding NDMP and handed them over to NDMA. In addition, the JICA study team gave an explanation of the materials in a careful manner in order to strengthen the understanding of the procedure for preparing NDMP.

7.4 Achievements and challenges

7.4.1 Achievements

The achievements can be seen as follows in terms of capacity development of NDMA.

1) 1st Disaster Management Workshop

- In the workshop, NDMA accomplished a presentation regarding description of this study.
- The understanding of NDMP of NDMA has been deepened in respect to the background of NDMP including the relationship between NDRMF 2007 and NDRP 2010
- Constructive discussions regarding NDMP have been achieved in the workshop between NDMA and the JICA study team and NDMA has deepened their knowledge of NDMP. In the discussions it was mentioned that although the procedures of disaster management should be described in detail per each disaster in NDMP, there would be some overlaps if the procedures were written for each disaster. Therefore, the procedures for disaster management should be merged together in the plan.

2) 2nd Disaster Management Workshop

- In the workshop, explanations were given by NDMA regarding the progress that the project has attained such as the entire schedule and the contents of the JICA project so far. In the discussions, it was recognized that the active involvement of not only full time but also part time employees (consultants) of NDMA into the project is essential.
- NDMA has enhanced their knowledge of EWSs through understanding the results of the examination of the current EWS by analyzing the records of the previous earthquake and tsunami disasters in Pakistan.
- Through explanation by the JICA study team of a comparison between the contents of NDMF and its recognition of disaster, a suggestion was made on what part was missing and what part should be added in the NDMP.

3) 3rd Disaster Management Workshop

- In the workshop, understanding of NDMA regarding NDMP has been facilitated through the explanations given by the JICA study team of the current progress status of the project.
- NDMA has improved their knowledge of EWSs through the explanations given by the JICA study team regarding the Hazard / Risk Maps made with GIS based on the survey of the previous disaster records and necessary suggestions regarding the EWS according to the maps.
- In the workshop, NDMA has obtained the recognition that there were small gaps between the results of this disaster vulnerability analysis which the team proposed and the 50 vulnerability analyses which NDMA had published.

4) Hazard Assessment Workshop

- In the workshop NDMA deepened their knowledge of HA through the presentation given by the JICA study team.
- Based on an evaluation of the Hazard Assessment Workshop, most of the NDMA officers have understood the definitions of Hazards and Vulnerability and Risk (in the questionnaire,75% of the officers answered they have understood the definitions)
- Many NDMA officers have grasped the objective of Hazard Assessment (75% of the officers answered they have understood the objective).
- All of the officers have understood the Hazards and Risks in each area (All of the officers have answered they could understand it more or less).

5) Training in Japan

- The representatives of NDMA participated in the training in Japan and understood the disaster management system of Japan.
- In the training in Japan, NDMA officers improved their understanding of the contents and the methodology of NDMP.
- The knowledge and materials for the training in Japan were shared within NDMA staffs.
- Through the training, NDMA has recognized the importance of integration of DRM into school education and the combination of self-help, mutual-help and public-help through understanding the different situations between Japan and Pakistan.
- Through the training NDMA has understood the challenge that DRM education should be improved in Pakistan as many people are educated in terms of DRM in Japan.

6) Technical Committee Meeting

- In the meeting, NDMA enhanced their understanding of NDMP through presentations and explanations of the second draft by the study team

- Active discussions were held regarding NDMP which indicated that the research conducted by NIDM should be included in the plan.
- A constructive opinion has been obtained from NDMA that those who are marginalized and vulnerable living in marginalized areas should be included as targets in the NDMP

7) Consultative Workshop

- NDMA and the JICA study team put together a presentation of NDMP and facilitated its understanding for 160 participants such as PDMAs, DDMAs, different governmental organizations, donor agencies, INGOs and local NGOs.
- In the workshop, NDMA carried out a presentation titled New Systems of Disaster management in Pakistan, Achievements and Way Forward and explained the new systems for disaster management in Pakistan to all of the participants.
- NDMA and the JICA study team gave presentations not only of NDMP but also of EWP, HRDP, CBDRM and have provided an opportunity to discuss the roles and responsibilities of the participants.

8) Achievements from the overall point of view

- NDMA officers have obtained basic knowledge and skills in Hazard Assessment which is most important factor to plan the NDMP and decide the goal of the plan.
- NDMA officers have continuously attended workshops and meetings for preparation of NDMP and improved their knowledge and capabilities for planning.
- The presentation materials of the workshops regarding NDMP were shared between NDMA officers and the basic technique of preparation of NDMP was handed over to NDMA.

7.4.2 Challenges to be attacked

The challenges can be seen as follows in terms of capacity development of NDMA.

- As a result of the capacity assessment of NDMA, it has been realized that most of the officers did not have work experience or a background in disaster management.
- In the evaluation of Hazard Assessment, only half of the officers have understood how the high level Hazard and Risk areas (districts) were decided in the map (only half of the officers have comprehended the areas more or less)
- A large number of officers felt that it was hard to understand the calculation methods of Hazard and Risk. Only a few officers answered that they could understand it to some extent.
- NDMA personnel are changeable due to the rotation system of Pakistani governmental officials every few years.

- Concrete roles and responsibilities of the academies, university and research institute regarding DRM which would conduct capacity development of NDMA in the future have not been decided yet.

7.4.3 Conclusions

The capacity development activities have been conducted toward the objective that capacities of NDMA officers to formulate and revise the NDMP should be enhanced. To achieve this, the JICA study team has worked harmoniously with NDMA in the process of formulation of the plan.

In the study, activities such as disaster management workshops, hazard assessment workshop, training in Japan, technical committee meetings and consultative workshops have been held to enhance the capacities of NDMA. Through the activities, NDMA has attained their capacity building and obtained the outcomes in learning planning methods of NDMP.

In the process of formulating NDMP, the study team has carried forward the capacity building activities with sufficient attention in securing that NDMA fully understand the contents of the plan through working together to formulate it with NDMA.

In the evaluation of Hazard Assessment workshop which is one of the most important factors in formulating NDMP, most of the NDMA officers answered that through the workshop, they could understand the definition, objective and area of Hazard and Risk. In a sense, the study accomplished its goal to provide the basic knowledge of Hazard Assessment which is a principal factor in formulation of the plan.

Moreover, in the consultative workshop, a presentation of contents of NDMP in cooperation with NDMA was accomplished and 160 stakeholders were provided with understanding and knowledge of the NDMP.

In the issues, however, as it can be seen in the evaluation of the HA workshop, a large number of officers felt that it was hard to understand the calculation methods of Hazard and Risk. Only a few officers could understand the calculation methods.

In addition, a change in NDMA's personnel and structure occurred in November 2010 and it had a negative influence on the capacity development activities which had been conducted so far. After the organizational change, most of the M&P officers who had worked with formulating NDMP left their jobs with NDMA and the JICA study team had to focus on new counterparts in the DRR department for the capacity building activities.

On the other hand, as a countermeasure to overcome the problems encountered due to the organizational change, the study team has prepared presentation materials for the workshops so that the presentation materials help NDMA officers understand the procedure of formulation of

NDMP from the beginning to the end. The study team shared the materials within NDMA staffs and the basic technique of preparation of NDMP was handed over to NDMA.

NDMA will implement disaster management through the NDMP which has been formulated in the study. To effectively implement it, it is required to continuously enhance their capacities in DRM. To secure that, capacity building agencies such as universities and research institutes regarding DRM must conduct the capacity building for NDMA. To ensure this, continuous capacity building regarding DRM education for NDMA is expected so that NDMA would effectively implement the plan.

CHAPTER 8 CONCLUSIONS AND RECOMMENDATIONS

This chapter intends to provide recommendations to Pakistan side based on the existing disaster management backgrounds and situations in the country.

8.1 Background and Existing Situations

8.1.1 Regional Characteristics of natural disaster risk in Pakistan

Based on the results of the hazard and risk analysis, the trends of disaster types in high risk areas are shown in the following table.

Table 8.1.1 Regional Characteristics of Very High Risk Areas in Pakistan by Type of Disaster

Disaster Type	Trend of Risk	Typical Districts of High Hazard
Flood disaster	High score districts were selected from areas that were flood-ravaged in the past. High risk areas are concentrated in the Indus River valley.	• **Sindh:** Larkana, Qamber and Shahdadkot, Shikarpur, Dadu, Ghotki, Jacobabad, Kashmore, Khairpur • **A.J.K:** Bagh, Haveli, Muzaffarabad, Hattian • **Khyber Pakhtunkhwa:** Nowshera, Peshawar, Shangla, Charsadda, Dera Ismail Khan • **Punjab:** Muzaffargarh, ahim Yar Khan, Rajanpur, Dera Ghazi Khan
Landslide disaster	High score districts were selected from areas with steep slopes (more than 30 degrees), high annual rainfall, fragile soil areas, and areas that were landslide-ravaged in the past. High risk areas are concentrated in the northern part of Pakistan.	• **A.J.K:** Bagh, Haveli, Poonch, Sudhnoti, Poonch, Mirpur • **Capital Territory:** Islamabad • **Khyber Pakhtunkhwa:** Nowshera, Peshawar, Shangla, Charsadda, Mardan, Swabi, Buner, Abbottabad, Haripur • **Punjab:** Gujrat, Rawalpindi, Gujranwala
Earthquake Disaster	High score districts were selected from high seismic zones. High risk areas are concentrated in the northern part of Pakistan.	• **A.J.K:** Bagh, Muzaffarabad, Neelum, Haveli, Poonch, Sudhnoti, Hattian, Kotli • **Capital Territory:** Islamabad • **Khyber Pakhtunkhwa:** Nowshera, Peshawar, Shangla, Charsadda, Mardan, Swabi, Abbottabad, Lower Dir, Malakand, Bannu • **Punjab:** Gujrat, Rawalpindi, Narowal, Sialkot , Okara • **FATA:** Bajaur Agency • **Sindh:** Karachi • **Balochistan:** Quetta
Tsunami disaster	High score districts were selected from areas at low elevations in the coastal region. High risk areas are concentrated in coastal districts.	• **Sindh:** Karachi
Cyclone disaster	High risk areas are concentrated in coastal districts.	• **Sindh:** Badin, Karachi
Drought Disaster	High score districts were selected from those with low annual rainfall and inadequate irrigation systems. High risk areas are concentrated in the southern part of Sindh.	• **Sindh:** Karachi, Tando Muhammad Khan, Hyderabad, Tando Allahyar, Jamshoro, Nawabshah, Matiari, Shikarpur, Jacobabad, Kashmore, Naushahro Feroze, Dadu, Ghotki, Sukkur, Khairpur • **A.J.K:** Bagh, Haveli, Poonch, Sudhnoti, Kotli, Mirpur • **Punjab:** Multan, Rahim Yar Khan

Source: JICA study team

As shown in the Table above, every district in KP, AJK, Punjab and Sindh has some risks of certain disasters.

8.1.2 Disaster Management Laws and Regulations

The national disaster management system was inaugurated by the National Disaster Management Ordinance (NDMO) in 2006 after the huge damage caused by the 2005 Pakistan earthquake and it became the National Disaster Management Act in 2010, which addresses all disaster phases of prevention and mitigation, preparedness, emergency response and recovery and rehabilitation. It specified the disaster management administration, disaster management plans, roles and responsibilities of the government authorities, establishment of NIDM, and establishment of the National Disaster Management Response Force (NDRF) and disaster management funds.

8.1.3 Disaster Management Administration

NDMA was established in 2006 after the 2005 Kashmir earthquake. The idea of the disaster management administration at National level is that Pakistan should focus on natural and manmade disasters to reduce the damages caused by those disasters. Since NDMA was established at the national level, NDMA prepared the disaster management regulations, administration at provincial and district levels, disaster management framework or plan etc. The Pakistan flood of 2010 reminded all the people in Pakistan that they should prepare for natural disasters.

8.1.4 Population growth and urbanization

The rapid population growth has become a major pressure affecting all aspects of social, economic and environmental life in Pakistan. The total population has grown by nearly a factor of four for the last half century from 33.7 million in 1951 to 132.3 million in 1998. The increased population has created hazard vulnerabilities in multiple ways. For example, increased population has pushed people to move to and live in hazard prone areas, which were traditionally considered as uninhabitable; e.g. flood plains, steep slopes and coastal areas. Population growth in upstream areas has increased the demand for fuel wood, fodder and timber, leading to uncontrolled forest cutting causing intensified erosion and higher peak flows, thus resulting in severe flooding downstream. High population density in hazard prone areas causes greater loss of life and property during the occurrence of disasters.

Pakistan is in transition from an agricultural and rural society to an urban and industrial society. In fact, rapid urbanization has been experienced in Pakistan for the last few decades. The urban population has increased much faster than the overall population. Between 1951 and 1998, the urban population increased by a factor of more than 7. The annual growth rate of urban population was about 5 percent during the 1950s and 1960s, while overall population growth rate was 2.4 percent and 3.9 percent during those periods. Between 1981 and 1998, the growth rate of urban population was about 3.5 percent, while it was 2.7 percent in overall population. In 1951, about 18 percent of the country’s population lived in urban areas and it rose to become 33 percent in 1998. The urbanization entails infrastructure development, environmental degradation and water and air pollution etc. City life demands better services and infrastructure, which consume more natural resources (land, water, forest) to sustain life styles. Accordingly, disaster management in urban areas is a critical issue in Pakistan.

If population growth trends continue at current rates, it is estimated that the population in Pakistan will increase from 184 million in 2010 to 335 million in 2050 (World Population Prospect Database, 2008, UN). A far greater number of people would be living in urban areas and hazard prone areas in the coming years. This leads to environmental degradation in urban areas and accelerated exploitation of natural resources in the countryside and upstream areas. Thus, degrading the environment would cause a higher frequency of hazards and greater loss of life and property in case of disasters.

8.1.5 Climate change

The IPCC Fourth Assessment Report (2007) describes progress in understanding of the human and natural drivers of climate change, observed climate change, climate processes and attribution, and estimates of projected future climate change. It has concluded that warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. Related to these climate changes, the following things are observed:

- The maximum area covered by seasonally frozen ground has decreased by about 7% in the Northern Hemisphere since 1900, with a decrease in spring of up to 15%;
- Long-term trends from 1900 to 2005 have been observed in precipitation amounts over many large regions. Significantly increased precipitation has been observed in northern and central Asia. Drying has been observed in parts of southern Asia; and
- The frequency of heavy precipitation events has increased over most land areas, consistent with warming and observed increases of atmospheric water vapour.

Based on such observations and facts regarding the relationship between flood/precipitation pattern change and climate change, future conditions are also expected as follows:

- Snow cover is projected to contract. Widespread increases in thaw depth are projected over most permafrost regions;
- It is very likely that hot extremes, heat waves and heavy precipitation events will continue to become more frequent; and

- Based on a range of models, it is likely that future tropical cyclones will become more intense, with larger peak wind speeds and more heavy precipitation associated with ongoing increases of tropical sea surface temperatures.

The expectations described in the IPCC Fourth Assessment Report mentioned above are significant concerns regarding disaster management related to floods in Pakistan. The decreasing of glaciers in northern areas must be attributed to the reducing of floodwater capacity volume in each dam. Further, heavy precipitation events and the intensification of tropical cyclones would result in increasing havoc due to flash floods and river floods.

8.2 Recommendations

This study was intended to illustrate the method of how to develop a disaster resilient society for the long term by systematically implementing a comprehensive disaster management approach. Realizing "self help efforts, mutual help efforts and public help efforts" is the principle of disaster management.

Considering that the occurrence of disasters differ by country and by region, lessons gained from previous disasters should be explored and applied to create disaster resilient regions and communities. In light of the foregoing, the disaster management system should be developed based on experience gained from the occurrence of recurring disasters. There are several items important for development of the disaster management system in Pakistan.

8.2.1 Disaster management first

In order to reduce disaster damage, there must be a close combination of three types of measures: “self-help effort”, “mutual-help efforts”, and “public-help efforts”. This principle must be applied in Pakistan.

Pakistan has realized the importance of disaster risk management for sustainable social, economic and environmental development and establishment of policy, and legal and institutional arrangements. The disaster management needs a long-term and comprehensive approach to reduce the risk of the country. The government commitment to disaster management is the most important, such as securing the disaster management related budget for disaster management institutions and development projects should be reviewed from the disaster management approach.

8.2.2 Lessons learned from past experience

The most important item for development of disaster risk management in the country is to learn from the past disaster experiences, because disasters differ from country by country such type of disaster, institutional set up, socio economic conditions etc. After a disaster has occurred, the cause of the disaster damage that was suffered should be clarified for all aspects: technical, institutional capacity, government response, level of preparedness, and delivery of goods and services. The lessons learned from past disasters should be fed-back to strengthen the disaster management system in Pakistan. Those efforts are essential to establish an original disaster management system in Pakistan.

8.2.3 Capacity Development

Over the next ten years, capacity development in each field of disaster management is the first priority in Pakistan. Capacity development for the disaster management field should be defined on a broad basis; including the concept that the whole population of Pakistan should work as a part of the disaster management activities. Human resource development in the disaster management field is conducted by individual organizations in an unorganized manner and disaster management education at school level is not fully implemented. The quality of training materials is not controlled by any organization. Moreover, coordination among the disaster management organizations is insufficient. Even though the importance of human resource development in the disaster management area is recognized by many stakeholders, human resource development in disaster management area has not been established in Pakistan. The principle of disaster management is “self-help efforts” rooted in the awareness of the people, cooperation in “mutual-help efforts” of various community-based organizations, and “public-help efforts” made by the national and local governments. Those three must be in close combination, with cooperation and participation in the disaster management activities.

In Pakistan, disaster management and disaster risk reduction are still new concepts. The governmental organizations are established in central and provincial levels and the district level is in the process of formulation. The capacity development activities are carried out by individual organizations in an unorganized manner and focus on the emergency response phase. Capacity development activities are not conducted for those three target groups because of limitation of budget, personnel and materials.

8.2.4 Technical and scientific knowledge of hazards

In order to reduce disaster damage and risk, technical scientific knowledge should be accumulated and utilized for disaster risk management. Research institutions such as universities and national institutions should be involved in the disaster risk management system, especially in mitigation and preparedness for disaster management.

International cooperation in this field is one of the important fields in Pakistan because it can provide access to international experience in disaster management and mitigation, scientific knowledge and advanced technology.

8.2.5 Disaster management organization

Pakistan has developed disaster management, especially emergency response, through the revenue department from provincial level unto the lowest level of the "Patwari", because the revenue office collected detailed information at village and individual level for tax collection purposes. When an emergency situation would be experienced at the district level, the revenue department together with DCO responds to the emergency situation. Contingency plans have been prepared by the district governments, even if DDMA has not been established. Disaster management in Pakistan has a long history of preparing for the annual monsoon rain and flood situations.

The Disaster Management Act requests national, provincial and district governments to implement a disaster management approach, addressing the three phases of the disaster cycle, to reduce the damage caused by natural disasters. However, disaster management in Pakistan is still focused on emergency response after a disaster. The implementation of disaster management in Pakistan is the responsibility of the provincial government, because the Act stipulated that the provincial government should "coordinate and monitor the implementation of the National Policy, National Plan and Provincial Plan" and the provincial budget, including at the district and teshil levels, is determined by the provincial government. The recent 18th amendment to the constitution also increases the power of the provincial government.

The disaster management organization covers national, provincial and district levels, yet local governments such as Teshil and Union Council levels are not so clear. The main responder after a disaster will be the local governments and Teshil level should have to play very important roles such as rescue and relief, evacuation, and distribution of goods and services. Emergency response activities are executed by the district government, especially the revenue department and Teshil administration. Therefore, those roles and responsibilities should be recognized by the laws.

8.2.6 Watershed and Floodplain Management approach

It is an undisputed fact that the magnitude of the 2010 Pakistan Flood was extraordinary, causing tremendous damage along the Indus River. However, it is also true that people have encroached in the floodplain or flood prone area after many years of other huge floods in the past, such as in 1950, 1973, 1976, and 1992.

Recently, it has been pointed out that the frequency of huge floods would increase due to global warming and climate change. The researchers in this field have warned that these changes in climatic conditions are expected to further increase flood discharge of rivers and nullahs in Pakistan. The concept of adaptation to climate change should introduce a watershed and floodplain management approach. Therefore, an essential foundation for the mitigation of flood damage is to manage the watershed and floodplain appropriately. For this purpose, it is indispensable to comprehensively evaluate the environmental value of the floodplain, to efficiently invest in flood control facilities and management in the floodplain, and to appropriately regulate/control the land use in the floodplain in harmonization with structural and non-structural measures.

8.2.7 NIDM construction

The National Disaster Management Act 2010 stipulates the responsibilities of NIDM such that "NIDM shall be responsible for planning and promoting training and research and developing core competencies in the area of disaster management, documentation and development of a national level information base relating to disaster management policies, prevention mechanisms and mitigation measures". The activities of NIDM can be categorized into four areas; they are "Training, Education and Awareness", "Promotion of Comprehensive Human Resource Development for Disaster Management" and "Advice for Policy Formulation". NIDM will play very important roles in the field of disaster management. Especially, capacity development of the government staff will be the responsibility of the NIDM. Despite those roles and responsibilities of NIDM, NIDM started its activities in the areas of training, education and awareness by limited funds and resource available. The early construction of NIDM is one of the issues of the human resource enhancement.

8.2.8 Strengthening NDMA

Roles and responsibilities of NDMA should be strengthening coordination functions. The NDMA should improve technical capability by accepting staffs from infrastructure related ministries and implement the main streaming of disaster risk reduction into a development approach to reduce the risk level of the country. The infrastructure development plan, which will be formulated by various organizations, should include the idea of disaster risk reduction.

Community level disaster risk reduction activities should be promoted through the initiative of NDMA. So far, there is no standard approach or method to promote the activities at the grass roots level. The community level education and activities for disaster management are very important to reduce the risk level of the country. The social survey done by the study shows that the people in the country have not been supplied with the necessary information regarding disasters. The level of knowledge is low; however, people's willingness to participate in the disaster management activities is relatively high. This means that the government intervention at the community level has room for improvement.

8.2.9 High disaster risk area

It is pointed out that the urban area in Pakistan has increased its vulnerability in many ways; high urban population growth, accumulation of urban infrastructure, accumulation of assets and weak linkage of community organization. The results of hazard and risk analysis show that Karachi is the area most vulnerable to natural hazard in Pakistan. Karachi is the centre of the economic activities and disaster damage may lead to economic disruption in the country. The preparation of a disaster management plan in Karachi and its implementation should be the first priority in the country.

APPENDIX

APPENDIX TO CHAPTER 3

Appendix 3.5.1 Details of Sanctioned Posts of PMD, July-2010

S. No.	Name of Posts	BPS	No. of Post(s)
O-1	Director General	21	1
O-2	Chief Meteorologist	20	3
O-3	Director / Principal Meteorologist	19	19
O-4	Principal Engineer	19	2
O-5	Chief Admin. Officer	19	1
O-6	Dy. Director / Senior Meteorologist	18	38
O-7	Senior Elect. Eng. / Dy. Dir. (Engg)	18	10
O-8	Deputy Chief Admin. Officer	18	3
O-9	Senior Programmer	18	1
O-10	Meteorologist	17	131
O-11	Librarian	17	1
O-12	Electronic Engineer	17	29
O-13	Admin Officer	17	9
O-14	Accounts Officer	17	1
O-15	Private Secretary	17	1
O-16	Security Officer	17	1
O-17	Programmer	17	9
O-18	Workshop Engineer	17	1
O-19	Assistant Programmer	16	21
O-20	Assistant Meteorologist	16	93
O-21	Assistant Electronic Engineer	16	18
O-22	Assistant Machanical Engineer	16	1
O-23	Superintendent	16	6
Total			400

S. No.	Name of Posts	BPS	No. of Post(s)	S. No.	Name of Posts	BPS	No. of Post(s)
N-1	Stenographer	15	15	N-21	Mechanic Grade-I	6	32
N-2	Head Draughtsman	15	1	N-22	Observer	5	108
N-3	Assistant (Ministerial)	14	28	N-23	Mechanic Grade-II	5	43
N-4	Sub-Engineer/Sr. Radio Mechanic	13	90	N-24	Wireman	5	1
N-5	Sub-Engineer (Mechanical)	13	1	N-25	Tracer	5	1
N-6	Mechanical Assistant	13	1	N-26	Duplicating Machine Operator	4	3
N-7	Professional Assistant	13	101	N-27	Driver	4	49
N-8	Meteorological Assistant	12	200	N-28	Line Man	4	1
N-9	Stenotypist	12	14	N-29	Feroprinter Operator	3	1
N-10	Computer Data Entry Operator	12	99	N-30	Mechanic Grade-III	3	2
N-11	Draughtman	11	3	N-31	Daftary	2	14
N-12	Sub-Engineer (Mechanical)	11	3	N-32	Lab. Attendant	2	15
N-13	Assistant (Technical)	9	61	N-33	Khadim	2	2
N-14	Upper Division Clerk	9	33	N-34	Balloon Maker	1	150
N-15	Junior Radio Mechanic	7	65	N-35	Naib Qasid	1	315
N-16	Chief Mechanic	7	7	N-36	Chowkidar	1	203
N-17	Senior Observer	7	434	N-37	Coolle	1	19
N-18	Pesh Iman	7	2	N-38	Cleaner	1	2
N-19	Lower Division Clerk	7	27	N-39	Sweeper	1	81
N-20	Electrician	6	1	N-40	Mali	1	44
				N-41	Farrash	1	4
Total							2276

Source: PMD Headquarter

Appendix 3.5.2 Discharge in Each Flood Classification (1/2)

River	Site	No.	Discharge (in lacs of cuses for upper values) (in m^3/s for lower values, 1cusec = 0.02832m3/s)					
			Design Capacity	Low	Med	High	Very High	Ex. High
Indus	Tarbela	I-1	15.00	2.50	3.75	5.00	6.50	8.00
			42,480	7,080	10,620	14,160	18,408	22,656
	Attock	I-2	-	2.50	3.75	5.00	6.50	8.00
				7,080	10,620	14,160	18,408	22,656
	Kalabagh	I-3	9.50	2.50	3.75	5.00	6.50	8.00
			26,904	7,080	10,620	14,160	18,408	22,656
	Chashma	I-4	9.50	2.50	3.75	5.00	6.50	8.00
			26,904	7,080	10,620	14,160	18,408	22,656
	Taunsa	I-5	11.00	2.50	3.75	5.00	6.50	8.00
			31,152	7,080	10,620	14,160	18,408	22,656
	Guddu	I-6	12.00	2.00	3.50	5.00	7.00	9.00
			33,984	5,664	9,912	14,160	19,824	25,488
	Sukkur	I-7	9.00	2.00	3.50	5.00	7.00	9.00
			25,488	5,664	9,912	14,160	19,824	25,488
	Kotri	I-8	8.50	2.00	3.50	4.50	6.50	8.00
			24,072	5,664	9,912	12,744	18,408	22,656
Jhelum	Kohala	J-1	-	1.00	1.50	2.00	3.00	4.00
				2,832	4,248	5,664	8,496	11,328
	Mangla	J-2	10.60	0.75	1.10	1.50	2.25	3.00
			30,019	2,124	3,115	4,248	6,372	8,496
	Rasul	J-3	8.50	0.75	1.10	1.50	2.25	3.00
			24,072	2,124	3,115	4,248	6,372	8,496
Chenab	Marala	C-1	11.00	1.00	1.50	2.00	4.00	6.00
			31,152	2,832	4,248	5,664	11,328	16,992
	Khanki	C-2	8.00	1.00	1.50	2.00	4.00	6.00
			22,656	2,832	4,248	5,664	11,328	16,992
	Qadirabad	C-3	8.07	1.00	1.50	2.00	4.00	6.00
			22,854	2,832	4,248	5,664	11,328	16,992
	Trimmu	C-4	6.45	1.50	2.00	3.00	4.50	6.00
			18,266	4,248	5,664	8,496	12,744	16,992
	Panjnad	C-5	7.00	1.50	2.00	3.00	4.50	6.00
			19,824	4,248	5,664	8,496	12,744	16,992
Ravi	Jassar	R-1	2.75	0.50	0.75	1.00	1.50	2.00
			7,788	1,416	2,124	2,832	4,248	5,664
	Ravi Syphon	R-2	4.50	0.40	0.65	0.90	1.35	1.80
			12,744	1,133	1,841	2,549	3,823	5,098
	Shahdara	R-3	2.50	0.40	0.65	0.90	1.35	1.80
			7,080	1,133	1,841	2,549	3,823	5,098
	Balloki	R-4	2.25	0.40	0.65	0.90	1.35	1.80
			6,372	1,133	1,841	2,549	3,823	5,098
	Sidhnai	R-5	3.25	0.50	0.80	1.20	1.75	2.25
			9,204	1,416	2,266	3,398	4,956	6,372
Sutlej	Sulemanki	S-1	3.25	0.50	0.80	1.20	1.75	2.25
			9,204	1,416	2,266	3,398	4,956	6,372
	Islam	S-2	3.00	0.50	0.80	1.20	1.75	2.25
			8,496	1,416	2,266	3,398	4,956	6,372
Kabul*	Warsak	K-1	5.40	0.30	0.45	1.00	2.00	4.00
			15,293	850	1,274	2,832	5,664	11,328
	Nowshera	K-2	-	0.45	0.47	1.00	2.00	4.00
				1,274	1,331	2,832	5,664	11,328

Source : FFD-PMD

Appendix 3.5.2 Discharge in Each Flood Classification (2/2)

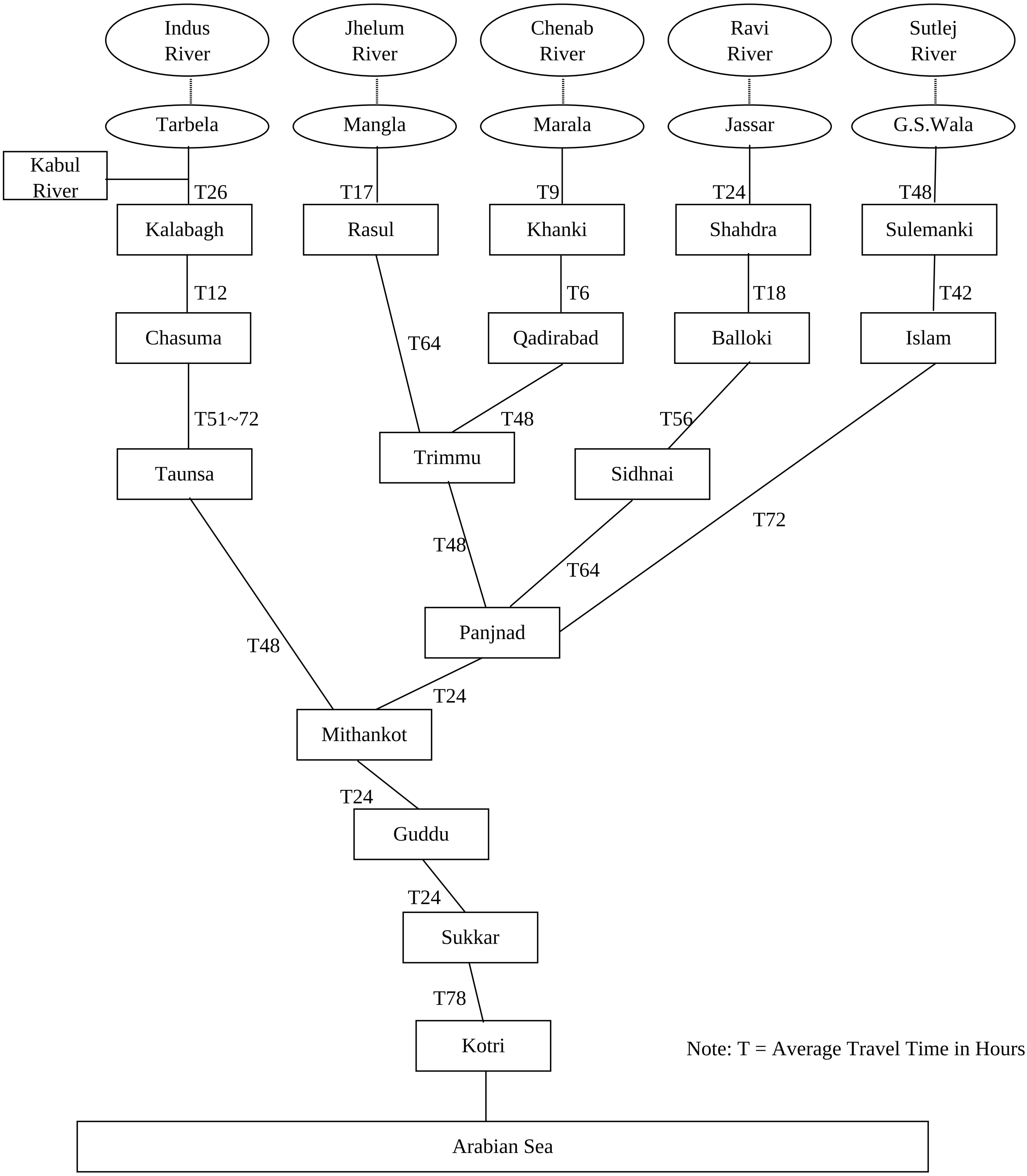
Nullah	Site	No.	Discharge (in cuses for upper values) (in m^3/s for lower values, 1cusec = 0.02832m3/s)						
			Design Capacity	Low	Med	High	Very High	Ex. High	
Bein	Chak Amru	N-1	-	1300	7000	20000	30000	35000	& above
				36.816	198.24	566.4	849.6	991.2	
	Shakar Garh	N-2	-	1600	3000	24000	26000	43000	& above
				45.312	84.96	679.68	736.32	1217.76	
Aik	Ura	N-3	-	2000	9000	13000	16000	33000	& above
				56.64	254.88	368.16	453.12	934.56	
Basantar	Jassar	N-4	-	4100	4700	7500	11600	17800	& above
				116.112	133.104	212.4	328.512	504.096	
Deg	Q.S.Singh	N-5	-	3600	7500	15000	30000	35000	& above
				101.952	212.4	424.8	849.6	991.2	
Palkhu	Wazirabad	N-6	-	2500	3100	5000	25000	26000	& above
				70.8	87.792	141.6	708	736.32	

Source : FFD-PMD

Appendix 3.5.3 Travel Time of Flow in Rivers in Normal Condition

S.No.	River	From	To	Travel Time in hours
1	Indus	Mandori	Kalabagh	24
		Kalabagh	Chashma	11
		Chashma	Taunsa	72
		Taunsa	Mithankot+Guddu	48 + 24
		Guddu	Sukkar	24
		Sukkar	Kotri	72
2	Jhelun	Mangla	Rasul	12
		Rasul	Trimmu	72
3	Chenab	Marala	Khanki	12
		Khanki	Qadirabad	6
		Qadirabad	Trimmu	48
		Trimmu	Panjnad	48
		Panjnad	Mithankot	24
4	Ravi	Madhopure	Jassar	18
		Jassar	Shahdara	36
		Shahdara	Balloki	18
		Balloki	Sidhnai	72
5	Sutlej	Sulemanki	Islam	48
		Islam	Panjnad	72

Source : FFD-PMD



Source : FFD-PMD

Appendix 3.5.4 Travel Time of Flow in Rivers in Normal Condition

Appendix 3.5.5 Kinds of Flood Forecast and Early Warning for Indus River Basin (1/2)

<table>
<tr><th>Method</th><th>Explanation</th><th colspan="3">Manner of Forecast/Warning</th></tr>
<tr><td rowspan="5">Qualitative</td><td rowspan="5">provide advance information about the approaching weather systems</td><td colspan="3">Name of System for Forecast: Colour Coded Qualitative Flood Forecast</td></tr>
<tr><td colspan="2">Category-I Flood</td><td>Due to the passage of Westery wave.
Flood is not so high.</td></tr>
<tr><td>Blue Alert</td><td rowspan="2">Category-II Flood</td><td>In case the monsoon low arrives over Rajasthan.
To indicate the possibility of flood within 24 to 72 hours depending upon the future movement of the monsoon</td></tr>
<tr><td>Yellow Alert</td><td>In case it starts to intensify, the chances of recurving shall increase and as it starts to move nonhwards. occurrence of flood may become imminent.</td></tr>
<tr><td>Red Alert</td><td>Category-III Flood</td><td>In case the low/depression starts to directly affect the catchment area and the heavy flood producing rains start.</td></tr>
<tr><td rowspan="9">Quantitative</td><td rowspan="9">Quantification of the flood peak can only be done after the total storm rain becomes available based on Actual Rainfall and Water Level data at each stations</td><td rowspan="7">Routine Daily Flood Forecast (RDFF) (Methodorology of Forecast is as Right Colums.)</td><td colspan="2">Issued once a day and based upon</td></tr>
<tr><td colspan="2">The discharge measurements of 0600 hrs (PST)</td></tr>
<tr><td colspan="2">Meteorological charts (both synoptic and upper air) of 0000 hrs GMT (0500 hrs PSl)</td></tr>
<tr><td colspan="2">Latest APT picture,</td></tr>
<tr><td colspan="2">Data of Lahore, Sialkot, Mangla & Islamabad radars,</td></tr>
<tr><td colspan="2">The Indian discharge data as received through PCIW</td></tr>
<tr><td colspan="2">Issued before the mid day for 24 hn period</td></tr>
<tr><td rowspan="2">Routine Daily Flood Forecast (RDFF) (Contents of Forecast is as Right Colums.)</td><td colspan="2">Bulletin-A (5 parts are contained:)
General situation of river flows describing the level of rivers in plain language containing the future trend in the river flow at any gauging site
The meteorological features i.e. the prevailing synoptic situation and weather pattern,
The weather forecast expected during next 24 hours emphasizing on Rain,
The amount of rainfall recorded during the last 24 hours in the country, and
The general weather outlook next 48 hours generally rain oriented</td></tr>
<tr><td colspan="2">Bulletin-B (2 parts are contained, when necessary:)
The weather/rain forecast in the upper catchment areas and in the lower catchment areas of all the five rivers,
Main flood forecast which includes the quantitative forecast of river flows at 22 sites including rim stations.</td></tr>
<tr><td rowspan="2">Early Warning</td><td>in fact the most important forecast</td><td>Significant Flood Forecast</td><td colspan="2">including flooding time.period and discharge quantity at designated location in targeted river</td></tr>
<tr><td>Based on the flood inundation maps prepared</td><td>Areal Flood Inundation Flood forecast</td><td colspan="2">Sample of Warning:
River Sutlej between the reach Sulemanki to Islam is likely to reach an exceptionally high flood level amounting to a discharge ranging between .... and .....
Consequently, the under mentioned areas are likely to come under water to the extent as mentioned against each.
<u>District</u> <u>Village</u> <u>Depth of Water</u>
AAA BB village XXX feet</td></tr>
</table>

Source: FFD-PMD

Appendix 3.5.5 Kinds of Flood Forecast and Early Warning for Indus River Basin (2/2)

<table>
<tr><th>Method</th><th>Explanation</th><th colspan="2">Manner of Forecast/Warning</th></tr>
<tr><td rowspan="7">Miscellaneous Flood Forecast / Information</td><td rowspan="3">for the flood and weather situation in general</td><td rowspan="3">Weather / Flood Forecast</td><td>Part - I
indicating of the prevailing meteorological situation</td></tr>
<tr><td>Part - II
the rainfall recorded during the last 24 hours</td></tr>
<tr><td>Part - III
the weather and the flood forecast in descriptive form which can be easily understood by a non-technical person</td></tr>
<tr><td rowspan="2">Invitation to the press is sent through the press lnfonnation Department (PlO) of the Punjab GOVT</td><td rowspan="2">Flood Information for Media</td><td>Press briefings are generally conducted in the evening at about 6 p.m only on occasions when the flood situation is serious enough to call for such briefings to filter out unauthorized and incorrect flood information from reaching public.</td></tr>
<tr><td>A written report to be passed to radio and TV is also given out by the press representative.</td></tr>
<tr><td>Chief Met FFD may advise the Minister of Water & Power / Chairman FFC or Chairman NDMA to conduct special press briefings with a view to providing such information to the public as is considered extremely useful in the context of flood mitigation.</td><td rowspan="2">Special Press Briefings By Minister of Water & Power/Chairman FFC or Chairman NDMA</td><td rowspan="2">A general outline of such briefings to be prepared by Chief Met FFD may be as follows
i) A brief mention of the prevailing weather system indicating its past track.present position and future track. Indicate the areas under heavy rain.
ii) Mention of a few heavy rainfall amounts in (India or Pakistan) and any reported damage. In case heaviest point rainfall data is not available: Radar based rainfall may be mentioned indicating the time duration and the areas of the heaviest rainfall.
iii) A brief on present and future flood situation in respect of each river indicating any damages (if so far reported).
iv) Mention of the flood mitigation arrangements to cope with the flood emergency. Advice to the flood prone population to remain vigilant and follow the advice to refrain from publishing unauthentic flood information or incorrect reporting.
v) Question / answer session (Indicate answers to the commonly asked questions).
vi) Concluding Remarks</td></tr>
<tr><td>The outline for the briefings is to be prepared by the Chief Met FFD under the advice of the authority. i.e. Minister of Waler & Power / Chairman FFC or Chairman NDMA.</td></tr>
</table>

Source: FFD-PMD

Government of Pakistan
MINISTRY OF FUEL, POWER AND NATURAL RESOURCES

Islamabad, the 4th January, 1977

R E S O L U T I O N

No. W-III(23)/76 The Government of Pakistan is pleased to constitute a Federal Flood Commission consisting of the following :-

1	Chief Engineering Advisor, (Grade-22) Ministry of Fuel, Power and Natural Resources.	: Chairman
2	Additional Chief Secretary, Irrigation and Power Department, Government of Sind.	: Member
3	Secretary, Irrigation and Power Department, Government of Punjab.	: Member
4	Secretary, Public Works Department, Government of NWFP.	: Member
5	Secretary, Irrigation and Power Department, Government of Baluchistan.	: Member
6	Member (Water), WAPDA.	: Member
7	Joint Secretary (Roads), Ministry of Communications.	: Member
8	Member (Civil Engineering), Railway Board, Ministry of Railways.	: Member
9	Chief, Water Resources, Planning Division.	: Member
10	Director General, Pakistan Meteorological Department.	: Member

2. The functions of the Federal Flood Commission shall be as follows:-

(i) Preparation of a flood protection plan for the country.

(ii) Approval of flood control/protection schemes prepared by Provincial Governments and Federal Agencies.

Contd.... 2/-

Appendix 3.6.1 Resolution dated 04-01-1977 (For FFC-1/2)

(iii) Recommendations regarding principles of regulation of reservoirs for flood control.

(iv) Review of damage to flood protection works and review of plans for restoration and reconstruction works.

(v) Measures for improvement of flood forecasting and flood warning system.

(vi) Preparation of a research programme for flood control and protection.

(vii) Standardization of designs and specifications for flood protection works.

(viii) Evaluation and monitoring of progress of implementation of the National flood protection plan.

. The Office of the Chief Engineering Advisor hall work as the Secretariat of the Commission.

. In performing its functions, the Commission may requisition assistance of experts of WAPDA and other Federal Agencies and the Provincial Governments or co-opt such others as members as it may deem necessary. The Commission may also engage consultants and experts as and when needed.

5. The Implementation of the National Flood Protection Plan will be undertaken by the Provincial Governments. The Federal Government shall, however, provide the resources for meeting the capital cost of the Plan.

6. Ordered that the Resolution be published in the Gazette of Pakistan.

O/C.

(Mansur Hasan Khan)
Secretary to the Government of Pakistan.

No. W.II-3(33)/76.

The Manager,
- Pakistan Printing Corporation, Karachi.
(It is requested that 100 copies of the printed Resolution may be supplied to this Ministry).

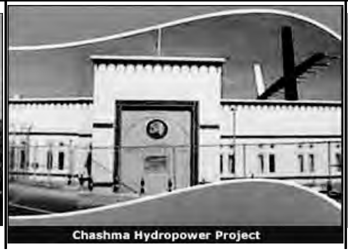
Appendix 3.6.1 Resolution dated 04-01-1977 (For FFC 2/2)

Appendix 3.6.2 Flood Classification of Rivers by FFC

River	Site of Gauge (D/S)	Discharge (in lacs of cuses for upper values) (in m^3/s for lower values, 1cusec = 0.02832m3/s)					
		Design Capacity	Low	Med	High	Very High	Ex. High
Indus	Tarbela	15.00	2.50	3.75	5.00	6.50	8.00
		42,480	7,080	10,620	14,160	18,408	22,656
	Kalabagh	9.50	2.50	3.75	5.00	6.50	8.00
		26,904	7,080	10,620	14,160	18,408	22,656
	Chashma	9.50	2.50	3.75	5.00	6.50	8.00
		26,904	7,080	10,620	14,160	18,408	22,656
	Taunsa	11.00	2.50	3.75	5.00	6.50	8.00
		31,152	7,080	10,620	14,160	18,408	22,656
	Guddu	12.00	2.00	3.50	5.00	7.00	8.00
		33,984	5,664	9,912	14,160	19,824	22,656
	Sukkur	15.00	2.00	3.50	5.00	7.00	8.00
		42,480	5,664	9,912	14,160	19,824	22,656
	Kotri	8.75	2.00	3.00	4.50	6.50	8.00
		24,780	5,664	8,496	12,744	18,408	22,656
Jhelum	Kohala	-	1.00	1.50	2.00	3.00	4.00
			2,832	4,248	5,664	8,496	11,328
	Mangla	10.60	0.75	1.10	1.50	2.25	3.00
		30,019	2,124	3,115	4,248	6,372	8,496
	Rasul	8.50	0.75	1.10	1.50	2.25	3.00
		24,072	2,124	3,115	4,248	6,372	8,496
Chenab	Marala	11.00	1.00	1.50	2.00	4.00	6.00
		31,152	2,832	4,248	5,664	11,328	16,992
	Khanki	8.00	1.00	1.50	2.00	4.00	6.00
		22,656	2,832	4,248	5,664	11,328	16,992
	Qadirabad	8.07	1.00	1.50	2.00	4.00	6.00
		22,854	2,832	4,248	5,664	11,328	16,992
	Trimmu	6.45	1.50	2.00	3.00	4.50	6.00
		18,266	4,248	5,664	8,496	12,744	16,992
	Panjnad	7.00	1.50	2.00	3.00	4.50	6.00
		19,824	4,248	5,664	8,496	12,744	16,992
Ravi	Jassar	2.75	0.50	0.75	1.00	1.50	2.00
		7,788	1,416	2,124	2,832	4,248	5,664
	Shahdara	2.50	0.40	0.65	0.90	1.35	1.80
		7,080	1,133	1,841	2,549	3,823	5,098
	Balloki	2.25	0.40	0.65	0.90	1.35	1.80
		6,372	1,133	1,841	2,549	3,823	5,098
	Sidhnai	1.50	0.30	0.46	0.60	0.90	1.30
		4,248	850	1,303	1,699	2,549	3,682
Sutlej	Sulemanki	3.25	0.50	0.80	1.20	1.75	2.25
		9,204	1,416	2,266	3,398	4,956	6,372
	Islam	3.00	0.50	0.80	1.20	1.75	2.25
		8,496	1,416	2,266	3,398	4,956	6,372
Kabul	Warsak	5.40	0.30	0.45	1.00	2.00	4.00
		15,293	850	1,274	2,832	5,664	11,328
	Nowshera	-	0.45	0.47	1.00	2.00	4.00
			1,274	1,331	2,832	5,664	11,328

Original Source : FFD-PMD

Appendix 3.9.1 Features of Major Dams managed by WAPDA

Item	Tarbela	Mangla	Cheshma Barrage	Warsak	Ghazi Barotha Barrage
River	Indus	Jhelum	Indus	Kabul (Indus)	Indus
Completion	1974	1967	1971	1960	2001
Project Cost	US$ 1.85 billion	Rs.6.587 Billion (US$ 1.473 Billion)	Hydropower: Rs17,821.77mil	First Phase: Rs 394.98 mil Second Phase: Rs106.25mil	Rs 96,957 mil
Photo					
Source:	*Source: http://www.wapda.gov.pk/htmls/water-index.html*				*http://en.wikipedia.org*
Height	485 ft (Max.) above river bed	Crest level of embankments; El. 1234 ft. SPD		250 ft (76.20m)	Barrage Type
Length	9,000 Ft	Crest Length: 8,400 ft		460 ft (140.21 m)	
Spillway	Main Spillway Capacity 650,000 cusecs Auxiliary Spillway Capacity 840,000 cusecs	Type of Main Spillway: Submerged Orifice Elevation of cill: EL1,086 ft Capacity at El 1202: 0.87ml.cu.ft. per sec. Capacity at El 1228: 1.10 ml.cu.ft. per sec. Type of Emergency Spillway Gate Type Elevation of Erodible Bund EL1,216 ft Width of Weir: 500 ft Capacity at El 1228: 0.23million cubic feet per sec	There are a number of crossing structures.	Type: Overflow type No. of Gates: 9 Capacity/Gate: 60,000cusec Gate Size: 40ft x 40ft (12.19 x 12.19m)	Normal Pond level: 340.0 m Design Flood: 18,700 cumecs Survival flood: 46,200 cumecs
Reservoir	100 square miles	-	Maximum pond level 649 ft. Normal pond level 642 ft. Minimum pond level 637 ft.	Max. Conservation Level: 1270 ft. SPD (387.10 m) Design Live Storage: 25300 AF Existing Live Storage: Nil Surface Area: 4.0 sq. miles (10.36 sq. km)	-
Hydropower	Total 3478 MW	Total 1000 MW (10X100MW)	23 MW x 8 bulbs	214MW in Total	1,450 MW in Total

Source: http://www.wapda.gov.pk and Interview Survey to WAPDA Officers by JICA Team

APPENDIX TO CHAPTER 4

Appendix 4.1.1	Questionnaire Survey Results Regarding Damage Records in Each District against Disasters
Appendix 4.1.2	Questionnaire Survey Results Regarding On-going/ Expected Projects on DRM
Appendix 4.1.3	Questionnaire Survey Results Regarding Issues/ Actual Future Plan, Projects and Programs/ Suggestion and Recommendation on DRM
Appendix 4.3.1	District-wise General Flood Losses/ Damages by 2010-Flood
Appendix 4.3.2	Characteristics of Natural Hazards in Gilgit and Baltistan
Appendix 4.3.3	Characteristics of Natural Hazards in KPK and FATA
Appendix 4.3.4	Characteristics of Natural Hazards in AJ&K
Appendix 4.3.5	Characteristics of Natural Hazards in Punjab
Appendix 4.3.6	Characteristics of Natural Hazards in Balochistan
Appendix 4.3.7	Characteristics of Natural Hazards in Sindh
Appendix 4.6.1	Summary of Historical Natural Dams and GLOF in Karakoram and Environs
Appendix 4.8.1	Maps with Hazard & Risk Analysis
Appendix 4.8.2	Damage and Loss Assessment Format
Appendix 4.9.1	Information and Evacuation Drill in Javed Colony
Appendix 4.9.2	Information and Evacuation Drill in Khangrah Doma

Appendix 4.1.1: Questionnaire Survey Results Regarding Damage Records in Each District against Disasters (1/6: KPK 1/2)

No	Province	Name of District	Year	Date	Location	Type	Description	Death	Injured	Affctd	Fully Damaged House		Partially Damaged		Services		Agri. (acres)	Damage Cost
											Mud	RCC	Mud	RCC	Masjid/ Hotel	Shop		
0	KPK	Provincial Base	2005	10/8	Abbotabad, Mansehra, Batagram, Shangla, Kohistan	Earthquak	Approximately 2lacs people affected. Their live stock etc damaged.	22,690	40,403		559,975							Not Surveyed
			2006	8/15	24 Districts	Torrentional Rain/ Flash Flood	Agricultural land damaged	258	226		40,203							Not Surveyed
			2007	Monsoon	24 Districts	Flash Flood	Agricultural land damaged in acres	26	4		3,009							Not Surveyed
			2008	5/11	Peshawar	Torrentional Rain/ Flash Flood	Agricutural land and different types of arches damaged in acres	10	80		9,986							
			2009	7/11	Mardan, Swabi, Karak and Marwat etc.	Torrentional Rain/ Flash Flood	Agricultural land damages in acres alongwith different types of arches	36	90		4,897							
1	KPK	Naushehra	2007	Feb.	Nowshera	Flood due to Heavy rain		23	21		N/S							3,350,000
			This was newly established district in 1991. Here is only this available data the very old data will be with Peshawar old district.															
2	KPK	Charsadda	There is No compiled statistics for Disaster in the District. But they have already identified the vulnerable areas (against Floods) as follows; Vulnerable Area for															
			River Kabul		Tehsil Shabqadar: Village Nooranai, Dalazak, Tehsil Charsadda: Jamat village, Agra village, Prang Yasin Zai, Shabara Jungle/Kamp Korona													
			River Swat		Sehra Sang, Turlandi, Bela No.4 and Tehsil Tangi, Shahi Kulai, Mandori, Gul Abad, Veno Garhri, Gohar Abad, Khar Bela, Prang and Chak Nisatta Tehsil Charsadda													
			River Jindi		Bela Korona Qazi Khet, Mirzagan, Sulay Qamar Rajjar, Turangzai Khat Korona village Utmanzai, Kanda Korona Haji Abad Umerzai													
3	KPK	Abbotabad	2005	8/10	Abbottabad	Earthquake	Abbottabad	528	889		49,634							1,313,918,250
			It is further added that the record of damages etc before 2005 was burnt in fire incident of General Muhafiz Khan Abbottabad during the month of July, 2005.															
4	KPK	Mansehra	2001	7/23	Daddar	Flood	Siran	116	72		17	27	64	2		6		
			2005	February	Kaghan	Rainfall	Snowfall/Rain	51	66		2165	23	9354	296				
			2005	10/8	Mansehra	Earthquake		15997	9400			145293						
			2006	5/24~8/5	Mansehra	Rainfall	Moonsoon	36	21		139	51			2	53		
			2007	3/22	Maswhra	Rainfall		1	2		12	11				1		
			2007	5/18	Malik Pur	Thunder Storm		4	2									
			2007	July	Mansehra	Thunder Storm		4	5		15	27						
			2007	10/30	Parhena	Rainfall		2										
			2008	2/25	Plan intl.	Bomb blast		4	9									
			2008	5/31	Bhogar Mang	Fire in Cattle Shade												
			2008	6/13	?	Traffic Accident		2	3									
			2008	6/15	Shinkiari	Fire		8				2						
			2008	7/23	Khair Abad	Thunder Storm			2									
			2008	7/12	*See Left*	Fire	Garri Habbibullah					10				10		
			2008	8/24	*See Left*	Fire	Mansehra Landa Bazar					21				21		
5	KPK	Batagram	2005	10/8	Batagram	Earthquake		3456	3799		67,411							2,104,900,000
			2006	8/3	Allai	Lighting Thunder		10	4		12							1,000,000

Source: JICA Study Team
Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.1: Questionnaire Survey Results Regarding Damage Records in Each District against Disasters (2/6: KPK 2/2, Punjab 1/3)

No	Province	Name of District	Year	Date	Location	Type	Description	Death	Injured	Affctd	Fully Damaged House		Partially Damaged		Services		Agri. (acres)	Damage Cost
											Mud	RCC	Mud	RCC	Masjid/ Hotel	Shop		
6	KPK	Haripur	1992	6/26	Sari Sala	Flash Flood		8										2,300,000
			1996	Aug	Sari Sala	Rain Flood	Sari Sala Soka	10										??
			2005	Oct	All Districts	Earthquake	Flash	6	3									455,000
			2007	6/21	Sari Sala	Flash Flood		1	1									15,000
			2007	9/7	Sari Sala	Flash Flood	in Soka	3	2									400,000
			2008	4/15	Sari Sala GT Road	Flash Flood	by Nullah		4									200,000
7	KPK	Swat	1991		Swat	Earthquake	Ropes/Wall,Collapse	8										
			1991		Swat Kalam	Landslide	Ropes/Wall Collapse	23										
			1995	Aug	Swat	Flood	River	15										
			1995	Aug	Manglawar Swat	Flood	River	13										
			1995	Aug	Swat	Flood	River	17										
			2005	1/2	Kalam Swat	Snow Fall	Ropes/Wall Collapse	137										
			2005	8/10	Swat	Earthquake	Ropes/WallCollapse	8										
8	KPK	Shangla	2005	Oct.	Shangla	Earthquake		441		1900	24,000							
			2005	Feb.	Shangla	Snow Falling		25		65								
			2010	Jul-Aug	Shangla	Flood												
9	Punjab	Chiniot	1973	8/10	Along Chenab River	Ex.High	854,000 cusec											
			1975	7/17		Ex.High	669,819 cusec											
			1976	8/2		Ex.High	628,741 cusec											
			1976	8/17		Ex.High	608,050 cusec											
			1988	9/20		Ex.High	892,229 cusec											
			1992	9/11		Ex.High	948,530 cusec											
			1995	7/29		Ex.High	640,577 cusec											
			1996	8/24		Ex.High	851,223 cusec											
			1997	8/28		Ex.High	873,000 cusec											
			2001	8/8		Low	125,492 cusec											
			2005	7/8		High	379,222 cusec											
			2006	8/5		High	286,802 cusec											
			2007	8/15		Low	117,254 cusec											
			2008	8/1		Mid	190,430 cusec											
10	Punjab	Jhang	1952	Monsoon	Chenab	Flood												
			1956	Monsoon	Chenab	Flood												
			1966	Monsoon	Chenab	Drought												
			1973	Monsoon	Chenab	Flood												
			1992	Monsoon	Chenab	Flood												

Source: JICA Study Team
Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.1: Questionnaire Survey Results Regarding Damage Records in Each District against Disasters (3/6: Punjab 2/3 and AJ&K)

No	Province	Name of District	Year	Date	Location	Type	Description	Death	Injured	Affctd	Fully Damaged House		Partially Damaged		Services		Agri. (acres)	Damage Cost
											Mud	RCC	Mud	RCC	Masjid/ Hotel	Shop		
11	Punjab	Gujrat	2003	8/1	Wahand	Flash Flood	Nullah Bhimber	1										65000
			2003	8/1	See Left	Flash Flood	Nullah Halsi	2		Kotli Kandoo								130000
			2004	7/21	SomeTehsils	Flood	River Chenab	2										
			2004	7/23	SomeTehsils	Flood	River Chenab	4										
			2004	8/17	See Left	Flash Flood	Nullah	1		Mohallah Arra, Kharian								
			2005	3/21	S.A. Gil	Flash Flood	Nullah Kass	1										
			2005	8/10	SomeTehsils	Earthquakes		2	23									180000
			2006	6/15	See Left	Flood	River Chenab	1		Jalalpur Jattan								65000
			2006	6/29	S.A. Gil	Flash Flood	Nullah Bolani	1										100000
			2006	7/10	S.A. Gil	Flash Flood	Nullah	1										65000
			2006	7/13	S.A. Gil	Flash Flood	Nullah Kass	1										65000
			2006	7/13	Khepranwala	Flash Flood	Nullah Bhimber	1										65000
			2006	7/13	See Left	Flash Flood	House Roof Collased	4		Mohallah Muslimabad Kharian and Jalapur Jattan								330000
			2006	7/14	Khariap	Flash Flood	Nullah	1										65000
			2006	7/14	See Left	Heavy Rain	Electrocuted	1		Jalalpur Jattan								100000
			2006	9/1	See Left	Heavy Rain		1		Bhagowal Kalan								100000
			2006	9/3	Gujrat	Heavy Rain	House Roof Collased	1										100000
			2007	3/4	Gujrat	Heavy Rain	House Roof Collased	4										400000
			2007	8/9	Dinga Sem	Flash Flood	Nullah Kharian	1										65000
			2010	7/12	Gujrat	Flash Flood	Boundary Wall Collapsed	2	1									under process
12	Punjab	Sialkot	1957			Flood	High Damage	Extensive devastation										
			1973			Flood	High Damage	672 villages were affected.										
			1975			Flood	Medium Damage	1054 villages were affected and 95,578 acres was devastated										
			1983			Flash Flood		Nullah Aik										
			1985			Flood, Flash Flood	High Damage	Chenab (Marala): 274,130 cusec and Aik: 25,000cuses, Deg: 75000 cuses										
			1988				High Damage	Chenab(Marala) : 40,000-12,000 cusec and Aik: 25,000cuses, Deg: 75000 cuses. Flood damaged the road network in Sialkot and Daska town was inundated with 4feet deep.										
			1993				Medium Damage											
			2005			Flood	Medium Damage	Chenab river was flooded due to heavy rain in India.										
			2006	July & September			Medium Damage											
13	Punjab	Bahawalpur	1988			Flood	High Flood	5,239			849						41,487	
			1992			Flood	High Flood	10,505			2,856						118,785	
			1995			Flood	High Flood	19,660			1,915						84,931	
14	Punjab	Rajanpur	There is No compiled statistics for Disaster in the District.															
15	Punjab	Muzaffargarh	There is No compiled statistics for Disaster in the District.															

Source: JICA Study Team
Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.1: Questionnaire Survey Results Regarding Damage Records in Each District against Disasters (4/6: Punjab 3/3 and AJ&K)

No	Province	Name of District	Year	Date	Location	Type	Description	Death	Injured	Affctd	Fully Damaged House		Partially Damaged		Services		Agri. (acres)	Damage Cost
											Mud	RCC	Mud	RCC	Masjid/ Hotel	Shop		
16	Punjab	D.G.Khan	2001		D.G.Khan, Taunsa, Political A.	River Flood Flash Flood		8		8,719	170 (Kacha)	18 (Pacca)	1829 (Kacha)	137 (Pacca)			11,194	
			2003	7/5	Taunsa (25 villages)	River Flood		3		722	95 (Kacha)	11 (Pacca)	167 (Kacha)	92 (Pacca)			4,309	
			2004	10/13	Daggar Chit	Flash Flood											18.5	449,000
			2005			Flash Flood												
			2006			Flash Flood												
			2007		37 Villages	Flash Flood		2	230	8,068	1,242		30				44,103	
			2008		7 Villages	Flash Flood					330 (Kacha)	21 (Pacca)	264 (Kacha)	7 (Pacca)				
			2009	8/20	10 Villages	River Flood Flash Flood				768	207							
17	Punjab	Bakkar	1997		23 villages	Flood				3,285	43 (Kacha)	0 (Others)	21 (Kacha)	0 (Others)			6,106	
			2006			Flood					661		349					
18	Punjab	Meanwali	2007		EIS Khail	Flood		19										
			2008		in Indus	Boat Sank		17										
			2009		River Kuram	Flash Flood		3										
			2010		Musa Khail	Flash Flood		2										
0	AJ&K	Provincial Base	1988			Avalanche		20			500				with Infrastrutural and Livestock Damage			
			1991			Avalanche		25			150				with Infrastrutural and Livestock Damage			
			1992			Flood (windstorm)		322		1.25 million	21,920				with Infrastrutural, Livestock, Cash Crops, orchards			
			1995			Heavy Rain		451		1mill.	5,500							
			1998			Flood		13			0				Estimated loss of asset Rs. 2million with 3000 people displaced			
			2000			Droght	'+>60% pop. affected. Agriculture, livestock, horticulture and health deterioration											
			2005			Earthquake w/Avalanche		43,412	Over 30,000 injured		246,280				Multisectoral long term high magnitude impact. and seat of Gov. brought to rubble.			
			2006			Flash Flood	31 villages displaced	27										
19	AJ&K	Muzaffarabad	1992	?	Whole District	Flood	There were death and injured in that worst flood in river Neelum and Jhelum but according to DC, record was devastated in earthquake in 2005											
			2005	8/10	Whole District	Earthquake		35,581	23,135		150,638							7,827,275
20	AJ&K	Neelum	2005	8/10	Whole District	Earthquake		466	824		15,890							460,235,000
			Often	Jun-Aug .		Landslide		3~4 for each landslide										

Source: JICA Study Team
Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.1: Questionnaire Survey Results Regarding Damage Records in Each District against Disasters (5/6: Balochistan 1/2)

No	Province	Name of District	Year	Date	Location	Type	Description	Death	Injured	Affctd	Fully Damaged House		Partially Damaged		Services		Agri. (acres)	Damage Cost
											Mud	RCC	Mud	RCC	Masjid/ Hotel	Shop		
0	Balochi	Provincial Base	1935		Quetta	Earthquake		35,000										
			1945		Pasni-Makran	Tsunami		4,000										
			2008		Ziarat etc.	Earthquake												
			2010		Gwadar, etc.	Cyclone		1	71	26,625								
			2010		Kohlu	Flash Flood		19		8,700								
21	Balochi	Gwadar	1945		See Left	Earthquake	Pasni, Ormara			60% of total population in both towns					Exact Damages are unknown			
			1985		Dasht Area	Hurricane				10% of total population in town					Exact Damages are unknown			
			1989		Coastal Towns	Sea Storm									Exact Damages are unknown			
			1990		Pasni	Sand Storm				20% of total population in town					Exact Damages are unknown			
			1992		Coastal Towns	Sea Storm									Exact Damages are unknown			
			1995		Pasni	Sand Storm				20% of total population in town					Exact Damages are unknown			
			1996		Coastal Towns	Sea Storm									Exact Damages are unknown			
			1998		Coastal Towns	Flood/Sea Storm									Exact Damages are unknown			
			2001		Pasni	Sand Storm				20% of total population in town					Exact Damages are unknown			
			2002		Coastal Towns	Flood/Sea Storm									Exact Damages are unknown			
			2005		See Left	Sea Erosion	Surbandar, Gwadar			20% of total population in both towns					Exact Damages are unknown			
			2005		Coastal Towns	Flood/Sea Storm									Exact Damages are unknown			
			2006		Pasni	Sand Storm				20% of total population in town					Exact Damages are unknown			
			2007		Coastal Towns	Cyclone, Flood		11 near Jiwani							Exact Damages are unknown			
			2010		Coastal Towns	Cyclone		0	25		7,671 houses were damaged.				214 boats			
22	Balochi	Ketch	1998	March		Flash Flood	Very High	10		N/R								
			2007	June	See Left	Flash F. Cyclone	Very High	5		1500	Affected Locations: Solband, Nosir Abad, Kosh Klant, Nodiz							
23	Balochi	Tharparkar (Mithi)	2003			Flash Flood		24										2,150,000
			2006			Flash Flood		6										600,000
			2007			Flash Flood		3										300,000
			2008			Flash Flood		2										200,000
			2009			Flash Flood		2										200,000
			1956			Drought												
			1968			Drought												
			1978			Drought												
			1987			Drought												
			1993			Locusts Attack												
			1995			Drought												
			2001			Drought												
			2004-05			Drought												
24	Balochi	Umarkot	2000			Earthquake	not so many damages											
			2006	Jul.-Aug.		Flash Flood	A few Damages											
			???			Drought	According to the insistence of Researcher, District provided wheat to the community at subsidise rate in the drought. They procrastinated showing data and said they have not calculation of damage cost. However, they answered that 25 villages are liable to be affected by drought and flash flood and 2000-2500 acres of land are always affected by disasters, in particular by flood.											
25	Balochi	Nasirabad	1988	July-Aug		Flash Flood	Very High											
			2007		whole district	Flash Flood	Land Erosion; 40573acres	2			4,037		2,500		3	13	51,161	
			2010	7/23 - 7/27		Flash Flood	In total, 2498villages, 18218families and 101,346acres are affected by flood											

Source: JICA Study Team
Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.1: Questionnaire Survey Results Regarding Damage Records in Each District against Disasters (6/6: Balochistan 2/2, Sindh)

No	Province	Name of District	Year	Date	Location	Type	Description	Death	Injured	Affctd	Fully Damaged House		Partially Damaged		Services		Agri. (acres)	Damage Cost
											Mud	RCC	Mud	RCC	Masjid/ Hotel	Shop		
26	Balochi.	Ziarat	2008	10/29	Tehsil Ziarat	Earthquake		171	155	53,876	5,604 houses							1,367,035,000
27	Balochi.	Nushki	2007	6/26	Nushki City	Flash Flood		2	2	513	830						115,046	12,450,000
28	Balochi.	Jacobabad	1978	6/23	Kahn Village	Flash Flood	Kahn River w/debris flow	5		1,000								5 million
			Not any other mentionable loss was due to any kind of disaster in the past															
29	Balochi.	Dadu	Not any mentionable loss was due to any kind of disaster in the past															
30	Sindh	Badin	1964		Coastal Belt Southern Badin	Cyclone 'A-I'		90		25,000								
			1973		Enlire Dist.	Torrential xxxfalls		20		100,000								
			1976		Southern Badin	Flood		40		35,000								
			1988		Southern Part of Badin	Flood		15		30,000								
			1994		Southern Part of Badin	Torrential xxxfalls		20		40,000								
			1999	5/19	Coastal Belt Southern Badin	Cyclone 'A-2'		176		202,000								
			2001	1/26	Kakkbam, B.Mennon & Ahmed Rajo	Earthquake		5		2,000								
			2003		Southern Part of Badin	Flood		115		225,670								
			2006		Southern Part of Badin	Flood		2		10,000								
			2007		B.Menien & Ahmed Rajo	Cyclonic Depression		0		20,000								
31	Sindh	Naushahro Feroze	There is No compiled statistics for Disaster in the District.															
32	Sindh	Sanghar	2006	Jun~Sep	whole district	Flood		22	22		22,573 (Kacha)	1,794 (Pacca)	22,249 (Kacha)	2,616 (Pacca)	Rs22mil for Relief Rs1,046mil for Civil Rs 315mil for Prv. Rd		230,160	1,353 mil
33	Sindh	Hyderabad	Nil any mentionable in the Past															
34	Sindh	Sukkar	Not any mentionable loss was due to any kind of disaster in the past															
35	Sindh	Shikarpur	In 1976 there was flood of higher scale people were given red alert but fortunately there was no loss of death on crop area was damaged of that we have no record															
36	Sindh	Thatta	They had not such kind of mentionable disaster in the past. their answer was totally in negative they said that they had not any such losses of human and property															
37	Sindh	Qambar Shahdadkot	Not any other mentionable loss was due to any kind of disaster in the past															

Source: JICA Study Team
Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.2 Questionnaire Survey Results Regarding On-going/Expected Projects on DRM (1/3)

No	Province	Name of District	On-going Project on DRM / Disaster Mitigation Activities	Expected Project on DRM / Disaster Mitigation Activities (No Plan)
0	KPK (PDMA) (Peshawar)		A Project entitled "Disaster Mitigation and Preparedness in Lhyber Pakhtunkhwa" has been included in the Provincial ADP for 2010-2011 with a cost of Rs.300 million (PKR). Contents of the project will be finalized during preparation of the PCI. The project will span over three years. **There are so many projects in the province but not executed by PDMA (KPK). therefore we do not own these projects.	
1	KPK	Naushehra	RAH program (Refugees Affected Host) area only in the project to minimise (only for temporary)	It is recognized that programs regarding Disasters are executed by PDMA
2	KPK	Charsada	None	District government in going to provide human as well as animal medicin during the moonsoon and flood season Civil defence department is being set up by district governement Tehsil Municipal staff on job training for disaster
3	KPK	Abbotabad	None (District has only development organization plan)	PKR 20million allocation for moonsoon main land sliding and road clearing (in process) funding verbally promised by PDMA
4	KPK	Mansehra	* GTZ technical support to DDMA 1. School Training for emergency response 2. Upgrading of Control Room 3. Search & Rescue Team Training Update 4. Finalization of District Disaster Management Plan 5. Volunteer Management & Training 6. Coordination Meeting with all stakeholders * Sarhad Rural Support Program (SRSP) * PEER Integrated Education Program Masehra NWFP by Catholic Relief Services (CRS)	
5	KPK	Batagram	None	
6	KPK	Haripur	One UN Joint DRM Program in Collaboration with NDMA Source of Funds are NDMA/UNDP	DDMA Works Plan 2010 (by UNDP in pipeline) -Establishment of District Emergency Operation Centre (DEOC) -Establishment of District Disaster Response Teams (DDRTs) -Hazard & Vulnerability Assesment
7	KPK	Swat	(1) the erection of bridge on Swat River by PAA Rs AW Fund to mitigate the suffering people.	No
8	KPK	Shangla	Not as such	Not as such /we are just coordination with PDMA
9	Punjab	Chiniot	No	No
10	Punjab	Jhang	Conmmunity Based Disaster Risk Management (CBDRM) funded and supported by UNDP * DRM Training of the Trainers * DRM Training of the Communities * Flood Mitigation Equipment * Development of shelter * Developmtne of DDMA unfrastructuring & operationalization	As one of UNDP Programs - Vulnerability Assessment - Livelihood & Flood Security by WAF and FAO
11	Punjab	Gujrat	No such type of Project	not expected
12	Punjab	Sialkot	One UN DRM Joint-Program Identification of Most Vulnerable UC (Chaprar) Training of Volunteers Development of First-DRM UC Plan	Pilot Project in Most Vulnerable UC Sialkot Structural Activity (Raised Building)
13	Punjab	Bahawalpur	Civil Defence Training for Public Some Brochure about Safety measures from disaster were also distributed among masses.	
14	Punjab	Rajanpur	1. Rehabilitation of Natural Roots of Hill Torrent (4,500 hours purchased Bulldozer worked for Rehabilitation of Irrigation)2. Repair of diversion structure at Kalia Issued Project (Katchi Canal)3. UNDP Project * Media Person Orientation * Official and Community Training * Disaster Coordination of Counsil * NGOs Activities (Non Food Item) * Girl Guided Association Reactivated	

Source: JICA Study Team

Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.2 Questionnaire Survey Results Regarding On-going/Expected Projects on DRM (2/3)

No	Province	Name of District	On-going Project on DRM / Disaster Mitigation Activities	Expected Project on DRM / Disaster Mitigation Activities (No Plan)
15	Punjab	Muzaffaragah	There are three (3) active NGOs DoAbA: Child Contered Disaster Risk Reduction Plan in Pakistan OXFAN: Emergency & Relief Activities for Flood Concer World Wide Livelihood Activites	
16	Punjab	D.G. Khan	1. Pakistan Red Crescent Relief Goods are provided to district occasionary 2. Crisis Cell Management also send Relief Goods to the community through district management.	
17	Punjab	Bakkar	Super Bund Protection from Darya to Dera Bridge 17KM against flood From Bridge Dera to Southward 10KM (half completed)	
18	Punjab	Meanwali	Nil	Nil
19	AJK	Muzaffarabad	(1) Disaster Risk Reduction Project by ERRA, 1) UC Level Training Program in Rescue Relief, District Level Training Program Hazrd Mapping Project, 2) Seismic Zoning (The Muzaffarabad District have been declered into three Seismic Zones, High Medium, Low Hazard Zones (2) Rural Housing 1) Structure Design Project	
20	AJK	Neelum		
21	Balochi.	Gwadar	(1) Rptary Club has provided them temporary shelter. (2) District government has allocated very safe land for these shelters to be utilized for emergency. Early Warning system has been operated just recently (PTC-L-V wireless System) by District own budget (UNDP) (1 set:Rs6500, District, Tehsil, Coast, Navy, Communities 50 sets in total)	Please see another file.
22	Balochi.	Ketch	UNDP is conducting: Camp Management Training Search and Rescue	* We are preparing proposal for rehabilitation of displaced population of 2007, flood. * We are also preparing proposal to repair the protection bunds breached by 2007 flood. * KechKore-Bridge made by USAID breached by 2007 flood, now provincial government has provided for repairing and this is on going
23	Balochi.	Tharparkar (Mithi)	UNDP Programs: Bah Baili qnd TRDP	WFO & WFP: Forest Plantation and Drought Mitigation PC1; District-PDMA submit for drought mitigation effects
24	Balochi.	Umarkot	Nil There are so many NGOs working for mitigation of disaster afffects but the officials were ingnorant or intentially were not telling about the project executed by these NGOs like TRDP (Their Deep Development Project in the Area). However, EDOR was of the view that in future they are planning to formulate different projects proposed for funding from donor.	Nil
25	Balochi.	Naseerabad	Nil	Nil
26	Balochi.	Ziarat	Balochistan Rural Support Program (BRSP) (Distribution of Al-Nahyan Food Package)	None
27	Balochi.	Nushki	None	None
28	Balochi.	Jacobabad	N/I	NGO in just recent flood activities are entering for relief and rehabilitation activities
29	Balochi.	Dadu	No	No

Source: JICA Study Team

Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.2 Questionnaire Survey Results Regarding On-going/Expected Projects on DRM (3/3)

No	Province	Name of District	On-going Project on DRM / Disaster Mitigation Activities	Expected Project on DRM / Disaster Mitigation Activities (No Plan)
30	Sindh	Badin	No Such Project	Under Consideration and Planning
31	Sindh	Naushahro Feroze	None	None
32	Sindh	Sanghar	None	None
33	Sindh	Hyderabad	Not such kind of project	Not such kind of project
34	Sindh	Sukkar	We have not such kind of disaster related project	No
35	Sindh	Shikarpur	No	No
36	Sindh	Thatta	just some NGOs are working for relief and in feeding the IDPs	N/I
37	Sindh	Qambar Shahdadkot	No	No

Source: JICA Study Team

Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.3 Questionnaire Survey Results Regarding Issues/Actual Future Plan, Projects and Programs/ Suggestion and Recommendations on DRM (1/6)

No	Province	Name of District	Issues	Actual Future Plans, Projects and Programs	Suggestion and Recommendations
			on DRM / Disaster Mitigation Activities	on DRM / Disaster Mitigation Activities	on DRM / Disaster Mitigation Activities
0	KPK (PDMA) (Peshawar)		1. Awareness among the communities. 2. Provision of equipments, 3. Transfer of skills and knowledge about usages of instruments. 4. Coordination among the government Department requires improvement. 5. Early warning systems requires establishment at local level.	1. Establishment of DDMAs Secretariates in the Province, 2. Establishment of functional structure of DDMA vo;unteers, 3. Large scale media campaign on disaster preparedness, 4. Establishment of provincial training academy for Emergency response and disaster preparedness.	we would suggest that the PDMA_KPK may be kept fully involved in all the development activities carried out through the NDMA in the districts.
1	KPK	Naushehra	1. must be disaster risk management plan, 2. that is flood prone district to be addressed priority, 3. there is indutrial state and fire system must be established. 4. Terror attack and unexpected disaster just like earthquake must be properly addressed. 5. Warehouses along with security items 6. Funds availability for focal person.	Flood damaged population must be rehabilitated properly.	Irrigation department must be technically supported to minimise the losses of flood affected people. (Boats for life saving)
2	KPK	Charsada	* PDMA has not given any fund for DDMA, that's why DDMA prepared budget by cutting of some budgets from another sections. Capital resources. Technical Training to stakeholders ** Swat River cutting/erosion of villages located in bank (Last year PKR(1.4m) were allocated for civil defence but were not utilized due to absence of basic infrastructure of this department.	This is flood vulnerable area therefore flood affected population must provide short as well as long relief and rehabilitation. * There are eleven (11) points vulnerable near the Swat River, Kabul River and Jindi(Nallah) * Kabul River overflow at 120,000 cusec-water. Swat river overflow at 70,000 cusec water when these river overflow then Jindi Nallah flow stop and that become main cause for people suffering and disaster. 25 out of 49 union counsils are vulnerable to flood and affected in one way or other * After flood, farmer water channel are blocked , machinary must be provided for clearing channels.	
3	KPK	Abbotabad	Budget Issues * Land Sliding in Rainy Season * No machinary or other equipment for Land Sliding	(1) Budget allocation for DDMA (2) Equipment for Removal of Land Sliding and Road Clearing (3) According to focal person view, all resources regaring the disaster (both human as well as machinary) must not be at District level at Divisional level (managed by Regional Comission). (4) For hilly areas, PDMA must provided helicopter service for disaster cases.	
4	KPK	Mansehra	* No presence of EWS for flash flood & river flood (Kunar, Siren and Upper Indus Rivers) * Land Slide causing micro damages * Avalanches (Kagham, Naran Areas) * In partcular, Flash Flood is main concers in District (Balakot where new city is planned by Government is vulnerable to land slide and flash flood.)	* Establishment of Assessment team for Minimum standard application within UCs areas, * Notification of minimum standards for implementationat village department, * Registration of volunteers with civil defence and social welfare department, * Institutionalization of volunteers management and response mechanism, * Strengthenining of the capacity of civil defence departments to provide technical support to all registered volunteers * Development of SOPs and ToRs for the SART, UCDMCs etc. * Building the capacity of SAR Team to multi disasters response	* Technical and continue support required to DDMA for one or two years for effective operationalization of DDMA * Development of District Disaster Management Plan * Operation of control room and DEOC * Scientiific support for undertaking risk assessment of the entire district * Support required for construction of Disaster Management Complex * Up-scaling of SAR Teams and other related services for comprehensive response * Human and material support required for strengthening capacity of Civil Defence

Source: JICA Study Team

Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.3 Questionnaire Survey Results Regarding Issues/Actual Future Plan, Projects and Programs/ Suggestion and Recommendations on DRM (2/6)

<table>
<tr><th rowspan="2">No</th><th rowspan="2">Province</th><th rowspan="2">Name of District</th><th>Issues</th><th>Actual Future Plans, Projects and Programs</th><th>Suggestion and Recommendations</th></tr>
<tr><th>on DRM / Disaster Mitigation Activities</th><th>on DRM / Disaster Mitigation Activities</th><th>on DRM / Disaster Mitigation Activities</th></tr>
<tr><td>5</td><td>KPK</td><td>Batagram</td><td>1. Lack of Resources
2. Dedicated Staffs / Establishments in DDMA
3. Absence of Civil Defence Dept.
4. EWS (Equipments, etc.)
5. After effect of a long standing disaster with Funza Atta Abud Lake as the population has been evacuated but can't be permitted to go back to their houses which give rise a score of problems</td><td colspan="2">I. Establishment of DDMA office and posting of dedicated staff on permanent basis,
II. Provision of Instrument to be used in case of any disaster,
III. Provision of Funds to be used in case of any emergency,
IV. Provision of Vehicles to DDMA,
V. Fire-Extinguish Vehicle</td></tr>
<tr><td>6</td><td>KPK</td><td>Haripur</td><td>* Funding not sufficient* No designated staff for disaster programmes* Absence of direct support from provincial government and lack at district and provincial level,* Not visit of PDMA (even single one),* Not existence of civil defence department* Lack of resources/Funds with district level departments* River Dhor and Small Flow (Nallah) are more vulnerable.</td><td>* Development of Model Union Counsil* Development of UC Level DRM Plan* Structural Mitigation Projects in Model Union Council* DRM Networks* Capacity Building Workshops/Trainings* Awareness Raising Sessions* Flood Response Drills* Early Warning System</td><td>- Multi-Hazard Early Warning System- Community and Local Risk Reduction Programming- Development of Model Union Council- Structural mitigation projects with regard to flood & flash floodsNDMA should give full support to district authorities to strengthen the DDMAs. Funds and necessary equipment should be provided to line departments</td></tr>
<tr><td>7</td><td>KPK</td><td>Swat</td><td colspan="3">The identification of vulnerable sites is the main issue. There is no mechanism of identifying such sites. After identification funding of such projects always remain the main issue. Quick response to this issue is required with professional expertise to tackle the issues.
The natural disasters can be tackled more easily with a collective approach, but the man-made disaster which is more painful then the national one requires a mechanism. Because there remain no provision even the Hospitals get closed.
So , a department exlusively dealing with both kinds of disasters, well-equipped with technical man-power is the need of hours.</td></tr>
<tr><td>8</td><td>KPK</td><td>Shangla</td><td>(1) Lack fo trainned professional disaster mitigation
(2) Lack of sources/equipment . There must be a heli with district administration
(3) Political Exploitation
(4) Communication System outdated
(5) Damaged road infrastructure</td><td colspan="2">There must be coordination among all the departments for disaster mitigation NHA must play due role with regard to the infrastures
Step must be taken to improve acceesibility →Public Awareness Campaign must be launched →Civil Defence must be activated on past lines to enroll volunteers→ Every district must be provided (Hilly Areas particulary to avoid mass scale casualities</td></tr>
<tr><td>9</td><td>Punjab</td><td>Chiniot</td><td>*This is newly established district not well equiped with regard to disaster mitigation
*Civil defence office needs to be established on modern line
*Recue 1122 Service must also be established the same way fire station</td><td>This is flood prone district.
We went to mitigate people suffering flood.</td><td>*Just nre district Chiniot having months of life, must provide funding for setup of DDMA
* Flood Control and other mitigation measures must be funded by national and international agencies.</td></tr>
<tr><td>10</td><td>Punjab</td><td>Jhang</td><td>- Lack of funds for DDMA (operationalization)
- No case study for Drought Hazard
- Lack of funds for flood/mitigation and preparedness
- Lack of funds and resources for Livelihood development
- Traditional System of Early Warning
- Limited activities for CBDRM implemenation (activities are carried out only 3 vulnerable UCs among 54 vulnerable USc)</td><td>- DRM activities should be expected to all (54) vulnerable Ucs for the DRM activities. But due to limited funds, the Project is restricted only to 3 Ucs.</td><td>- JICA and UN should coordinate for implementing DRM activites in Jhang
- Drought study should be focused and mitigation intervention should be introduce in this spectrums.
- Early Warning</td></tr>
<tr><td>11</td><td>Punjab</td><td>Gujrat</td><td>Fundding Constraints
Evacuation and earthmoving equipment (bulldozer) are not available in the District.
Cpacity Building of Staff
Official Infrastructure
Hill Torrent Bhimber, Bhinder, Wala, Hailsi Nala, Doarah, these all nala fall into Chenab River and cause suffering to the population.</td><td colspan="2">This is flood effected and vulnerable district having wide range of disaster due to flood.
Your all efforts must address our this problem by solving our issues.</td></tr>
</table>

Source: JICA Study Team

Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.3 Questionnaire Survey Results Regarding Issues/Actual Future Plan, Projects and Programs/ Suggestion and Recommendations on DRM (3/6)

No	Province	Name of District	Issues on DRM / Disaster Mitigation Activities	Actual Future Plans, Projects and Programs on DRM / Disaster Mitigation Activities	Suggestion and Recommendations on DRM / Disaster Mitigation Activities
12	Punjab	Sialkot	1. Strengthening of DDMA Sialkot 2. Coordination between NDMA/UNDP and DDMA Sialkot 3. Budget Allocation	Strengthening of DDMA Establishment of Sialkot Tannery Zone (for Chemical Hazard)	
13	Punjab	Bahawalpur	There is authority but not work for eventuality.No MechanismNo Manpower & Equipment and CoordinationIt is just like toothless tiger about DDMAHow can it be established and managed, we do not know	All efforts must be coordinated.A mechanism must be developed to mitigate and addressed the disaster effect.We are directionless & clear direction must be given to all stakeholder (Official & Private)A budget along with its usage must be cleared.	
14	Punjab	Rajanpur	Eacuation Machinery (Boats, Helicoptor in Flood Time) Warehouses are not available, No combine cell of disaster working in the district, Staff infrastructure must be developed (computer and other disaster related machinery)	To settle in issue immediately are required and sggested.	
15	Punjab	Muzaffaragah	Newly constructed Bye-Pass Link Road of NHA has not provided any "water passage" for disposal of flood water. Any flood situation may cause serious threat to uraban area & population. Muzaffaragarh has variety of Industry but there is no appropriate arrangement for , god forbid, vast/widespread fire hazard or industrial associated risk. Muzaffaragarh has been a busy crossing point connecting D.G.Khan, Balochistan and even certain districts of KPK with Multan and central Punjab. This makes its roads busy and vulnerable for accidents. No rapid ambulance/highway rescue is available. Flood Rescue & Rehabilitation have been core issues for district administration. Early Warning & Rescue through large power boats etc may be helpful to fight this menace.		Issues discussed in preceeding paragraphs may be readressed to make disaster combat effective & efficient.
16	Punjab	D.G. Khan	* Indus + Hill Torrent both side flood to be tackled * Ways Cut * Boats insufficiency * Funding Issue * Emergency Measures & Relief Goods * Irrigation has not sufficient fund for flood bunds * Scattered entered settled population * Early Warning System needed (Time mergin is short.)	DCO has no idea to mitigate damage from disaster and expected that D.G.Khan would be saved from any disaster by the Project.	
17	Punjab	Bakkar	* NGO and government must address salinity it needs * Salinity Channel	No request must provide funding and we would execute the project as district need	
18	Punjab	Meanwali	(1) Funding difficulty for addressing disaster (2) Machinary for bund (3) Motorboat (4) Wireless system to communicate with each stakeholders Coordination among department needs to strengthen International aid through internationalagency (to xxxx) not through xxxx	Nil	Nil Issues must settle.

Source: JICA Study Team

Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.3 Questionnaire Survey Results Regarding Issues/Actual Future Plan, Projects and Programs/ Suggestion and Recommendations on DRM (4/6)

<table>
<tr><th rowspan="2">No</th><th rowspan="2">Province</th><th rowspan="2">Name of District</th><th>Issues</th><th>Actual Future Plans, Projects and Programs</th><th>Suggestion and Recommendations</th></tr>
<tr><th>on DRM / Disaster Mitigation Activities</th><th>on DRM / Disaster Mitigation Activities</th><th>on DRM / Disaster Mitigation Activities</th></tr>
<tr><td>19</td><td>AJK</td><td>Muzaffarabad</td><td>District Level Rescue Relief Teams are required.
DDMA needs to be strengthened.</td><td>Nil</td><td>Establishment of Disaster Relief & Rescue Team
Strengthening of DDMA</td></tr>
<tr><td>20</td><td>AJK</td><td>Neelum</td><td></td><td></td><td></td></tr>
<tr><td>21</td><td>Balochi.</td><td>Gwadar</td><td>Detail Requests are prepared..We need weather station near our area.Emergency communication system has not been worked when we are emergency of any nature.</td><td>Detail Requests are prepared.</td><td>Detail Requests are prepared.</td></tr>
<tr><td rowspan="3">22</td><td rowspan="3">Balochi.</td><td rowspan="3">Ketch</td><td>* Rehabilitation of 2007 flood
* No emergency and Rescue Cell
* DDMA must be properly equiped with medicine equipment to save the people from disasters
* Capacity Building of disaster related people must be enhanced
* Fire Station with trained Staff
* Weather Station should be established here.</td><td rowspan="3" colspan="2">* DDMA must have independent structure so that it might be responsible to any activities.
* Proper Rescue Centre, we are ready to give them office structure
* Fire Station and Weather Station
* Hospital Casualty
* Funding Problem
* Capacity Building of Stakeholder
* We want to present our case directly to doner (0333-229-1759 (EDO (R): Mr. Kahif Jamil)</td></tr>
<tr><td>* 2010 Cyclone was not properly updated informed and
forecasted.
* Early Warning System is intensuly required.
* In the area, Ketch Disaster Response Forum (KDRF) is organisation of different NGOs and district goernemnt chaired by DCO - must be strengthened financially and its capacity building must be enhanced.</td></tr>
<tr><td>* Awareness Campaign
* For Rehabilitation 2007 Flood, the plan has already been demarcated by Revenue dept. We need fund for lay out, maps and rehabilitation process.
* (Disaster and Rescue Centre) must be here.
* Livestock protection and also Crop Protection measures during disasters
* Rescue Boats during flood and flood related equipment.</td></tr>
<tr><td>23</td><td>Balochi.</td><td>Tharparkar (Mithi)</td><td>* Funding Issues
* All the issues are funding related</td><td colspan="2">Structure of DDMA must be amended and be separate body.
Funding must be provided as per notification.</td></tr>
<tr><td rowspan="2">24</td><td rowspan="2">Balochi.</td><td rowspan="2">Umarkot</td><td rowspan="2">There are certain issues and problems which hamper our preparedness.
Main hazard in district Umarkot is drought in desert area comprising of an area of 6Lac acres in Taluka Umarkot. We need to have small-scale go-downs for keepiong reserve grain and feed for the animals
It is proposed that officials involved directly in the process disaster management at district level should be given proper training abroad in development countries to replicate such DRM Plan for their districts.</td><td>Nil</td><td>Nil</td></tr>
<tr><td colspan="2">They have need(?) the priority as this area is vulnerable to drought, flood (rain) and earthquake. (??) But they are not interested to give any suggestion or proposal
(as a view of Researcher)</td></tr>
</table>

ource: JICA Study Team

Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.3 Questionnaire Survey Results Regarding Issues/Actual Future Plan, Projects and Programs/ Suggestion and Recommendations on DRM (5/6)

No	Province	Name of District	Issues	Actual Future Plans, Projects and Programs	Suggestion and Recommendations
			on DRM / Disaster Mitigation Activities	on DRM / Disaster Mitigation Activities	on DRM / Disaster Mitigation Activities
25	Balochi.	Naseerabad	1. Provision of Shelter2. Food/Clean Drinking Water3. Health Cover/Medical Camp4. Motorboat5. Trained Staff6. Machinery to meet emergency7. Disaster Office Equipment8. Funding Difficulty9. Lehri Nala Water Flood * * Lehri Nala Water flooded Bakhtiarabad and then Noutal town and then Rabi Canal is flooded and hited and cause havoc and disaster in Monjhooshori are where 25 villages with 20,000 population affected. ** According to EDR (R), NDMA has instructed the provincial government not to allow NGOs to work in the flood affected area until cleared by NDMA or central government. In recent flood 2010, right side of Pat Feder Canal area was completely demolished displacing all the poipulation. Hill torrent from Kohlu, Tali and Harni (mountaineous area) becomes main reason of the all this havoc.	Lehri Nala; A protection bund constructed near Noutal may convert all the flash flood water to the barren land for irrigation purpose.Nauri Gaji;If a small dam at this place is constructed, the all flood water can be stored to protect the population of three districts, Naseerabad, Jhalmagsi and Katchi.Allah Yar Shah:The dam that was breached in early 70s if constructed again may irrigate one district "Khatchi" and can also save people from flood destruction and disaster of the area.Koh Sulehman (Koh means Mountain) Koh Sulehman Water goes to River Nari from there to be flooded to Sharakal then hits and flooded Qaboola Nala and from there its hits two areas. Once again Monju Shoori while other to Tehsil "Babakot" and some parts of tehsil Tamboo affecting 60,000-70,000 persons.	
26	Balochi.	Ziarat	None	None	None
27	Balochi.	Nushki	The following items are lacking for the District: 1. Fund, 2. Machinery, 3. Equipment, 4. Skilled Person 5. Relief Centre	Mid-term Action Plan for DRM: Rs. 21.1million/3years	None
28	Balochi.	Jacobabad	Ø Relief to the IDPs, Ø Reconstruction resources deficiency Ø Shelter to IDPs, Ø Disruption of communication system Ø Fodder for livestock, Ø Irrigation protective bunds weakness Ø Hygienic condition in the city, Ø Livelihood to iDPs	Restoration immediately of communication system- rail / roads	Irrigation department capacity both horizontally and vertically must be improved to tackle such level of water in future
29	Balochi.	Dadu	Ø Lack of proper drainage system in the AREA, Ø Lack of fly over and bridges Ø Lack of dewatering machines, Ø Ineffective civil defense Ø Lack of health services at DCO disposal, Ø Lack of heavy machinery, Ø Lack of motor boats Ø Budget constraint with district government, Ø Lack of material to strengthen the protective bunds	All the issues must be considered as recommendation and proposal to be solved	

ource: JICA Study Team

Survey Period: June-July 2010 (before 2010 Floods)

Appendix 4.1.3 Questionnaire Survey Results Regarding Issues/Actual Future Plan, Projects and Programs/ Suggestion and Recommendations on DRM (6/6)

No	Province	Name of District	Issues	Actual Future Plans, Projects and Programs	Suggestion and Recommendations
			on DRM / Disaster Mitigation Activities	on DRM / Disaster Mitigation Activities	on DRM / Disaster Mitigation Activities
30	Sindh	Badin	No such Issues	-	-
31	Sindh	Naushahro Feroze	None	None	None
32	Sindh	Sanghar	None	None	None
33	Sindh	Hyderabad	o Food for them, o Accommodation o Medical for IDPs, o Lacking of Train manpower o Lack of flood related equipment, o Law and order o Weakness of irrigation department o Absence of strong structure of civil defense o Political interference in development schemes	No	We request NDMA to set up district level body with fully equipped to cope up with such kind of disaster in future
34	Sindh	Sukkar	• Capacity issue with regard to finance of the district administration bodies • Capacity building of the all stakholder to cope with disaster of any kind confronting them • Lack of heavy machinery in the district		please consider our issue as recommendation and suggestion to be settled NDMA must try to present them at district level
35	Sindh	Shikarpur	DOR version: as far as Shikarpur is concerned following issues came to surface keeping in mind the experience of recent flood: Ø Response and prompt briefing /information sharing by irrigation department Ø Financial constraint of the district Ø Patrolling and security related issue during flood Ø Disaster preparedness required coherent approach to counter the upcoming calamity by extensive involvement from all the stakeholders as government, community, NGOs, philanthropist, media, and people representative at large. Its needs to strengthened Ø Coordinated efforts to set well defined and well thoughts out terms of reference for DDMA to make it proactive, prompt and professional	v Activation of DDMA v Regular meeting with all stakeholders of the districts v Establishment of updated early warning system v Awareness campaign on regular bases to apprise the community of their situation v Strengthening and coordination mechanism among the entire stakeholder to confront the disaster v A programme would be chalked out to assess vulnerability, weaknesses strength of the district to cop with problem, situation in future	v Inter district and intra district coordination must be improved v Capacity of DDMA must be enhance on modern lines v Establishment of early warning system at the district and provisional level v Financial outlays and budget should be specified to for disaster management on priority bases v Each district should submit a report (detail) that how recent flood losses could be minimized/ mentioned all the loophole in every aspect that all district realized in this emergency v Proper plan should be ready in advance to mobilize, philanthropist/NGOs international donors for relief, rescue and rehabilitation purpose v Statistics should be a priority area for each DDMA to avoid data gaps experience in this crises v NDMA must activated the DDMA at every district
36	Sindh	Thatta	o Totally collapsed of irrigation department during this flood o Lack of infrastructure to cop up with flood or other disaster o As this area is near sea so safer drainage to the sea is very indispensable o Feed to the people IDPs o Shelter to IDPs o Proper drainage for agriculture boosting in the area o Well maintain communication system is absence in the area	Coastal highway must be developed as protective bund Early warning system inn the area Infrastructure development in the area Properly education with regard to disaster management	N/I
37	Sindh	Qambar Shahdadkot	Ø Protective bund weakness Ø Lack of early warning system Ø Department coordination Ø Civil defense with meager resources	Issues must be settled as proposal and recommendations	

Source: JICA Study Team

Survey Period: June-July 2010 (before 2010 Floods)

Appendix A.4.3.1 District-wise General Flood Losses/ damages by 2010-Flood (1/4)

Table 1 Province-wise Flood Losses/Damages caused due to Rain/Flood 2010 in Pakistan

As of 04/10/2010 & 17/02/2011
Summary

	Province/ Federal Agency	Villages Affected	Persons Affected (person)	Area Affected (acre)	Cropped Area Affected (acre)	Houses Damaged partially*) (Number)	Houses Damaged fully*) (Number)	Persons Died *) (person)	Persons Injured*) (person)	Cattle Perished (head)	Relief Camps Established (number)
1	FANA (Gilgit & Baltistan)	347	81,605	0	9,000	0	3,157	183	60	4,669	0
2	AJ&K	0	131,416	1,800	77,548	5,212	1,631	71	87	288	0
3	KPK	544	3,823,670	0	509,597	162,582	94,712	1,068	1,109	52,750	86
4	FATA	489	59,080	57,133	50,052	4,178	1,241	88	89	18,866	0
5	Punjab	1,778	5,038,992	3,471,109	1,914,104	248,151	127,622	110	262	3,572	17
7	Balochistan	2,896	476,559	4,605	901,463	5,196	74,524	54	104	57,816	3
6	Sindh	11,988	7,475,685	7,445,658	2,611,305	269,558	610,419	411	1,235	263,703	4,682
	Total	**18,042**	**17,087,007**	**10,980,305**	**6,073,069**	**694,877**	**913,306**	**1,985**	**2,946**	**401,664**	**4,788**

Source: NDMA, PDMA, GBDMA, SDMA, FDMA, Provincial Board of Revenue/Relief & Crisis Management Departments, FFC
Note: *) Final figure by DNA Report & NDMA as of basically 04/10/2010 or partly 17 Feb. 2011

Table 2 Agency-wise Flood Losses/Damages Caused due to Rain/Flood 2010 in FANA Area (Gilgit & Baltistan)

As of 09/09/2010 & 17/02/2011
Gilgit & Baltistan (FANA)

	Agency	Villages Affected	Persons Affected (person)	Area Affected (Acres)	Cropped Area Affected (Acres)	Houses Damaged partially*)	Houses Damaged fully*)	Persons Died *) (person)	Persons Injured*) (person)	Cattle Heads Perished	Relief Camps Establised
1	Diamir	71	42,500	0	1,625	0	953	103	0	1,558	0
2	Gilgit	74	7,429	0	2,000	0	905	5	0	112	0
3	Ghizer	68	7,855	0	1,750	0	528	5	0	1,500	0
4	Hunza Nagar	37	12,738	0	625	0	144	0	0	26	0
5	Astore	33	2,006	0	875	0	79	1	0	50	0
6	Skardu	29	4,877	0	1,375	0	112	56	0	1,213	0
7	Ghanche	35	4,200	0	750	0	436	13	0	210	0
	Total	**347**	**81,605**	**0**	**9,000**	**0**	**3,157**	**183**	**0**	**4,669**	**0**

Source: NDMA, Gilgit-Baltistan Desaster Management Authortity (GBDMA), FFC
Note: *) Final figure by DNA Report as of 17 Feb. 2011

Table 3 Agency-wise Flood Losses/Damages Caused due to Rain/Flood 2010 in AJ&K Area

As of 05/10/2010 & 17/02/2011
AJ&K Area

	Agency	Villages Affected	Persons Affected (person)	Area Affected (Acres)	Cropped Area Affected (Acres)	Houses Damaged partially*)	Houses Damaged fully*)	Persons Died *) (person)	Persons Injured*) (person)	Cattle Heads Perished	Relief Camps Establised
1	Neelum	0	100,000	1,500	0	944	710	11	18	133	0
2	Muzaffarabad	0	6,102	100	0	1,279	114	14	4	7	0
3	Hatian	0	2,250	30	0	436	130	10	9	8	0
4	Bagh	0	13,674	30	0	1,350	168	6	4	5	0
5	Haveli	0	3,210	10	0	477	136	7	7	105	0
6	Pooch	NR 0	1,896	10	0	199	164	0	1	4	0
7	Sudhnoh	0	882	70	0	134	65	11	32	0	0
8	Kotki	0	50	0	0	131	144	6	2	0	0
9	Mirpur	0	2,500	25	0	61	0	3	0	0	0
10	Blimber	0	852	25	0	201	0	3	10	26	0
	Total	**0**	**131,416**	**1,800**	**77,548**	**5,212**	**1,631**	**71**	**87**	**288**	**0**

Source: NDMA, State Disaster Management Authority (SDMA), Government of AJ & K, FFC
Note: NR shows data not reported
*) Final figure by DNA Report as of 17 Feb. 2011

Appendix A.4.3.1 District-wise General Flood Losses/ damages by 2010-Flood (2/4)

Table 4 **District/Agency-wise Flood Losses/Damages Caused due to Rain/Flood 2010 in Khyber Pakhtunkhwa Province**

As on 08/09/2010 for KPK & 02/10/2010 for FATA

Khyber Pakhtunkhwa Province and FATA Agency

	District Agency	Villages Affected	Persons Affected	Area Affected	Cropped Area Affected	Houses Damaged		Persons Died *)	Persons Injured*)	Cattle Heads Perished	Relief Camps Establised
						partially*) (damaged)	fully*) (washed away)				
			(person)	(Acres)	(Acres)			(person)	(person)		
1	Kohistan	38	464,333			500	2,500	85	10	14,908	
2	Shangla	7	83,649			4,393	3,320	162	241	20	
3	Batagram	9	10,416			0	359	33	18	361	
4	Mansehra	12	22,870			1,715	1,042	36	37		
5	Abbottabad		3,500		1,500	0	30	17	5		
6	Haripur	42	56,646			3,352	2,567	37	21	141	
7	Buner	24	5,614		3,747	1,030	627	22	35	227	1
8	Swabi	11	15,389		100	1,040	334	7	4		
9	Chitral	12	69,164		150	241	359	21	21	180	2
10	Upper Dir	14	210,498		25,000	736	526	77	4	2,720	
11	Lower Dir	7	180,686			301	59	35	12		
12	Swat	42	634,654		34,470	4,666	2,334	95	207		
13	Malakand	6	45,086		35,000	1,000	600	18	15	2	1
14	Mardan	43	19,992		700	5,292	1,372	8	40	8	
15	Charsadda	34	502,732		40,725	18,482	7,452	66	115	33,559	17
16	**Peshawar**	16	237,068		92,797	24,179	6,347	46	68	120	65
17	Nowshera	27	499,818			29,475	11,212	167	10		
18	Kohat	32	38,716		3,750	2,505	551	35	36	302	
19	Hangu	19	45,841			658	217	12	13	26	
20	Karak	21	50,935			5,537	1,478	23	63	6	
21	Lakki Marwat	26	28,092		2,174	5,148	1,102	12	26	35	
22	Bannu	60	54,473		89,232	7,332	516	12	27	135	
23	D.I.Khan	26	394,608		180,252	37,935	48,266	31	61		
24	Tank	16	148,890			7,065	1,542	11	20		
	Total	**544**	**3,823,670**	**0**	**509,597**	**162,582**	**94,712**	**1,068**	**1,109**	**52,750**	**86**

Source: NDMA, PDMA, Provintial Board of Revenue/Relief & Crisis Management Departments, FFC, FATA Disaster Management Authority (FDM

Notes: Symbol * shows divisions of FATA.

*) Final figure by DNA Report & NDMA as of 17 Feb. 2011

Table 5 **Agency-wise Flood Losses/Damages Caused due to Rain/Flood 2010 in FATA Area**

As on 04/10/2010

Federally Administrative Trival Area (FATA)

	Agency	Villages Affected	Persons Affected	Area Affected	Cropped Area Affected	Houses Damaged		Persons Died *)	Persons Injured*)	Cattle Heads Perished	Relief Camps Establised
						partially*)	fully*)				
			(person)	(Acres)	(Acres)			(person)	(person)		
1	FR Peshawar	5	4,370	7,535	3,135	0	437			358	
2	Bajaur Agency	86	32,360	10,598	10,598	3,115	121	25	26	6,430	
3	Mohmand Agency	61	3,680	2,017	1,955	174	194	5	1	842	
4	Khyber Agency	37	3,790	7,635	7,635	379	0	17	23	724	
5	FR Kohat	83	3,690	433	230	0	368	3		176	
6	F.R.Laki Marwat	18	1,220	177	177	121	1	1		575	
7	Orakzai Agency	36	220	1,196	1,196	5	17	2		212	
8	Kurram Agency	64	3,130	421	273	293	20	4		551	
9	FR Bannu	10	4,880	709	665	0	0			546	
10	N.Waziristan Ager	39	660	5,333	5,135	0	66	21	17	322	
11	S.Waziristan Agen	24	170	18,431	17,690	0	17	2		1,844	
12	FR D.I.Khan	14		1,513	846	0	0	8	22	3,167	
13	FR Tank	12	910	1,135	517	91	0			3,119	
	Total	**489**	**59,080**	**57,133**	**50,052**	**4,178**	**1,241**	**88**	**89**	**18,866**	**0**

Source: NDMA, FATA Desaster Management Authortity (FDMA), FFC

Note: *) Final figure by DNA Report as of 17 Feb. 2011

Appendix A.4.3.1 District-wise General Flood Losses/ damages by 2010-Flood (3/4)

Table 6 District-wise Flood Losses/Damages Caused due to Rain/Flood 2010 in Punjab Province

As of 26/09/2010 & 17/02/2011

Punjab Province

	Province/ Federal Agency	Villages Affected	Persons Affected (person)	Area Affected (Acres)	Cropped Area Affected (Acres)	Houses Damaged partially*)	Houses Damaged fully*)	Persons Died *) (person)	Persons Injured*) (person)	Cattle Heads Perished	Relief Camps Establised
1	**Islamabad**										
2	Rawalpindi										
3	Attock										
4	Chakwal										
5	Mianwali	132	672,322	537,100	527,512	23,445	9,993	16	2	345	
6	Bhakkar	54	66,710	118,008	27,202	10,090	2,178	1	1	1	
7	Laylah	122	360,647	236,586	90,000	7,716	2,123	2	24	30	8
8	Muzaffargarh	589	1,780,226	379,642	304,000	99,960	47,040	2	35	2,127	2
9	D.G.Khan	141	263,501	179,125	24,760	13,010	21,990	4	43		
10	Rajanpur	421	945,644	1,020,671	448,752	53,465	26,560	31	37	207	5
11	Rahin Yar Khan	130	394,772	272,929	117,379	22,400	12,600	8	72	725	2
12	Jhelum							1			
13	Khushab	39	115,969	162,000	59,710	4,230	1,867	19	27	136	
14	Gujrat							3			
15	Mandi Bahauddin							1			
16	Sargogha	60	124,565	109,945	167,518	4,124	1,765	11			
17	Jhang	29	86,821	391,083	102,256	7,366	1,145	5	21	1	
18	Khannewal										
19	Multan	61	227,815	64,020	45,015	2,345	361	1			
20	Bahawarlpur										
21	Sialkot							1			
22	Gujranwala							1			
23	Hafizabad							1			
24	Chiniot										
25	Narowal							1			
26	Sheikhupura										
27	Nankana Sahib										
28	Faisalabad										
29	Toba Tek Singh										
30	**Lahore**							1			
31	Kasur										
32	Okara										
33	Sahiwal										
34	Pakpattan										
35	Vehari										
36	Lodhran										
37	Bahawalnagar										
	Total	**1,778**	**5,038,992**	**3,471,109**	**1,914,104**	**248,151**	**127,622**	**110**	**262**	**3,572**	**17**

Source: NDMA, PDMA, Provintial Board of Revenue/Relief & Crisis Management Departments, FFC

Note: *) Final figure by DNA Report & NDMA as of 17 Feb. 2011

Appendix A.4.3.1 District-wise General Flood Losses/ damages by 2010-Flood (4/4)

Table 7 District-wise Flood Losses/Damages Caused due to Rain/Flood 2010 in Sindh Province

As of 20/09/2010 & 17/02/2011

Sindh Province

	Province/ Federal Agency	Villages Affected	Persons Affected (person)	Area Affected (Acres)	Cropped Area Affected (Acres)	Houses Damaged partially*)	Houses Damaged fully*)	Persons Died *) (person)	Persons Injured*) (person)	Cattle Heads Perished	Relief Camps Establised
1	Kashmore	1,000	615,000	455,624	400,124	33,497	81,313	9	14	17,500	47
2	Shikarpur	1,599	790,000	401,831	110,189	29,706	73,855	41	77	838	322
3	Jacobabad	3,781	982,594	1,017,712	587,000	29,852	68,072	173	78	615	107
4	Ghotki	133	250,000	158,590	105,157	14,574	31,398	5	662	41,778	171
5	Sukker	130	247,913	255,058	102,300	22,105	43,576	16		124,448	231
6	Larkana	115	490,000	74,480	25,028	28,957	66,658	7	R.A.		710
7	Qambar Shahdadkot	1,547	1,050,000	965,340	497,380	25,687	59,279	16	30	44,050	145
8	Dadu	1,409	980,000	581,096	224,630	7,441	17,523	43	324	1,945	484
9	Jamshoro	553	395,700	190,650	142,212	3,457	6,705		8	197	229
10	Khairpur	287	345,900	589,251	46,055	20,876	48,787	32	41	32,290	484
11	N' Feroze	223	148,000	133,576	52,600	14,311	33,377	17			207
12	Nawabshah (Shaheed Benazirabad)	89	78,000	98,461	57,170	7,826	17,382	6	R.A.		99
13	Sanghar							24			321
14	Matiari	31	45,600	89,140	63,500	6,610	13,742	1		26	47
15	Hyderabad	35	125,000	25,028		8,505	9,798	10	R.A.		148
16	T.Allahyar							0	0		162
17	Mirpur Khas										
18	Umer Kot										
19	Thatta	977	895,400	2,345,600	177,800	14,899	36,160	7			462
20	T.M.Khan	79	36,578	64,221	20,160	1,157	2,556	4	1	16	32
21	Badin					98	238				212
22	Tharparker										
23	**Karachi**										62
	Total	**11,988**	**7,475,685**	**7,445,658**	**2,611,305**	**269,558**	**610,419**	**411**	**1,235**	**263,703**	**4,682**

Source: NDMA, PDMA, Provintial Board of Revenue/Relief & Crisis Management Departments, FFC

Note: R.A.: Reports awaited

*) Final figure by DNA Report as of 17 Feb. 2011

Table 8 District-wise Flood Losses/Damages Caused due to Rain/Flood 2010 in Balochistan Province

As of 29/09/2010 & 17/02/2011

Balochistan Province

	Province/ Federal Agency	Villages Affected	Persons Affected (person)	Area Affected (Acres)	Cropped Area Affected (Acres)	Houses Damaged partially*) (damaged)	Houses Damaged fully*) (washed away)	Persons Died *) (person)	Persons Injured*) (person)	Cattle Heads Perished	Relief Camps Established
1	Sherani					70	150				
2	Zhob				1,200			3	6	51	
3	Killa Saifullah					50	350				
4	Musa Khel					50	100				
5	Bharkahan	314	1,993	4,205	8,184	500	1,846	18	25	2,264	0
6	Dera Bugti										
7	Ziarat				10,000						
8	Lora Lai					100	259				
9	Kohlu	16	31,313		10,000	200	6,350	1	2	6,570	
10	Harnai					30	115				
11	Sibbi	30	40,030	400	132,000	396	7,350	7	70	15,931	3
12	Bolan	18			181,765	0	0	1		1,000	
13	Nasirabad	2,498	3,223		172,819	800	576	3		10,000	
14	Jafarabad	20	400,000		323,595	2,500	57,142	16	1	22,000	
15	Jhal Magsi				61,900	0	0				
16	Kalat										
17	Khuzdar										
18	Lasbela							5			
19	Chaghi										
20	Kharan										
21	Punjgur										
22	Awaran										
23	Kech					500	286				
24	Gwadar										
25	Mastung										
26	Panjpai										
27	Pishin										
28	K. Abdullah										
29	**Quetta**										
	Total	**2,896**	**476,559**	**4,605**	**901,463**	**5,196**	**74,524**	**54**	**104**	**57,816**	**3**

Source: NDMA, PDMA, Provintial Board of Revenue/Relief & Crisis Management Departments, FFC

*) Final figure by DNA Report as of 17 Feb. 2011

Appendix 4.3.2 Characteristics of Natural Hazards in Gilgit and Baltistan

<table>
<tr><td>Region</td><td>Federal Administrative Northern Area (FANA- Gilgit & Baltistan)</td></tr>
<tr><td>River System</td><td>Indus River and the northern tributaries: Gilgit, Hunza, Astor, Shyok, etc.</td></tr>
<tr><td>Type of Disaster</td><td>Earthquake, Snowstorm, Landslide, GLOF,
Flash floods associated with Landslides and GLOFs</td></tr>
<tr><td colspan="2" align="center">Characteristics</td></tr>
<tr><td colspan="2">The northern areas are affected by the westerly low pressure waves, which deliver precipitation (snow in winter and rain in summer), especially heavy snow falls over the mountain ranges of Hindu Kush, Karakoram, of which the highest peak is K2 (8,619 m asl.) and North-West Himalaya, of which the highest peak is Nanga Parpat (8,125 m asl.). The existing precipitation gauging stations of PMD are located below 3,000 m asl., and the precipitation above 3,000 m asl. is not observed. Total rainfall amounts are different locally, but the vertical distribution of precipitation is not clear. Those at the south side of the North-West Himalaya monsoon rains are dominating. However, the average maximum daily rainfall is less than 50 mm, and possibilities of causing flash floods are assumed to be low.
High possibilities of flash floods are caused by heavy snow melts, breaching of natural dams filled by landslides and also associated floods with GLOFs.
There are presently 2,420 glacier lakes, of which 52 glacier lakes are having high risks of GLOFs according to the disaster management plan of NDMA.
About GLOF, PMD has been conducting monitoring of six glacier lakes at Hunza Valley and Baltoro Glacier. WAPDA has installed 20 telemetric monitoring stations, and is monitoring about 15 glacier lakes.
The areas have a high risk of GLOFs and needs basic study on GLOFs for preparation for disaster risk management against GLOFs.
The names of gauging stations (Elevation) and average annual rainfalls:
Gilgit (1,460 m asl.): 135.2 mm/y
Bunji (1,372 m asl.) : 162.3 mm/y
Skardu (2,317 m asl.): 269.5 mm/y
Astore (2,168 m asl.): 486.3 mm/y

Causes of floods are:
Heavy snow melt by unusual high temperature in the area;
GLOFs; and
Result of breaching or bursting of natural dams by lands

Major issues:
Installation of new precipitation gauges in the mountain ranges; at Gilgit,
Strengthen research and study on disaster risks caused by glacier lakes; and
Promotion of some pilot projects for community based disaster risk reduction of glacier lakes.</td></tr>
</table>

Appendix 4.3.3 Characteristics of Natural Hazards in KPK and FATA (1/2)

Region	**Khyber Pakhtunkhwa (KPK) (former NWFP) and Federally Administrated Tribal Area (FATA)**
River System	Indus River, Kabul River and northern and western tributaries (Chitral, Swat and kurrum Rivers)
Type of Disaster	Flood, Flash flood, Drought, Landslide and Earthquake

Characteristics

The northern part of KPK and FATA is affected by the westerly waves, which deliver snow falls in winter and rainfalls in summer, especially it seems that the westerly waves deliver heavy snow falls over the mountain ranges of Hidukushi (the highest peak is Trici Mir (7,708 m asl.) in Chitral district. The gauging station at Chitral is recording about 70% of the average annual rainfall amounts from January to May.

At the southern part of KPK and FATA, the gauging stations of Peshawar and Parachinar are affected by both the westerly waves and the south/west monsoon, but the precipitation from January to May is slightly dominating. Peshawar and Chenab districts have high possibilities of flood and flashfloods caused by snowmelt from the Kabul River and its tributaries (Swat and Panjkora) from the northern part, and also flashfloods from tributaries, which have relatively steep catchments. The upper basin of the Kabul River is located in Afghanistan and no hydro-meteorological data is available. At the southern end of KPK and FATA, at D.I.Khan summer monsoon rain is dominating. At the plain area, the average annual rainfall amount is about 300 mm, but the watersheds of tributaries are located in the Sulaiman Range over 3,000 m asl., where the watersheds of hill torrents receive more rainfall amounts and have a high possibility of causing flash floods.

The area is vulnerable to floods/flashfloods, but lack of meteorological facilities, forecasting/ warning systems and fundamental flood control facilities against flood/flashflood. The area requires to establish flood/flashflood warning systems especially for Swat, Chitral and Kabul Rivers, which bring heavy flooding through snow melting as well as rainfall, and also for and Kurram Rivers and hill torrent areas of D.I.Khan.

Appendix 4.3.3 Characteristics of Natural Hazards in KPK and FATA (2/2)

Region	**Khyber Pakhtunkhwa (KPK) (former NWFP) and Federally Administrated Tribal Area (FATA)**
River System	Indus River, Kabul River and northern and western tributaries (Chitral, Swat and kurrum Rivers)
Type of Disaster	Flood, Flash flood, Drought, Landslide and Earthquake
Characteristics	
The names of gauging stations (Elevation) and average annual rainfalls: Chitral (1,497.8 m asl.): 465.9 mm Peshawar (-): 463.5 mm Parachinar (1,725.0 m asl.): 784.9 mm D.I.Khan (171.2 m asl.): 295.4 mm Causes of floods at Indus and Kabul rivers, and flash floods at tributaries are summarized as follows: Heavy snow melt by unusual high temperature at the northern mountain ranges at Chitral, Dir, Saidu Heavy rainfalls at mountain ranges; and Combination of heavy snow melt and heavy rainfalls. Major issues: Observation of precipitation in the mountain ranges and flashflood risk areas by installation of new gauging stations in the Sulaiman Range; and Basic Study on the flashflood risk management at the Swat Valley, Sulaiman Range.	

Appendix 4.3.4 Characteristics of Natural Hazards in AJ&K

<table>
<tr><td>Region</td><td>State of Azad Jammu & Kashmir</td></tr>
<tr><td>River System</td><td>Indus River and tributaries (Jhelum and Chenab Rivers) and hill torrents</td></tr>
<tr><td>Type of Disaster</td><td>Flood/ Flashfloods, Landslides, and Earthquake</td></tr>
<tr><td colspan="2" align="center">Characteristics</td></tr>
<tr><td colspan="2">AJ&K is located in the south side of the North-West Himalaya, of which the highest peak is Nanga Parpat (8,125 m asl.). The area is affected by both the westerly waves and the south-west monsoon, and summer monsoon rains are dominating in the area.

The area is within the most heavy rainfall areas, and the gauging station at Muzaffarabad records average annual rainfall amounts of 1,547.0 mm, which is by far the larger amount than the other areas.
Heavy snow melt from the Jhelum basin and heavy rainfalls in the watershed of its steep hill torrents are causing flashfloods, which cause severe damage to the down stream areas.
The priority districts (Bagh, Neelem and Muzaffarabad) for floods should consider risks of flashfloods from hill torrents.

The names of gauging stations (Elevation) and average annual rainfalls:
Muzaffarabad (702.0 m asl.): 1547.0 mm

Causes of floods and flash floods are:
Heavy snow melt by unusual high temperature in the catchment areas;
Heavy monsoon rains; and
Combination of heavy snow melt and heavy rains.

Major issues:
Installation of rainfall gauges and observation in mountain ranges and flashflood risk areas; and
Study on the flashflood risk management plan for Bagh, Neelem and Muzaffaraabad.</td></tr>
</table>

Appendix 4.3.5 Characteristics of Natural Hazards in Punjab (1/2)

<table>
<tr><td>Region</td><td>Punjab</td></tr>
<tr><td>River System</td><td>Indus River and tributaries (Jhelum, Chenab, Ravi and Sutlej Rivers), and nullahs/hill torrents</td></tr>
<tr><td>Type of Disaster</td><td>Flood /Flash floods, Drought and Earthquake</td></tr>
<tr><td colspan="2" align="center">Characteristics-1</td></tr>
<tr><td colspan="2">Northern part of Punjab plain receives rainfalls all year round, but summer monsoon rains are dominating.

In Punjab plain, the Indus and its major tributaries, which are composed of the Indus. Jhelum, Chenab, Ravi and Sutlej Rivers, flow through. However, according to the Indus Treaty which was signed in September 1960 between India and Pakistan, waters of the three eastern rivers of Ravi, Beas and Sutlej are reserved for exclusive use of Pakistan. In order to restore water to the canal system (for 3 million ha) fed by the three eastern rivers the Indus Basin Project was commenced by Pakistan in February 1960. The project has constructed the two storage dams: Tarbela Dam on the Indus River and Mangla Dam on the Jhelum River and, five barrages, one gated siphon and eight inter river link canals of 590 km in length. Among the major rivers in Punjab Plain, the upper reaches of Jhelum, Chenab, Ravi and Sutlej are located in India and are not accessible to meteorological and hydrological data in India.

Floods in Punjab are most extensive and damaging in the Indus Plain along the Indus and its tributaries. Among five major rivers, Indus and Jhelum Rivers have large reservoirs at Tarbela, Mangla and Chashma, and are controlling floods due to the flood forecasting system. For effective use of the flood control functions of Tarbela and Mangla Dams, accurate quantitative flood forecasting and flood warning system should be required in order to protect people and reduce flood disaster risks in the flood risk areas in the Indus Plain. Chenab, Ravi and Sutlej have no flood control facilities except local flood embankments and the flood by-pass routs, and the present flood forecasting system is a basic measure for reducing flood disaster risks. The flood protection bunds have been generally constructed either to protect head works and other irrigation structures, or to protect certain towns and villages.

Currently heavy damages by flashfloods and hill torrents are experienced in the hill side districts like DG. Khan and Sialkot. The hilly areas of Upper Punjab need to establish flashflood monitoring and warning systems. Gujrat and Sialkot districts are selected as priority districts for flood risks but have a high possibility of flashfloods from the mountain range of Pir Panial Range in India with heavy rainfalls. D.G. Khan and Rajanpur, which are located at the hill side of the Sulaiman Range of the western periphery of Punjab Plain, have suffered from hill torrents. The districts have a high risk of flash floods/hill torrents.</td></tr>
</table>

Appendix 4.3.5 Characteristics of Natural Hazards in Punjab (2/2)

Region	**Punjab**
River System	Indus River and tributaries: Jhelum, Chenab Ravi and Sutlej rivers and tributaries
Type of Disaster	Flood, Hill Torrents and Flash floods, Drought and Earthquake

Characteristics-2

Punjab Plain is covered by the canal irrigation system. However, average annual rainfalls of districts in the southern Punjab are as low as 100~200 mm and there are months which have no rainfalls. There are many districts such as Bahawalpur, Bhakkar, D.G.khan, Mianwali Rajanpur and Rawalpindi, which are drought risk areas, and the areas need to conduct drought management and effective water use.

The names of gauging stations (elevation) and average annual rainfalls:
Jhelum (287.2 m asl.): 902.6 mm
Sialkot (255.1 m asl.): 1,002.6 mm
Lahore (214.0.2 m asl.): 674.3 mm
Multan (122.0 m asl.): 202.4 mm
Khanpur (88.4 m asl.): 103.4 mm

Causes of floods at Indus and major tributaries, and flash floods at small rivers with relatively steep catchments are:
Heavy snow melt in the upper reach of the Indus system;
Monsoon rains and heavy rains in the Punjab plain and in the upper reach of the Indus system;
Heavy rains at periphery mountain ranges: Pir Panjal Range at north-east and Sulaiman Range at west; and
Combination of snowmelt and monsoon rains.

Major issues:
Installation of rainfall gauging stations and observation in flash flood risk areas; and
Study on the flash flood risk areas at Gujrat, Sialkot, D.G. Khan and Rajanpur.

Appendix 4.3.6 Characteristics of Natural Hazards in Balochistan (1/2)

Region	**Balochistan**
River System	Without any important river, but many small rivers and hill torrents
Type of Disaster	Flood, Flash flood, Drought, Cyclone, Earthquake and Tsunami

Characteristics

Balochistan has the largest area about 44% of Pakistan and least population which is less than 5%. Balochistan as a whole receives less annual precipitation than others and has months which have no rainfall at all. The area needs to conduct drought risk management and effective water use. However, the topographic and hydrological conditions are locally different and there are some parts prone to flash floods. The area may be divided into four regions from topographic and hydrological aspects as follows:

(1) The area around Quetta in the north east part of Balochistan receives average annual rainfalls of 282 mm and winter rain is dominating;

(2) the areas around Barkan and Khuzdar in the eastern periphery area, where the Sulaiman Range (the highest point: 2,328 m asl.) is located at the border with Punjab and Kirthar Range (the highest point: 2,174 m asl), located at the border with Sindh, have both the winter rains and the summer rains, but the summer rains are dominating, may be affected by monsoon rains. The area has flashflood risks;

(3) the areas around Dasht, Pasni, Ormara in Guwadar District and Punjgar, located in the western coastal and inland areas of Balochistan, receive less than 100 mm of average annual rainfalls. There winter rains are dominating, but occasionally summer rains, affected by cyclone rains. The area has flashflood risks.

(4) the western inland area, winter rains are dominating, but receives less than 100 mm of average annual rainfalls.

Appendix 4.3.6 Characteristics of Natural Hazards in Balochistan (2/2)

Region	**Balochistan**
River System	Without any important river, but many small rivers and hill torrents
Type of Disaster	Flood, Flash flood, Drought, Cyclone, Earthquake and Tsunami

Characteristics

The names of gauging stations (elevation) and average annual rainfalls:
Quetta (1,719.0 m asl.): 282.0 mm
Barkhan (1,097.0 m asl.): 403.8 mm
Khuzdar (1,231.0 m asl.): 265.8 mm
Punjgar (968.0 m asl.): 94.6 mm
Pasni (9.0 m asl.): 96.5 mm
Lasbella (87.0 m asl.): 153.7 mm

Causes of flash floods are:
Hill torrential rains at small rivers with relatively steep catchments in the Sulaiman Range ;
Monsoon rains; and
Cyclone rains.

Major issues:
Installation of meteorological radar, rainfall gauges and water level gauges for establishment of flash flood monitoring and warning systems; and
Study on the flashflood risk areas at Gawardar, Kech, Khuzdar Districts

Appendix 4.3.7 Characteristics of Natural Hazards in Sindh

Region	**Sindh**
River System	Indus River and hill torrents
Type of Disaster	Drought, Flood /flash flood, Cyclone, Earthquake and Tsunami

Characteristics

The area is classified as arid and receives mostly less than 200 mm of average annual rainfalls. Monsoon and cyclone rains are dominating, but there are months which have no rainfalls. The area needs to conduct drought risk management and effective water use.

However, floods in Sindh are most extensive and damaging in the Indus Plain. Sindh is located at the lowest reach of the Indus and receives the discharge of the whole Indus River System. However, the Indus flows on a ridge in Sindh Province, and surrounding areas are generally lower than the river bed; hence flood waters once leaving the Indus River will not return and the flood water cause serious damages to wide areas for long duration. The province has been protected by a huge extension of flood embankments. For flood risk management purpose optimum maintenance of the flood embankments and land use management of the possible flood prone areas should be fundamental measures as well as flood forecasting and warning systems.

Also Sindh has flashflood risks from hill torrents at western periphery mountain ranges and urban storm water. Hill torrents in mountain ranges at western periphery areas of Kirthar Range and Mor Range have flash flood risks.

The names of gauging stations (elevation) and average annual rainfalls:
Karachi-AP (22.0 m asl.): 153.0 mm
Padidan (46.0 m asl.): 108.5 mm
Chhor (5.0 m asl.): 246.5 mm

Causes of floods of Indus and flashfloods at small rivers with relatively steep catchments are summarized as follows:
Heavy snow melt in the upper reach of the Indus system;
Monsoon rains and heavy rains in the Punjab plain and in the upper reach of the Indus system;
Heavy rains (Monsoon and cyclone rains) at periphery mountain ranges:
Monsoon rains; and
Cyclone rains.Major issues:
Installation of meteorological radar, rainfall and water level gauging stations and observation in flash flood risk areas for establishment of flashflood monitoring and warning systems; and
Study on the flashflood risk areas at Dadu, Kanbar and Larkana.

Appendix 4.6.1 Summary of Histrorical Natural Dams and GLOF in Karakoram and Environs

Year	Glacier / River System	Ice Dam	GLOF	Major Disaster
1533	Upper Shyok River	x	x	x
1780	Upper Shyok River	x	x	
1818-1840s	Upper Shyok River	x		
1826	Upper Shyok River	x	x	x
1833	Upper Shyok River	x	x	
1833	Yashkuk Yaz Glacier	x	x	x
1835	Sultan Chhussku Glacier	x	x	
1841	Indus River			
1842	Upper Shyok River	x	x	x
1844	Ishkoman River	x	x	x
1848	Aktash Glacier	x		
1848	Kichik Khumdan Glacier	x		
1850	Chungphar Glacier	x	x	x
1850	Aktash Glacier	x		
1852-1858	Kichik Khumdan Glacier	x		
1855	Upper Shyok River		x	
1855	Upper Shyok River		x	x
1858-1862	Hunza River			
1864	Kichik Khumdan Glacier	x		
1865	Ishkoman River	x	x	
1869-1872	Kichik Khumdan Glacier	x		
1870	Karambar Glacier	x		
1873	Batura Glacier	x		
1873	*Chungphar Glacier*	*Had lain across the Astore R. since 1850(?) dam burst*		
1879	Upper Shyok River	x	x	
1882	Upper Shyok River	x	x	x
1884	Shimshall River	x	x	x
1887	*Chungphar Glacier*	*Had lain across the Astore R. but tongue thicker*		
1889	Upper Shyok River	x		
1891-1892	Ishkoman River	x		
1892	*Yazghil Glacier*	*Partial winter damming across the Shimshal R.*		
1893	Shimshall River	x	x	
1893	Ishkoman River	x	x	x
1895	*Pasu Glacier*	*Terminus at edge of Hunza R.*		
1896	*Stak River*	*Photo of (Kutiah?) glacier across River*		
1899	Upper Shyok River	x		
1901	Upper Shyok River	x	x	x
1902-1911	Kichik Khumdan Glacier	x		
1903	Kichik Khumdan Glacier	x	x	
1904-1905	Ishkoman River	x		
1905-1906	Khurdopin Glacier	x		
1905	Kichik Khumdan Glacier		x	
1905	Karambar Glacier	x	x	x
1905	Khurdopin Glacier	x	x	x
1906	Khurdopin Glacier	x	x	x
1906	*Chungphar Glacier*	*Terminal Area, 100m thick across River.*		
1907	Khurdopin Glacier	x	x	
1908	*Malangetti Glacier*	*Across Shimshal R. which tunnelled beneath glacier*		
1909	Whirgut Glacier	x		
1909	*Bawoni Glacier*	*Across Saltoro (Kondus?) R. below bed of past dammed lake*		
1911		Land Slide Dam near Gilgit		
1915	*Niaro Glacier*	*Dammed Niamel Nullah, outburst in Upper Shigar Valley*		
1916	Ishkoman River	x	*Chillinji, Whirgut and Bukh Glaciers*	
1924-1933	Chong Khumdan Glacier	x		
1925-1927	Khurdopin Glacier	x		
1925	*Barpu Glacier*	*x*	*across Hispar R.*	
1926	Chong Khumdan Glacier	x	x	x
1926	*Yazghil Glacier*	*x*	*Across Shimshal R.*	
1927	Kaz Yaz Glacier	x	x	x
1927	Khurdopin Glacier	x	x	
1928	Kilik River (Hunza)	x	x	
1929	Chong Khumdan Glacier	x	x	x
1929-1930	Ishkoman River	x		
1930	Kyagar Glacier	x		
1930	*Barpu Glacier*	*x*	*across Hispar R.*	
1930	*Upper Shaksgam*	*x*	*Two existing dams by five glaciers*	
1932	Chong Khumdan Glacier	x	x	
1933	Chong Khumdan Glacier	x	x	
1939	Chong Khumdan Glacier	x		
1953	Kuiah Glacier	x	*Interfering with flow of Shimshal R.*	
1976	*Malangetti and Yazghil Glacier*	*x*		
1976	*Kichik Khumdan and Chong Khundan Glacier*	*x*	*At edge of Upper Shyok R.*	
1977		Hunza Landslide dam related to glacier surge		
1978	Kyagar Glacier	x		
1979	Kyagar Glacier	x	x	

Original Source: Hewitt, 1968b; 1968c

Source: Glacial Lake Outburst Flood in Upper Indus Basin on Pakistan Snow & Ice Hydrology Project of Hydrology and Research Directorate of WAPDA

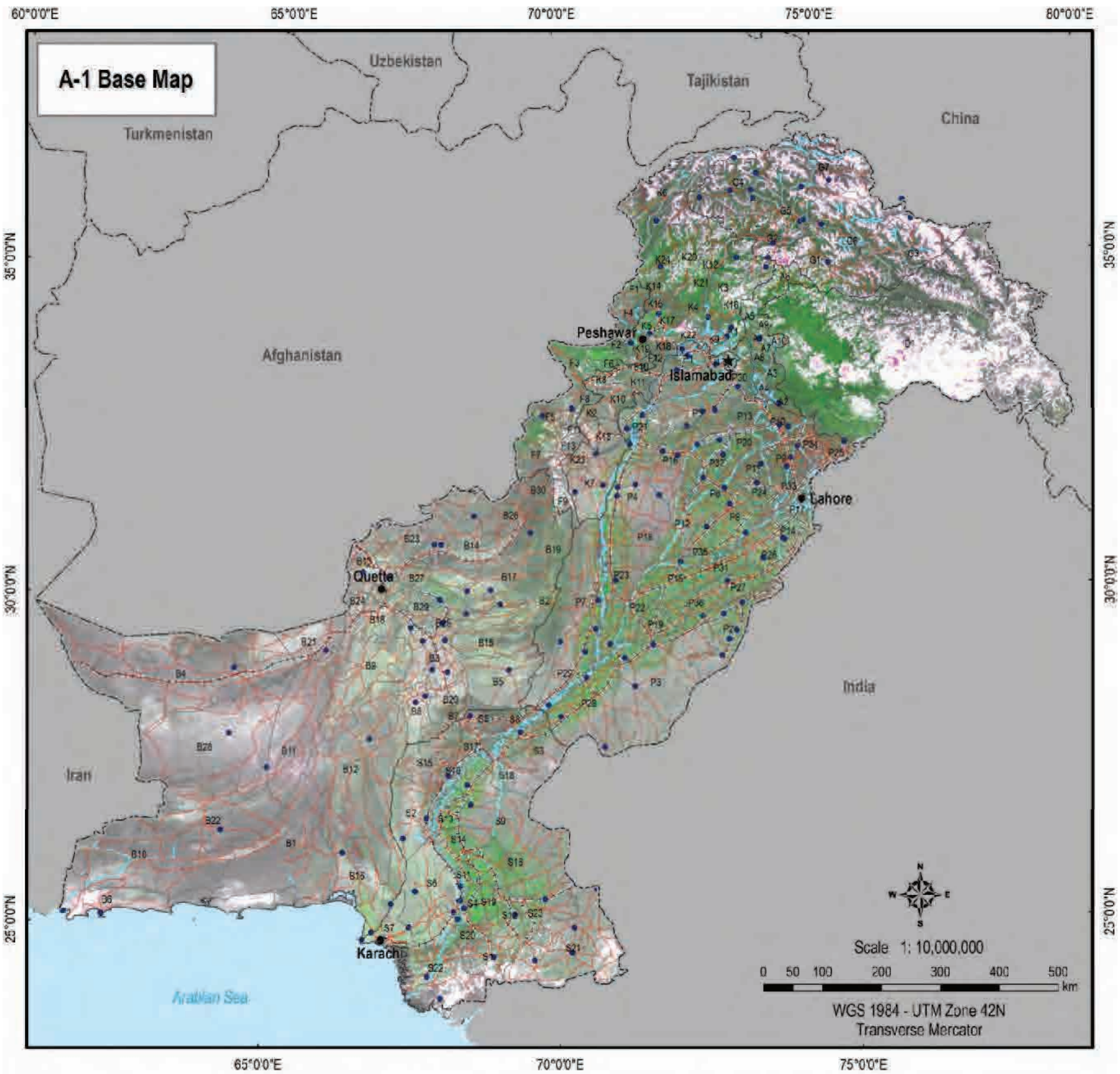
Appendix 4.8.1 Contents of Maps with Hazard & Risk Analysis

A. Existing Conditions

B. Hazard Analysis

C. Risk Analysis

D. Flood 2010



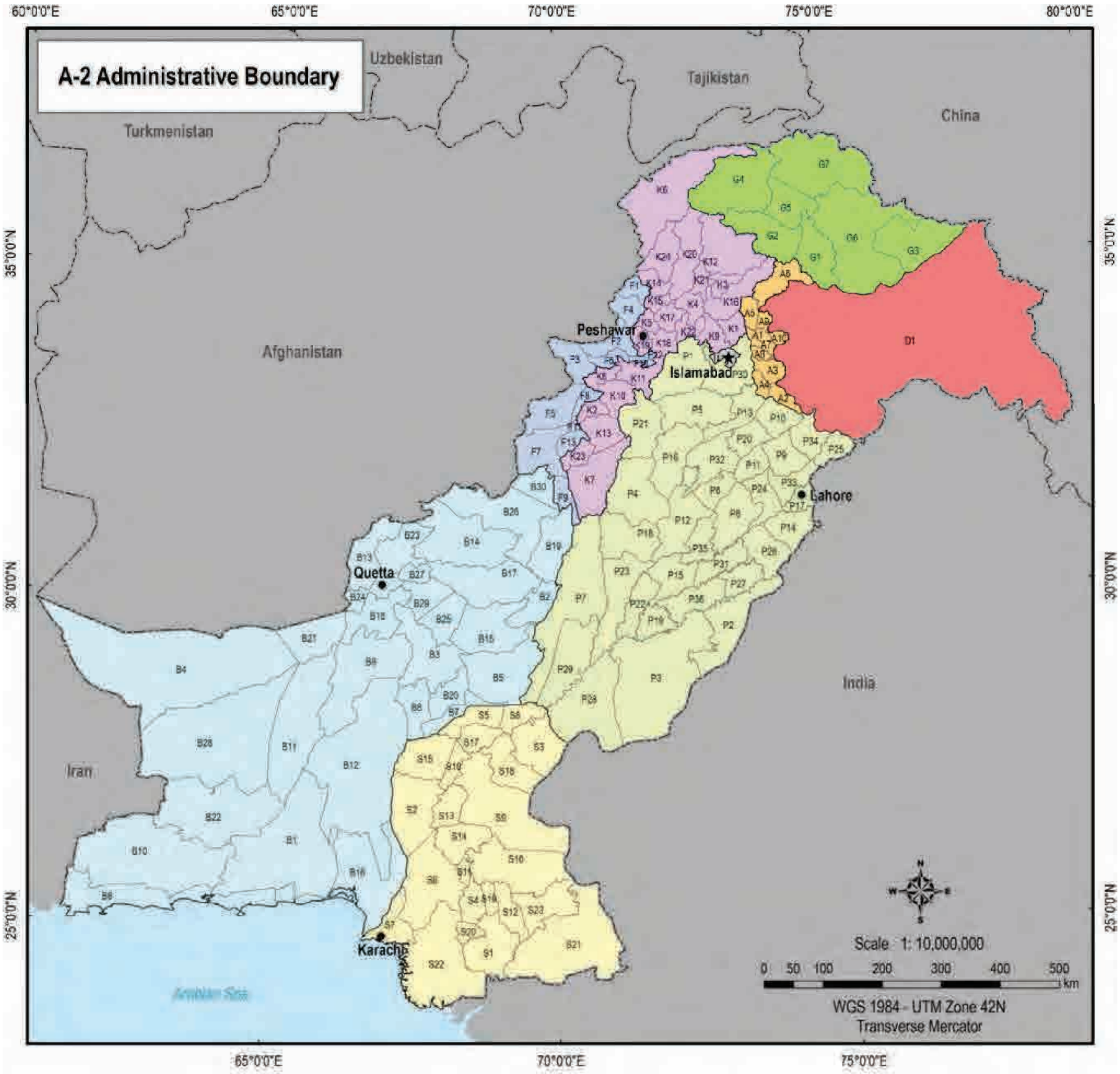
No.	District Name	No.	District Name	No.	District Name	No.	District Name	No.	District Name
A1	Bagh	B20	Nasirabad	G5	Gilgit	P2	Bahawalnagar	P31	Sahiwal
A2	Bhimber	B21	Nushki	G6	Skardu	P3	Bahawalpur	P32	Sargodha
A3	Kotli	B22	Panjgur	G7	Hunza-Nagar	P4	Bhakkar	P33	Sheikhupura
A4	Mirpur	B23	Pishin	I1	Islamabad	P5	Chakwal	P34	Sialkot
A5	Muzaffarabad	B24	Quetta	K1	Abbottabad	P6	Chiniot	P35	Toba Tek Singh
A6	Neelum	B25	Sibi	K2	Bannu	P7	D. G. Khan	P36	Vehari
A7	Poonch	B26	Zhob	K3	Batagram	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	B29	Harnai	K6	Chitral	P11	Hafizabad	S4	Hyderabad
B1	Awaran	B30	Sherani	K7	D. I. Khan	P12	Jhang	S5	Jacobabad
B2	Barkhan	D1	Disputed Area	K8	Hangu	P13	Jhelum	S6	Jamshoro
B3	Bolan	F1	Bajaur Agency	K9	Haripur	P14	Kasur	S7	Karachi
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	Jaffarabad	F5	North Waziristan Agency	K13	Lakki Marwat	P18	Layyah	S11	Matiari
B8	Jhal Magsi	F6	Orakzai Agency	K14	Lower Dir	P19	Lodhran	S12	Mirpur Khas
B9	Kalat	F7	South Waziristan Agency	K15	Malakand	P20	Mandi Bahauddin	S13	Naushahro Feroze
B10	Kech	F8	FR Bannu	K16	Mansehra	P21	Mianwali	S14	Nawabshah
B11	Kharan	F9	FR D. I. Khan	K17	Mardan	P22	Multan	S15	Qambar and Shahdadkot
B12	Khuzdar	F10	FR Kohat	K18	Nowshera	P23	Muzaffargarh	S16	Sanghar
B13	Killa Abdullah	F11	FR Lakki Marwat	K19	Peshawar	P24	Nankana Sahib	S17	Shikarpur
B14	Killa Saifullah	F12	FR Peshawar	K20	Swat	P25	Narowal	S18	Sukkur
B15	Kohlu	F13	FR Tank	K21	Shangla	P26	Okara	S19	Tando Allahyar
B16	Lasbela	G1	Astore	K22	Swabi	P27	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	Rajanpur	S22	Thatta
B19	Musakhel	G4	Ghizer	P1	Attock	P30	Rawalpindi	S23	Umerkot

Legend

- District Boundary
- ★ National Capital
- ● Administrative Center
- • City
- Roads
- Railway
- Rivers/Canals

Sources: JICA Study Team; Background - NASA Satellite FFC; Image (background); MapCruzin.com; http://www.mapcruzin.com/index.html

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



No.	District Name	No.	District Name	No.	District Name	No.	District Name	No.	District Name
A1	Bagh	B20	Nasirabad	G5	Gilgit	P2	Bahawalnagar	P31	Sahiwal
A2	Bhimber	B21	Noshki	G6	Skardu	P3	Bahawalpur	P32	Sargodha
A3	Kotli	B22	Panjgur	G7	Hunza Nagar	P4	Bhakkar	P33	Sheikhupura
A4	Mirpur	B23	Pishin	I1	Islamabad	P5	Chakwal	P34	Sialkot
A5	Muzaffarabad	B24	Quetta	K1	Abbottabad	P6	Chiniot	P35	Toba Tek Singh
A6	Neelum	B25	Sibi	K2	Bannu	P7	D. G. Khan	P36	Vehari
A7	Poonch	B26	Zhob	K3	Batagram	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	B29	Harnai	K6	Chitral	P11	Hafizabad	S4	Hyderabad
B1	Awaran	B30	Sherani	K7	D. I. Khan	P12	Jhang	S5	Jacobabad
B2	Barkhan	D1	Disputed Area	K8	Hangu	P13	Jhelum	S6	Jamshoro
B3	Bolan	F1	Bajaur Agency	K9	Haripur	P14	Kasur	S7	Karachi
B4	Chagai	F2	Khyber Agency	K10	Karak	P15	Khanewal	S8	Kashmore
B5	Dera Bugti	F3	Kurrum Agency	K11	Kohat	P16	Khushab	S9	Khairpur
B6	Gwadar	F4	Mohmand Agency	K12	Kohistan	P17	Lahore	S10	Larkana
B7	Jaffarabad	F5	North Waziristan Agency	K13	Lakki Marwat	P18	Leiah	S11	Matiari
B8	Jhal Magsi	F6	Orakzai Agency	K14	Lower Dir	P19	Lodhran	S12	Mirpur Khas
B9	Kalat	F7	South Waziristan Agency	K15	Malakand	P20	Mandi Bahauddin	S13	Naushahro Feroze
B10	Kech	F8	FR Bannu	K16	Mansehra	P21	Mianwali	S14	Nawabshah
B11	Kharan	F9	FR D. I. Khan	K17	Mardan	P22	Multan	S15	Qambar and Shahdadkot
B12	Khuzdar	F10	FR Kohat	K18	Nowshera	P23	Muzaffargarh	S16	Sanghar
B13	Killa Abdullah	F11	FR Lakki Marwat	K19	Peshawar	P24	Nankana Sahib	S17	Shikarpur
B14	Killa Saifullah	F12	FR Peshawar	K20	Swat	P25	Narowal	S18	Sukkur
B15	Kohlu	F13	FR Tank	K21	Shangla	P26	Okara	S19	Tando Allahyar
B16	Lasbela	G1	Astore	K22	Swabi	P27	Pakpattan	S20	Tando Muhammad Khan
B17	Loralai	G2	Diamer	K23	Tank	P28	Rahim Yar Khan	S21	Tharparkar
B18	Mastung	G3	Ghanche	K24	Upper Dir	P29	Rajanpur	S22	Thatta
B19	Musakhel	G4	Ghizer	P1	Attock	P30	Rawalpindi	S23	Umerkot

Legend

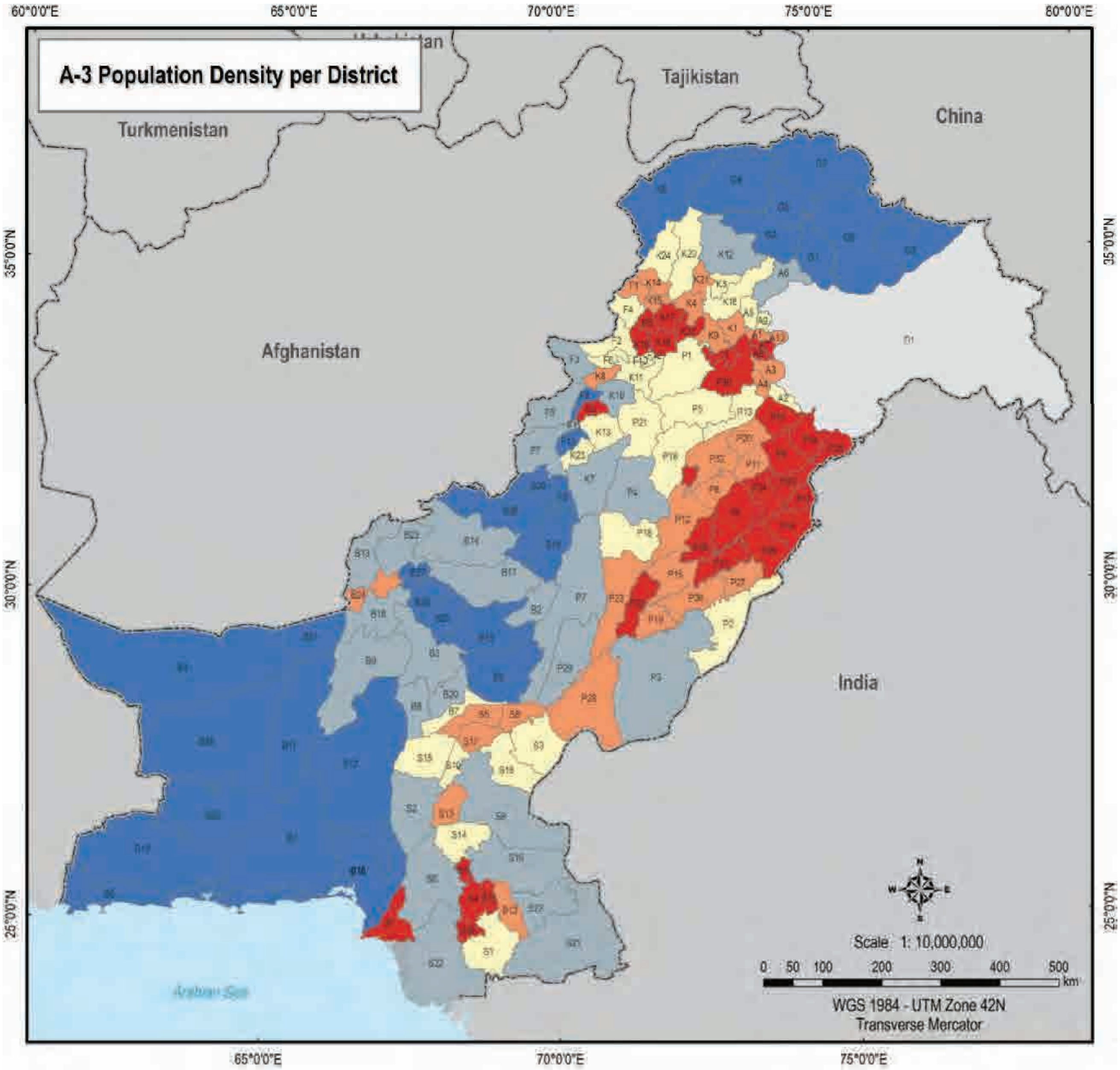
- Natioanl Border
- ★ National Capital
- ● Administrative Center
- District Boundary

Province/State/Region

- A.J.K.
- Balochistan
- Disputed Area
- F.A.T.A.
- Gilgit-Baltistan
- Islamabad
- Khyber Pakhtunkhawa
- Punjab
- Sindh

Source: JICA Study Team; MapCruzin.com; and http://www.mapcruzin.com/index.html

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



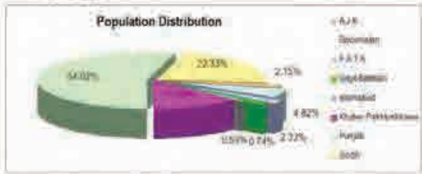
No.	District Name	No.	District Name	No.	District Name	No.	District Name	No.	District Name
A1	Bagh	B20	Nasirabad	G5	Gilgit	P2	Bahawalnagar	P31	Sahiwal
A2	Bhimber	B21	Nushki	G6	Skardu	P3	Bahawalpur	P32	Sargodha
A3	Kotli	B22	Panjgur	G7	Hunza-Nagar	P4	Bhakkar	P33	Sheikhupura
A4	Mirpur	B23	Pishin	I1	Islamabad	P5	Chakwal	P34	Sialkot
A5	Muzaffarabad	B24	Quetta	K1	Abbottabad	P6	Chiniot	P35	Toba Tek Singh
A6	Neelum	B25	Sibi	K2	Bannu	P7	D. G. Khan	P36	Vehari
A7	Poonch	B26	Zhob	K3	Batagram	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	B29	Harnai	K6	Chitral	P11	Hafizabad	S4	Hyderabad
B1	Awaran	B30	Sherani	K7	D. I. Khan	P12	Jhang	S5	Jacobabad
B2	Barkhan	D1	Disputed Area	K8	Hangu	P13	Jhelum	S6	Jamshoro
B3	Bolan	F1	Bajaur Agency	K9	Haripur	P14	Kasur	S7	Karachi
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	Jaffarabad	F5	North Waziristan Agency	K13	Lakki Marwat	P18	Layyah	S11	Matiari
B8	Jhal Magsi	F6	Orakzai Agency	K14	Lower Dir	P19	Lodhran	S12	Mirpur Khas
B9	Kalat	F7	South Waziristan Agency	K15	Malakand	P20	Mandi Bahauddin	S13	Naushahro Feroze
B10	Kech	F8	FR Bannu	K16	Mansehra	P21	Mianwali	S14	Nawabshah
B11	Kharan	F9	FR D. I. Khan	K17	Mardan	P22	Multan	S15	Qambar and Shahdadkot
B12	Khuzdar	F10	FR Kohat	K18	Nowshera	P23	Muzaffargarh	S16	Sanghar
B13	Killa Abdullah	F11	FR Lakki Marwat	K19	Peshawar	P24	Nankana Sahib	S17	Shikarpur
B14	Killa Saifullah	F12	FR Peshawar	K20	Swat	P25	Narowal	S18	Sukkur
B15	Kohlu	F13	FR Tank	K21	Shangla	P26	Okara	S19	Tando Allahyar
B16	Lasbela	G1	Astore	K22	Swabi	P27	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	Rajanpur	S22	Thatta
B19	Musakhel	G4	Ghizer	P1	Attock	P30	Rawalpindi	S23	Umerkot

Legend

District Boundary

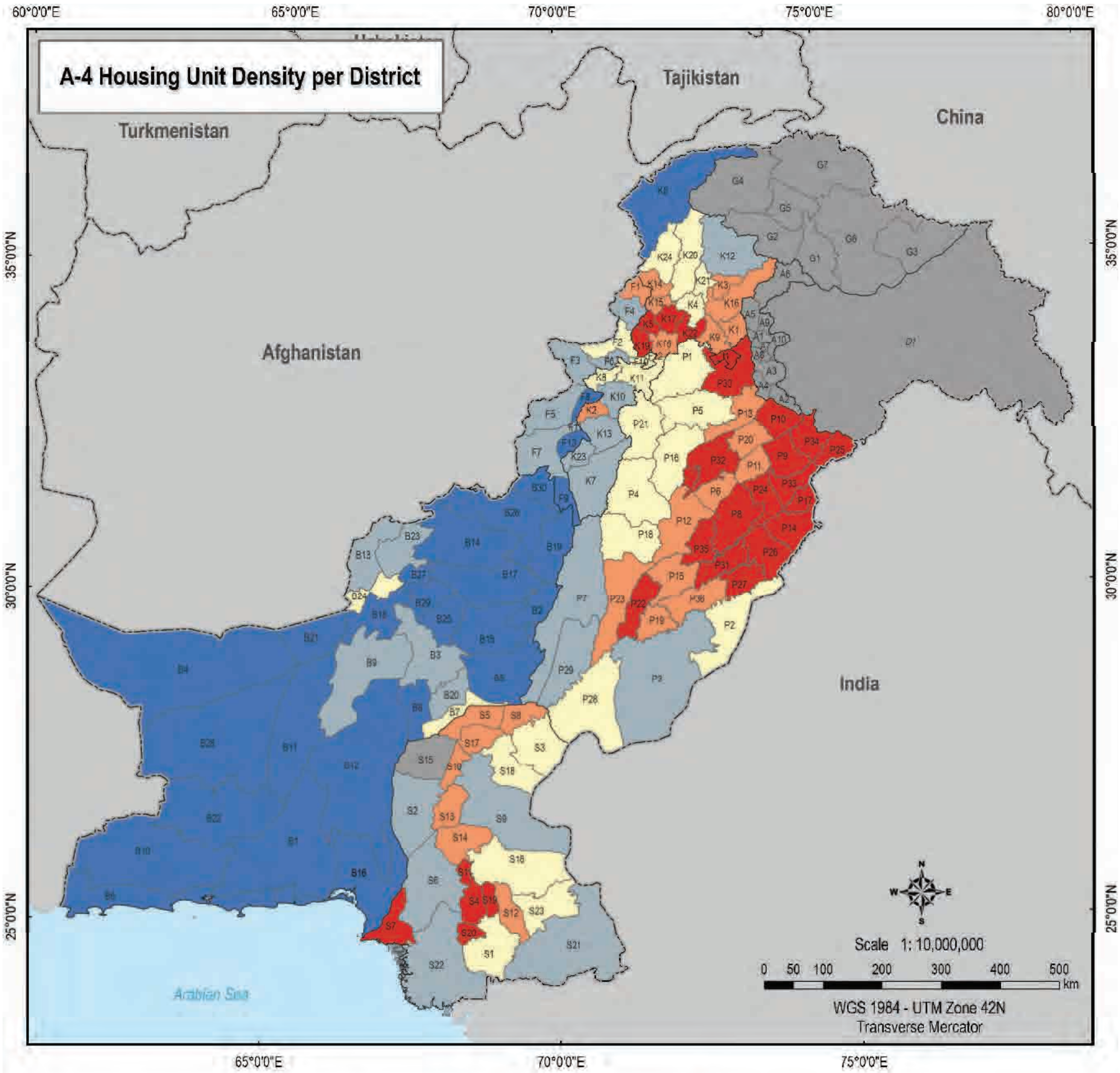
Population Density per District (person/km2)

- More than 480
- 262 - 479
- 139 - 261
- 27 - 138
- Less than 26
- No Data



Source: 1998 Census Report of Pakistan

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



No.	District Name	No.	District Name	No.	District Name	No.	District Name	No.	District Name
A1	Bagh	B20	Nasirabad	G5	Gilgit	P2	Bahawalnagar	P31	Sahiwal
A2	Bhimber	B21	Nushki	G6	Skardu	P3	Bahawalpur	P32	Sargodha
A3	Kolli	B22	Panjgur	G7	Hunza-Nagar	P4	Bhakkar	P33	Sheikhupura
A4	Mirpur	B23	Pishin	I1	Islamabad	P5	Chakwal	P34	Sialkot
A5	Muzaffarabad	B24	Quetta	K1	Abbottabad	P6	Chiniot	P35	Toba Tek Singh
A6	Neelum	B25	Sibi	K2	Bannu	P7	D. G. Khan	P36	Vehari
A7	Poonch	B26	Zhob	K3	Balagram	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	B29	Harnai	K6	Chitral	P11	Hafizabad	S4	Hyderabad
B1	Awaran	B30	Sherani	K7	D. I. Khan	P12	Jhang	S5	Jacobabad
B2	Barkhan	D1	Disputed Area	K8	Hangu	P13	Jhelum	S6	Jamshoro
B3	Bolan	F1	Bajaur Agency	K9	Haripur	P14	Kasur	S7	Karachi
B4	Chagai	F2	Khyber Agency	K10	Karak	P15	Khanewal	S8	Kashmore
B5	Dera Bugti	F3	Kurrum Agency	K11	Kohat	P16	Khushab	S9	Khairpur
B6	Gwadar	F4	Mohmand Agency	K12	Kohistan	P17	Lahore	S10	Larkana
B7	Jaffarabad	F5	North Waziristan Agency	K13	Lakki Marwat	P18	Leiah	S11	Matiari
B8	Jhal Magsi	F6	Orakzai Agency	K14	Lower Dir	P19	Lodhran	S12	Mirpur Khas
B9	Kalat	F7	South Waziristan Agency	K15	Malakand	P20	Mandi Bahauddin	S13	Naushahro Feroze
B10	Kech	F8	FR Bannu	K16	Mansehra	P21	Mianwali	S14	Nawabshah
B11	Kharan	F9	FR D. I. Khan	K17	Mardan	P22	Multan	S15	Qamber and Shahdadkot
B12	Khuzdar	F10	FR Kohat	K18	Nowshera	P23	Muzaffargarh	S16	Sanghar
B13	Killa Abdullah	F11	FR Lakki Marwat	K19	Peshawar	P24	Nankana Sahib	S17	Shikarpur
B14	Killa Saifullah	F12	FR Peshawar	K20	Sawat	P25	Narowal	S18	Sukkur
B15	Kohlu	F13	FR Tank	K21	Shangla	P26	Okara	S19	Tando Allahyar
B16	Lasbela	G1	Astore	K22	Swabi	P27	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	Rajanpur	S22	Thatta
B19	Musakhel	G4	Ghizer	P1	Attock	P30	Rawalpindi	S23	Umerkot

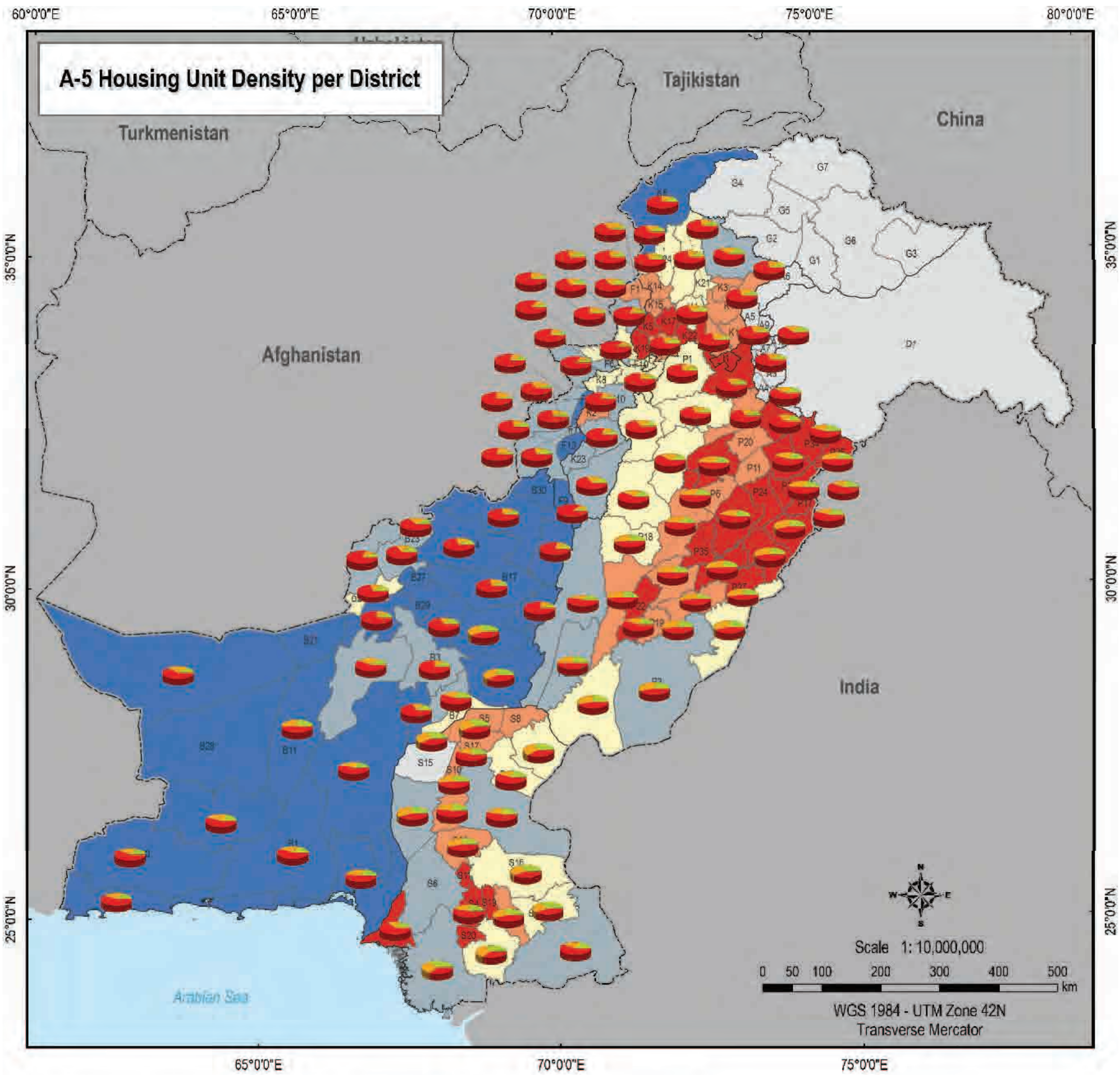
Legend

Housing Units Density per District (unit/km2)

- 80 - 500
- 50 - 70
- 30 - 40
- 5 - 20
- 1 - 4
- No Data

Source: 1998 Census Report of Pakistan

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



No.	District Name	No.	District Name	No.	District Name	No.	District Name	No.	District Name
A1	Bagh	B20	Nasirabad	G5	Gilgit	P2	Bahawalnagar	P31	Sahiwal
A2	Bhimber	B21	Nushki	G6	Skardu	P3	Bahawalpur	P32	Sargodha
A3	Kolli	B22	Panjgur	G7	Hunza-Nagar	P4	Bhakkar	P33	Sheikhupura
A4	Mirpur	B23	Pishin	I1	Islamabad	P5	Chakwal	P34	Sialkot
A5	Muzaffarabad	B24	Quetta	K1	Abbottabad	P6	Chiniot	P35	Toba Tek Singh
A6	Neelum	B25	Sibi	K2	Bannu	P7	D. G. Khan	P36	Vehari
A7	Poonch	B26	Zhob	K3	Balagram	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	B29	Harnai	K6	Chitral	P11	Hafizabad	S4	Hyderabad
B1	Awaran	B30	Sherani	K7	D. I. Khan	P12	Jhang	S5	Jacobabad
B2	Barkhan	D1	Disputed Area	K8	Hangu	P13	Jhelum	S6	Jamshoro
B3	Bolan	F1	Bajaur Agency	K9	Haripur	P14	Kasur	S7	Karachi
B4	Chagai	F2	Khyber Agency	K10	Karak	P15	Khanewal	S8	Kashmore
B5	Dera Bugti	F3	Kurrum Agency	K11	Kohat	P16	Khushab	S9	Khairpur
B6	Gwadar	F4	Mohmand Agency	K12	Kohistan	P17	Lahore	S10	Larkana
B7	Jaffarabad	F5	North Waziristan Agency	K13	Lakki Marwat	P18	Leiah	S11	Matiari
B8	Jhal Magsi	F6	Orakzai Agency	K14	Lower Dir	P19	Lodhran	S12	Mirpur Khas
B9	Kalat	F7	South Waziristan Agency	K15	Malakand	P20	Mandi Bahauddin	S13	Naushahro Feroze
B10	Kech	F8	FR Bannu	K16	Mansehra	P21	Mianwali	S14	Nawabshah
B11	Kharan	F9	FR D. I. Khan	K17	Mardan	P22	Multan	S15	Qamber and Shahdadkot
B12	Khuzdar	F10	FR Kohat	K18	Nowshera	P23	Muzaffargarh	S16	Sanghar
B13	Killa Abdullah	F11	FR Lakki Marwat	K19	Peshawar	P24	Nankana Sahib	S17	Shikarpur
B14	Killa Saifullah	F12	FR Peshawar	K20	Sawat	P25	Narowal	S18	Sukkur
B15	Kohlu	F13	FR Tank	K21	Shangla	P26	Okara	S19	Tando Allahyar
B16	Lasbela	G1	Astore	K22	Swabi	P27	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	Rajanpur	S22	Thatta
B19	Musakhel	G4	Ghizer	P1	Attock	P30	Rawalpindi	S23	Umerkot

Legend

District Boundary

Units by period of construction

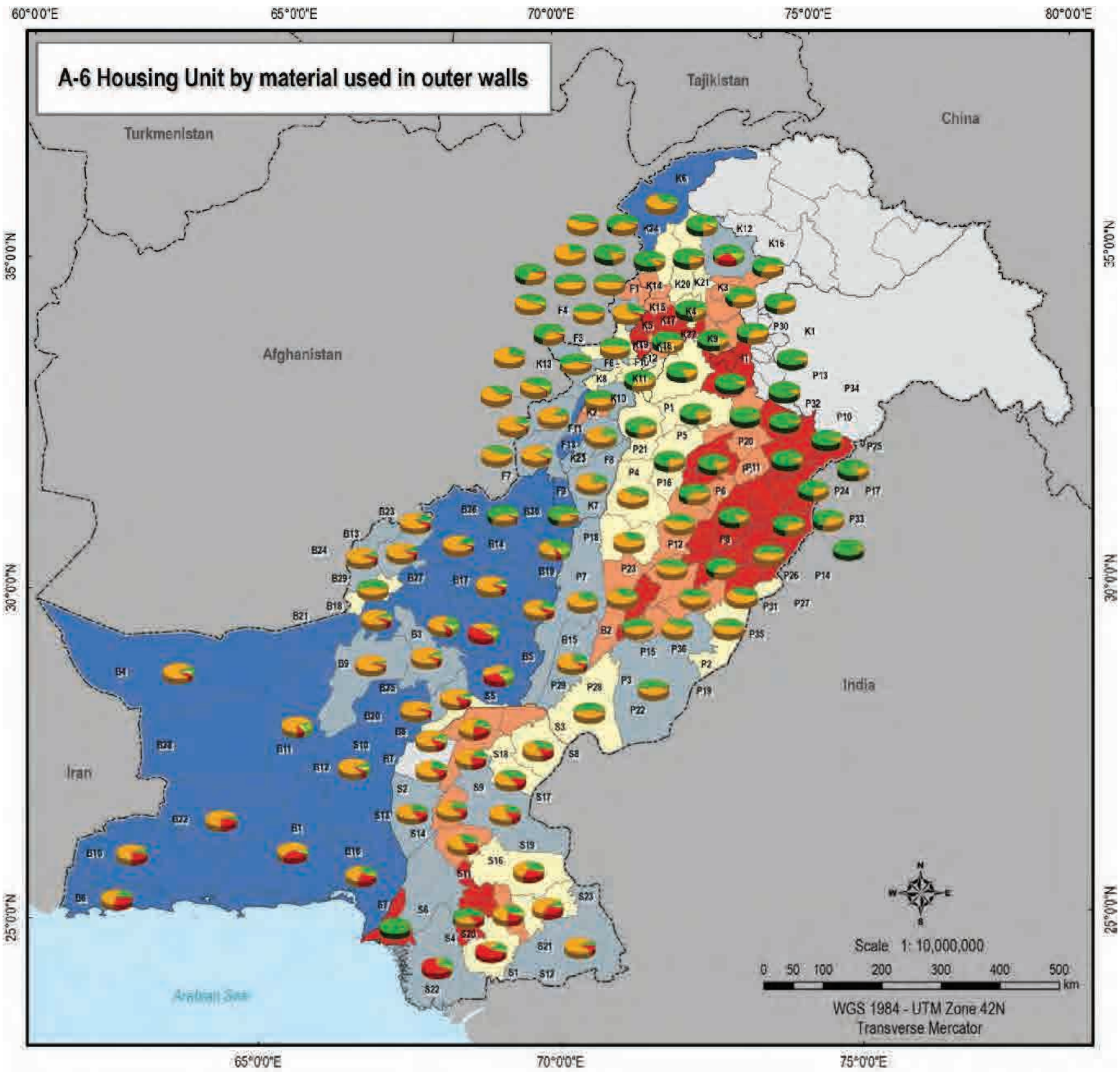
- Units under construction
- Units less than 5 years
- Units 5 - 10 years
- Units more than 10 years

Housing Units Density per District (unit/km2)

- 80 - 500
- 50 - 70
- 30 - 40
- 5 - 20
- 1 - 4

Source: 1998 Census Report of Pakistan

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



No.	District Name	No.	District Name	No.	District Name	No.	District Name	No.	District Name
A1	Bagh	B20	Nasirabad	G5	Gilgit	P2	Bahawalnagar	P31	Sahiwal
A2	Bhimber	B21	Nushki	G6	Skardu	P3	Bahawalpur	P32	Sargodha
A3	Kotli	B22	Panjgur	G7	Hunza-Nagar	P4	Bhakkar	P33	Sheikhupura
A4	Mirpur	B23	Pishin	I1	Islamabad	P5	Chakwal	P34	Sialkot
A5	Muzaffarabad	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	Batagram	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	B29	Harnai	K6	Chitral	P11	Hafizabad	S4	Hyderabad
B1	Awaran	B30	Sherani	K7	D. I. Khan	P12	Jhang	S5	Jacobabad
B2	Barkhan	D1	Disputed Area	K8	Hangu	P13	Jhelum	S6	Jamshoro
B3	Bolan	F1	Bajaur Agency	K9	Haripur	P14	Kasur	S7	Karachi
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	Jaffarabad	F5	North Waziristan Agency	K13	Lakki Marwat	P18	Layyah	S11	Matiari
B8	Jhal Magsi	F6	Orakzai Agency	K14	Lower Dir	P19	Lodhran	S12	Mirpur Khas
B9	Kalat	F7	South Waziristan Agency	K15	Malakand	P20	Mandi Bahauddin	S13	Naushahro Feroze
B10	Kech	F8	FR Bannu	K16	Mansehra	P21	Mianwali	S14	Nawabshah
B11	Kharan	F9	FR D. I. Khan	K17	Mardan	P22	Multan	S15	Qamber and Shahdadkot
B12	Khuzdar	F10	FR Kohat	K18	Nowshera	P23	Muzaffargarh	S16	Sanghar
B13	Killa Abdullah	F11	FR Lakki Marwat	K19	Peshawar	P24	Nankana Sahib	S17	Shikarpur
B14	Killa Saifullah	F12	FR Peshawar	K20	Swat	P25	Narowal	S18	Sukkur
B15	Kohlu	F13	FR Tank	K21	Shangla	P26	Okara	S19	Tando Allahyar
B16	Lasbela	G1	Astore	K22	Swabi	P27	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	Rajanpur	S22	Thatta
B19	Musakhel	G4	Ghizer	P1	Attock	P30	Rawalpindi	S23	Umerkot

Legend

District Boundary

Units by material used in outer walls

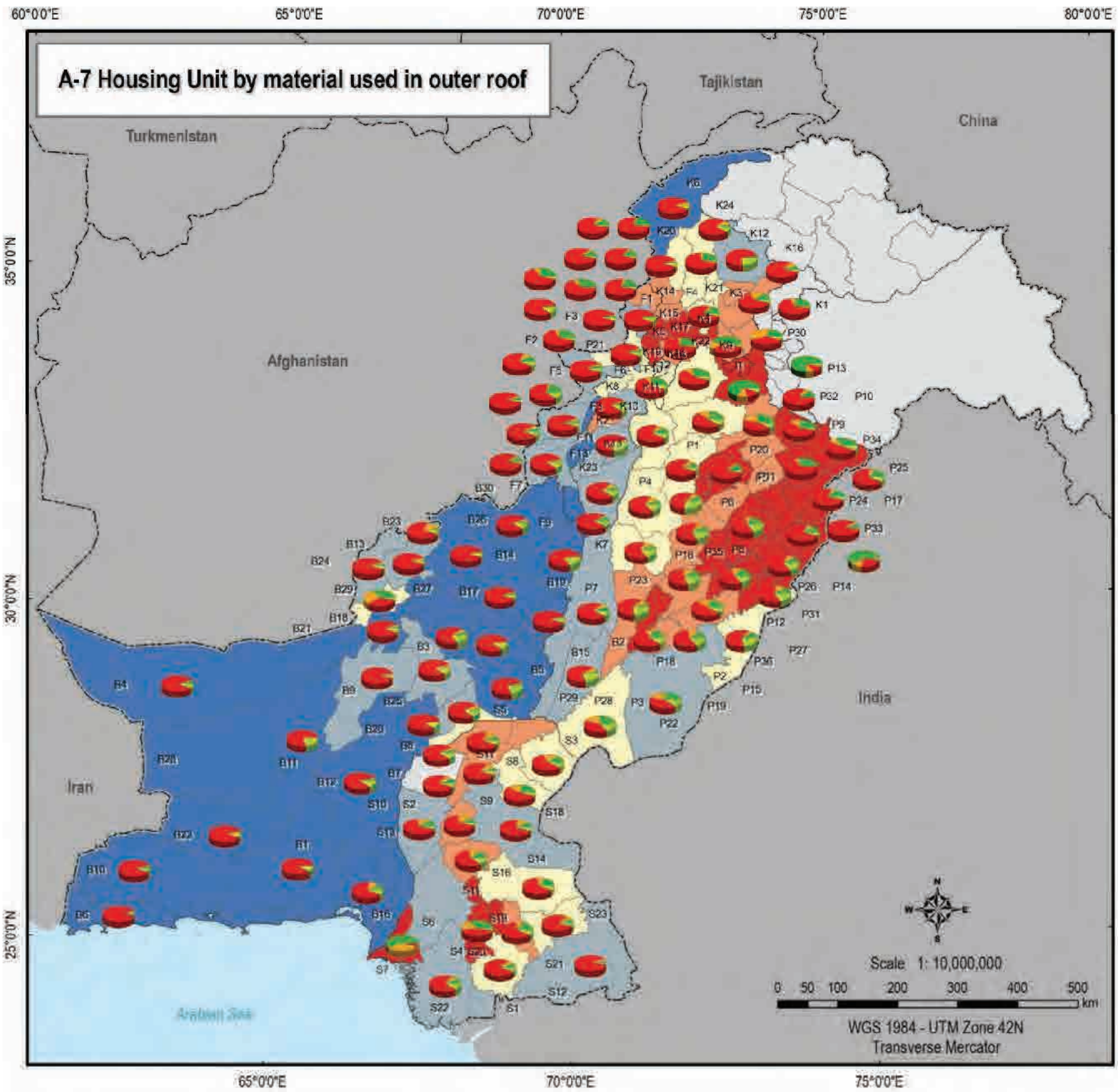
- Baked bricks/ Blocks/ Stones
- Unbaked bricks/Earth bound
- Wood/Bamboo
- Others

Housing Units Density per District (unit/km2)

- 80 - 500
- 50 - 70
- 30 - 40
- 5 - 20
- 1 - 4

Source: 1998 Census Report of Pakistan

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



No.	District Name	No.	District Name	No.	District Name	No.	District Name	No.	District Name
A1	Bagh	B20	Nasirabad	G5	Gilgit	P2	Bahawalnagar	P31	Sahiwal
A2	Bhimber	B21	Nushki	G6	Skardu	P3	Bahawalpur	P32	Sargodha
A3	Kotli	B22	Panjgur	G7	Hunza-Nagar	P4	Bhakkar	P33	Sheikhupura
A4	Mirpur	B23	Pishin	I1	Islamabad	P5	Chakwal	P34	Sialkot
A5	Muzaffarabad	B24	Quetta	K1	Abbottabad	P6	Chiniot	P35	Toba Tek Singh
A6	Neelum	B25	Sibi	K2	Bannu	P7	D. G. Khan	P36	Vehari
A7	Poonch	B26	Zhob	K3	Batagram	P8	Faisalabad	S1	Badin
A8	Sudhnuti	B27	Ziarat	K4	Buner	P9	Gujranwala	S2	Dadu
A9	Hattian	B28	Washuk	K5	Charsadda	P10	Gujrat	S3	Ghotki
A10	Haveli	B29	Harnai	K6	Chitral	P11	Hafizabad	S4	Hyderabad
B1	Awaran	B30	Sherani	K7	D. I. Khan	P12	Jhang	S5	Jacobabad
B2	Barkhan	D1	Disputed Area	K8	Hangu	P13	Jhelum	S6	Jamshoro
B3	Bolan	F1	Bajaur Agency	K9	Haripur	P14	Kasur	S7	Karachi
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	Jaffarabad	F5	North Waziristan Agency	K13	Lakki Marwat	P18	Leiah	S11	Matiari
B8	Jhal Magsi	F6	Orakzai Agency	K14	Lower Dir	P19	Lodhran	S12	Mirpur Khas
B9	Kalat	F7	South Waziristan Agency	K15	Malakand	P20	Mandi Bahauddin	S13	Naushahro Feroze
B10	Kech	F8	FR Bannu	K16	Mansehra	P21	Mianwali	S14	Nawabshah
B11	Kharan	F9	FR D. I. Khan	K17	Mardan	P22	Multan	S15	Qamber and Shahdadkot
B12	Khuzdar	F10	FR Kohat	K18	Nowshera	P23	Muzaffargarh	S16	Sanghar
B13	Killa Abdullah	F11	FR Lakki Marwat	K19	Peshawar	P24	Nankana Sahib	S17	Shikarpur
B14	Killa Saifullah	F12	FR Peshawar	K20	Swat	P25	Narowal	S18	Sukkur
B15	Kohlu	F13	FR Tank	K21	Shangla	P26	Okara	S19	Tando Allahyar
B16	Lasbela	G1	Astore	K22	Swabi	P27	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	Rajanpur	S22	Thatta
B19	Musakhel	G4	Ghizer	P1	Attock	P30	Rawalpindi	S23	Umerkot

Legend

District Boundary

Units by material used in outer roofs

- RCC / RBC
- Cement / Iron Sheets
- Wood / Bamboo
- Others

Housing Units Density per District (unit/km2)

- 80 - 500
- 50 - 70
- 30 - 40
- 5 - 20
- 1 - 4

Source: 1998 Census Report of Pakistan

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