



Disaster Preparedness for Natural Hazards Current Status in Pakistan

About the Organisations

International Centre for Integrated Mountain Development

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Disaster Preparedness for Natural Hazards: Current Status in Pakistan



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A consultancy report by
M. Asif Khan

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Foreword

Inhabitants in the Himalayan region are exposed to many natural hazards. The mountain ranges are young with an unstable geology, steep slopes, and a climate that is difficult to predict. As a result, the region is highly susceptible to natural hazards such as floods and flash floods, landslides, and earthquakes. In populated areas, these can lead to disaster. Vulnerable groups – the poor, women, and children – are often hit hardest.

Since its establishment in 1983, ICIMOD has dedicated much of its work to examining ways to reduce the risk of disasters from natural hazards, thereby working towards the decreased physical vulnerability of people in the Hindu Kush-Himalayas. This work has encompassed training courses, hazard mapping, landslide mitigation and control, mountain risk engineering, watershed management, vulnerability assessment, and much more. ICIMOD has also fostered regional and transboundary dialogue for improved management of both the resources provided and the risks threatened by the big rivers in the Himalayan region; sharing of hydro-meteorological data and information among the countries in the region is of particular importance for mitigating the risk of riverine and flash floods in the major river basins.

This publication is one of a series produced under the project ‘Living with risk – sharing knowledge on disaster preparedness in the Himalayan region’, implemented by ICIMOD during a 15-month period in 2006 and 2007. The project was funded by the European Commission through their Humanitarian Aid department (DG ECHO) as part of the Disaster Preparedness ECHO programme (DIPECHO) in South Asia, and by ICIMOD. Through this project, ICIMOD has endeavoured to encourage knowledge sharing and to strengthen capacity among key practitioners in the field of disaster preparedness and management. This has been done through training courses, workshops, knowledge compilation and dissemination, and the establishment of a website (www.disasterpreparedness.icimod.org).

The publications resulting from this project include baseline assessments of the disaster preparedness status in the four target countries (Bangladesh, India, Nepal, and Pakistan); case studies and a framework on local knowledge for disaster preparedness; and gender and vulnerability aspects in disaster risk reduction. The publications, training sessions, and workshops were undertaken in the context of the ‘Hyogo Framework for Action 2005-2015’ which recommends that regional organisations should promote sharing of information; undertake and publish baseline assessments of disaster risk reduction status; and undertake research, training, education, and capacity building in the field of disaster risk reduction.

The long-term mission to bring the Himalayan region to an acceptable level of disaster risk has only just begun. The countries in the region are among the most disaster prone in the world in terms of number and severity of disasters, casualties, and impact on national economies. Only by strong commitment, hard work, and joint efforts can this situation be improved. It is ICIMOD's hope that our collective endeavours will help improve disaster risk reduction in the mountain region we are committed to serve.

Dr. Andreas Schild
Director General
ICIMOD

Preface

This report is one of four status reports on disaster preparedness planning covering four countries; viz., Bangladesh, India, Nepal, and Pakistan. The purpose of these reports is to provide an opportunity for the reader to get a quick overview of the current status on documents in place and the institutions governing the implementation of these documents in the respective countries.

The reports are consultancies undertaken as part of the project 'Living with risk – sharing knowledge on disaster preparedness in the Himalayan region', implemented by ICIMOD. It was funded by the European Commission through its Humanitarian Aid Department (DG ECHO) as part of the Disaster Preparedness ECHO Programme (DIPECHO) in South Asia, and by ICIMOD. The project takes off from the Hyogo Framework for Action 2005-2015 (HFA) which provides guidance on the roles regional organisations, such as ICIMOD, can play in long-term work towards reducing the risks of disaster. One recommendation by HFA is to undertake and publish baseline assessments of the status of disaster risk reduction.

As part of this project, a 'regional workshop on disaster preparedness plans' was held in Kathmandu in August 2006. The main objective of this workshop was to discuss the status of disaster preparedness as reflected in policies, strategies, plans, and other relevant documents available, or being developed, in the four countries. Particular interest was given to identifying gaps and shortcomings in the functioning and implementation of these guiding documents. First drafts of these country status reports were prepared for the workshop and formed the basis for the discussion and gap analysis. The reports have since been updated, improved, and extended. The outcome of the workshop was summarised in 15 concluding points, highlighting the status of disaster preparedness (DP), in particular, and disaster management (DM), in general, in the region. These 15 concluding points follow below.

The complete compilation of all documents at all governance levels, covering all types of disaster and providing full descriptions of all implementing institutions is an immense task, and it is beyond the scope of this project. ICIMOD has a mandate to focus primarily on mountain hazards, and therefore the scope of the consultancy has been to cover earthquakes, landslides, and floods, including flash floods (see Annex 1 for Terms of Reference). Furthermore, the study focused on documents and institutions governing disaster preparedness planning at the central, national level, with more limited coverage given to district and community levels. Hence, the reports are not

exhaustive in terms of covering all natural hazards. Nevertheless, the documents and institutions governing disaster preparedness at the national level do, in many cases, take a multi-hazard approach. In conclusion, the present document will give the reader a good, albeit quick, overview of the status of disaster preparedness planning for natural hazards. As such, it is the hope of ICIMOD that it will prove helpful as a source of information and thereby support the joint efforts undertaken by many government and non-government organisations towards a Himalayan region that is better prepared to mitigate the impacts of disasters.

Dr. Mats G. Eriksson
Water, Hazards and
Environmental Management
ICIMOD

Conclusions from the Regional Workshop on Disaster Preparedness Plans for Natural Hazards (Kathmandu, 7-9 August 2006)

General Observations

1. Disaster preparedness (DP) has to be approached **holistically** because it is difficult to isolate preparedness from other components of disaster management (DM) such as reduction, response, and recovery.
2. A **paradigm shift** in DM from a relief-driven approach to a more preparedness-driven approach is occurring.
3. **Local communities** should be at the centre of DM plans. They are the first victims of natural hazards and the first respondents.

Development and Vulnerable Groups

4. DM should be integrated into **national development plans** for improved sustainable livelihoods and poverty reduction.
5. A **multi-hazard approach** is crucial as most communities are exposed to hazards that have interacting and cascading effects.
6. **Vulnerable groups** and marginalised people are insufficiently addressed in DM plans.

Institutions and Policies

7. The **political will** to direct sufficient resources is essential for the efficient implementation of existing DM plans.
8. Planning for DM is an iterative **process** that should be based on the efficient use of already existing resources.
9. **Roles and responsibilities** for DM of all stakeholders at the national, regional, and local levels need to be clarified. DM should be a priority on the national political agenda.

Knowledge and capacities

10. **Local knowledge** should be respected and combined with other knowledge to improve the design and implementation of DM activities.
11. **Learning** from past disaster events through research and documentation is important in order to anticipate and respond to future disasters more effectively than is currently the case.
12. **Education and training** in DM is necessary for awareness and capacity building of all stakeholders.

Communication and Cooperation

13. **Insufficient coordination** prevails among key actor in the field of DM.
14. Functional and **efficient communication** among key actors at local, national, and international levels needs to be improved.
15. **Data and information sharing** at a regional transboundary level needs to be strengthened and requires appropriate capacity and technology.

Executive Summary

This report reviews the status of disaster management, especially in the context of preparedness, in Pakistan. Whereas Pakistan faces a number of disasters of natural origin, such as floods, earthquakes, landslides, debris flows, avalanches, drought, and, to a lesser extent, tsunamis and tornadoes, the scope of this report is limited to floods, earthquakes, and landslides.

Disasters caused by natural hazards have played a major hindrance in economic development and poverty reduction in South Asia, especially in Pakistan. On the one hand, Pakistan has one of the highest growth rates, resulting in its being the third fastest growing population in the world, and this is resulting in urban as well as rural expansion in hazard-prone areas. On the other hand, Pakistan has a geographic and physiographic location that presents risks for natural disasters of the highest possible order. The great losses of lives and property in the Kashmir earthquake (2005) are sufficient to portray the harsh realities of natural disasters threatening Pakistan.

Earthquakes are not the only threat; over 2,000 people have died in floods in the last 50 years. Every year, hundreds die because of flash floods, debris flows, and landslides, with considerable loss of property, roads, agriculture, and livelihoods. Under these circumstances, one would expect Pakistan to be amongst the leading nations in disaster management. Unfortunately, this is not the case as revealed by the 2005 earthquake disaster.

Disaster management in Pakistan prior to the 2005 earthquake has been unidirectional, focused on river floods. For this disaster, Pakistan has succeeded in developing institutions which not only carry out mitigation measures through engineering structures and early warning systems, but have developed an efficient mechanism for rescue, relief, and short-term recovery also. The principal institutions involved in this disaster management practice include the 1) Pakistan Flood Commission, 2) Flood Forecasting Division, Pakistan Meteorological Department, 3) Federal and Provincial Relief Commissions, 4) District Government, and 5) Pakistan Army. Major shortcomings include 1) lack of documented preparedness plans clearly outlining responsibilities, coordination, and standard operating procedures, 2) minimal community involvement, 3) lack of plans and measures for long-term rehabilitation, and 4) sole dependence on the Pakistan Army, especially for search and rescue. While Pakistan's status for management of disasters from river floods may be rated satisfactory, flash floods continue playing havoc with life and property every year and Pakistan has a long way to go to cope effectively with this disaster.

Disasters caused by earthquakes, landslides, and debris flows are relatively less predictable in time and locale and Pakistan has made little effort to cope with them. On paper, Pakistan has Crisis Management Cells (Ministry of the Interior) at both the federal and provincial levels, which are the levels to take action first in case of an emergency. However, firstly, natural disasters have never been the focus of the Crisis Management Cells; rather these are primarily geared towards emergencies arising from security-related internal and external threats. Secondly, there is no well-defined institution to activate in case of an emergency arising from a natural disaster, apart from the Pakistan Army. Pakistan has a Civil Defence Department meant for disaster response, but over the years this department has remained in a dismal condition in terms of both management as well as funding and is virtually non-existent in terms of effectiveness.

Pakistan's concept of preparedness for natural disasters has remained restricted to relief. Institutions such as the Emergency Relief Cell at federal level and Relief Departments at provincial level have coordinated plans for storage and supply of relief goods (tents, medicine, and blankets) all the way to district level, and these are distributed in the communities affected. However, there is no institution in the country for mitigation, preparedness, response (other than relief – including search, rescue, evacuation, and emergency medical and food services), and rehabilitation. Over the years, these shortcomings have been dealt with by the Pakistan Army, which not only carries out rescue and evacuation activities, but also provides short-term shelter, medical services, and food. Until after the 2005 earthquake, the concept of long-term rehabilitation for communities affected was lacking almost completely.

Preparedness for natural disasters involves tedious scientific activities carried out by dedicated institutions. For instance, for earthquake disasters it is imperative to have sound seismic zonation defining expected ground shaking (in terms of peak ground acceleration [PGA]) which is incorporated in appropriate building codes setting a minimum engineering standard for buildings in each zone. This practice needs reliable data on seismicity, as well as strong motion, throughout the country. Unlike Pakistan Flood Commission, which is a dedicated body dealing with research and development in river flood hazards, there is no institution in Pakistan dedicated to earthquake hazards. In Pakistan, the Meteorological Department deals with earthquakes, and this is not only beyond its capacity in terms of expert manpower and instrumentation, but also is far too much of a burden considering its crucial focus on weather-related issues, climatology, and flood forecasting. The lack of a dedicated institution for earthquake hazards has resulted not only in lack of reliable seismicity, ground motion, and neotectonic data, but also has hindered development of appropriate earthquake-resilient building codes and their implementation. Likewise, data and maps for flash-flood, landslide, and debris-flow vulnerability are lacking, and this hinders mitigation and preparedness for the threats these disasters pose.

Whereas the 2005 Kashmir earthquake has been the biggest tragedy in Pakistan's history in terms of loss of life, property, livelihoods, and overall economics of the country, it served as a severe jolt in terms of the need for preparedness for natural disasters. Pakistan formulated a dedicated institution called the Earthquake Reconstruction and Rehabilitation Authority (ERRA) which took over from the Relief Commission and is now pursuing a concerted programme of rehabilitation and reconstruction. Pakistan has constituted another institution recently called the National Disaster Management Commission (which encompasses Disaster Management authorities from federal, through provincial, to district level). With experience from the 2005 earthquake, satisfactory disaster management against floods, and a national character endowed with sacrifice and volunteerism, Pakistan has an optimistic outlook for the future in terms of disaster preparedness.

Acronyms and Abbreviations

AJ&K	Azad Jammu and Kashmir
COSPAS-SARSAT	satellite aided search and rescue programme
ERRA	Earthquake Reconstruction and Rehabilitation Authority
ERC	(1) Emergency Resource Centre (2) Emergency Relief Cell
FATA	Federally Administered Tribal Areas
FFC	Federal Flood Commission of Pakistan
FFD	Flood Forecasting Division
GRA	Gas Regulatory Authority
HID	Human and Institutional Development Programme
ISRIP	Innovation and Science Research Investment Programme
JCSC	Joint Chiefs of Staff Committee
JICA	Japanese Agency for International Development
NDMA	National Disaster Management Authority
NORAD	North American Aerospace Defence Command
NWFP	North West Frontier Province
PCMC	Provincial Crisis Management Cells or Centres
PEC	Pakistan Engineering Council
PGA	peak ground acceleration
PMD	Pakistan Meteorological Department
SOP	Survey of Pakistan
SUPARCO	Pakistan Space and Upper Atmosphere Research Commission
WAPDA	Water and Power Development Authority

Glossary

tehsil	sub district
zila	district
zila nazim	head of a district
nullah	drainage channel, man-made or natural

In 2007, US\$ 1 = 60 Pakistani rupees (approx)

Some Key Terms

Capacity – A combination of all the strengths and resources available within a community, society, or organisation that can reduce the level of risk, or the effects of a disaster.

Disaster – A serious disruption of the functioning of a community or a 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.

Disaster risk reduction (disaster reduction) – The conceptual framework of elements considered with the possibilities to minimise 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.

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

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

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.

Resilience/resilient – The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. It is determined by the degree to which the social system is capable of organising itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Risk – The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted, or environmental damage) resulting from interactions between natural or human-induced hazards and vulnerable conditions. Conventionally risk is expressed by the notation $\text{Risk} = \text{Hazards} \times \text{Vulnerability}$. Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability. A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk.

Risk assessment or analysis – A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend.

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.

Adapted from UN/ISDR (2004)

Chapter 1

Introduction

Natural disasters are caused by rapid and extreme changes in the geophysical system (lithosphere, hydrosphere, biosphere or atmosphere); and they most frequently occur as floods, landslides, debris flows, avalanches, drought, and earthquakes.

With the global population increasing at a rate of 80 million/year, there is an uncontrolled extension of settlements in the regions prone to natural hazards, increasing their vulnerability to disasters. According to Van Westen (2002), weather-related disasters have resulted in an eight times increase in economic losses over the past four decades. Less developed countries, which host two thirds of the world's population, suffer 95% of the losses from disasters.

Adequate and comprehensive disaster management is the only way of dealing with disasters. Disaster management involves policies, administrative decisions, and operational activities related to various stages of disaster. With effective disaster management strategies, it is possible to avoid or reduce the impact of disasters (Montoya 2002). The main objective of disaster management is to increase preparedness, provide early warning, monitor the hazard in real time, assess the damage, and organise relief activities (Ayanz et al. 1997). Prevention of disasters caused by natural phenomena is extremely demanding in terms of expertise, technology, and resources. Montoya (2002) divided disaster management into four phases: mitigation, preparedness, response, and recovery, and each involves a great deal of effort and skills.

Underdeveloped countries are hard pressed to provide basic necessities such as water, food, roads, education, and health to the population with no or few resources left to prepare for disaster control. Pakistan is no exception. Hard pressed for economic resources and rapid population growth combined with political and security issues at domestic, regional, and international level, disaster management has received the least priority in the country. The impact of natural disasters in Pakistan can be judged by the fact that 6,037 people were killed and 8,989,631 affected in the period from 1993-2002 (IFRCRC 2003). Since 2002 more than three earthquakes exceeding magnitude 6 have struck northern Pakistan. Whereas the Astor Earthquake (2002) and Upper Hazara Earthquake (2003) resulted in casualties amounting to 36 and 17 respectively, more than 85,000 people lost their lives in the October 2005 Kashmir

earthquake. Many lives were lost to landslides, debris flows, and floods following the earthquake, with hundreds at risk in the monsoon season of 2006 -2007.

This report assesses Pakistan's preparedness for effective response to disasters caused by natural hazards. Unfortunately, Pakistan's formulated plans for disaster preparedness are virtually negligible: the emphasis is rather on mitigation through structural measures or relief as and when the need arises. Plans, including response through prior evacuation from threatened locations, timely and effective search and rescue, and long-term relief and rehabilitation, are non-existent.

This status report covers disaster preparedness plans and includes information on related aspects in the broad context of disaster management. Since the earthquake in 2005, several disaster management plans have been formulated and institutions established; however, most of them are in their infancy, and their long-term impact and effectiveness are yet to be evaluated. Nevertheless, they do reflect a renewed focus on disaster preparedness in Pakistan and are included in this report.

Chapter 2

Natural Hazards in Pakistan

Pakistan is a country with diversity not only of people, cultures, and traditions but also of physiography. A phrase from the Pakistan Handbook (Mannheim and Winter 1996) states that it has “an almost unbelievable range of landscapes and environments; mighty rivers and huge deserts; and fertile plains, thick forests, and towering mountains.” From another perspective, this landscape is a perfect recipe for disasters caused by natural hazards.

Much of the northern areas of Pakistan are covered by the mountains of the Himalayas, Karakoram, and Hindu Kush, and the inhabitants face winter snow storms and blizzards, which often result in snow avalanches. At the same time, much of the southern and western areas of Pakistan suffer acute drought; and this seems to have been the case frequently in the last ten years. The extremely dry, hot climate in early summer causes catastrophic snow melting, often resulting in floods; and, once in every ten years, monsoon rains play havoc with life and property by causing flash floods and exceptional rises in water levels in the country’s major rivers. The result of this is flooding throughout large tracts of the country all the way to Karachi on the shores of the Indian Ocean.

Slope stability is a major issue in the mountainous areas of Pakistan, especially early in the spring season when Pakistan receives rainfall from the westerlies and in the summer during the monsoon rains. None of these hazards, however, has caused greater loss of life and property than earthquakes. In the past 75 years, Pakistan has been hit by three earthquakes exceeding magnitude 7.5 (Quetta 1935; Makran 1945; and Kashmir 2005) with total loss of life exceeding 120,000. According to Bilham et al. (2001), the next major earthquake in the Himalayas (including Pakistan, India, and Nepal) might kill more than a million people, which will not be surprising considering the active geodynamic setting of the Himalayas and the rapid rate of population growth and growing urbanisation.

This report concentrates on only three of the natural hazards mentioned above: floods, landslides, and earthquakes. Snow blizzards and avalanches in the high mountains in

north Pakistan and drought hazards in the Punjab, Sindh, and Baluchistan provinces are quite devastating also, but they are beyond the remit of this report.

Floods

Over the years, major floods have occurred in almost all the countries of South Asia, causing huge loss of life and property. Despite huge investments in river control in the region, the frequency of major flood disasters has actually increased over the past three decades. There is a growing consensus that the impacts of climate change may well lead to an increase in both the frequency and magnitude of floods (Kennedy 2004).

Like elsewhere in the world, floods in Pakistan are of two types: riverine and flash floods. Whereas the former is a substantially greater hazard in terms of extent of area and population affected, flash floods are deadlier because of their unpredictable nature.

Riverine floods

A riverine flood is caused by flooding of the river outside its regular boundaries. This can be accompanied by a breach of dykes or abutments next to the river. Such floods can be due to dense precipitation (not necessarily in the flooded area) or other causes such as melting snow or blockage in the river flow. In general, extreme river discharges can be predicted some time in advance (Jonkman 2005).

Much of Pakistan is drained by the Indus Basin that spans four countries of South-Central Asia (Afghanistan, China, India, and Pakistan), covering an area of one million sq. km. About 56% of the Indus Basin lies in Pakistan, covers 70% of the area (IUCN 2005), and is inhabited by 150 million people (UNESCO 2001). The Indus is the principal river in the region with the Chennab, Jhelum, Kabul, Ravi, and Sutlej rivers being the major tributaries. The major component of the annual flow of these rivers is derived from snowmelt, originating in the Hindu Kush-Himalayan region. Many of the catchment sources are in India but, because of its location downstream, the flood impact is greater in Pakistan than in the other three countries (Afghanistan, China, and India).

A combination of one or more of four major factors causes river floods in Pakistan.

- Monsoon torrential rains in the months of July and August
- Westerlies from the Arabian and Mediterranean seas in winter
- Excessive melting of snow in spring and early summer
- Natural damming and subsequent outbursts because of landslides, debris flows, or glacier advances (glacial lake outbursts can be an additional cause of floods in Pakistan.)

Usually, the late spring and early summer months (April-June) are dry in the Himalayas and associated with extremely high temperatures which result in catastrophic melting of the snows. This situation has been aggravated in recent years because of regional climate changes. The 2005-2006 floods in the North West Frontier Province (NWFP) were a result of this phenomenon. The heavy monsoons last from July to August, but recently they have begun to last into the month of September. Both these mechanisms are more effective in the catchments than in the Indus River Basin itself. The monsoon low or depression that causes intense rain develops in either the Arabian Sea or in the Bay of Bengal. Heavy flooding is associated with the depression from the Bay of Bengal moving across India in a west/north-westerly direction and then turning north at the border with Pakistan.

The Indus Basin is prone to flooding also because of collapse of temporary natural dams formed by glacial movements and landslides (including earthquake-triggered) and glacial lake outburst floods (GLOF). A recent study (ICIMOD 2005) found that of the 2,420 glacial lakes in the Indus Basin, 52 lakes are potentially dangerous and can result in GLOFs with consequent damage to life and property.

During flooding, the major rivers inundate areas along their banks, damage irrigation and communication facilities across or adjacent to the rivers, and cause erosion of land along the river banks. In the upper reaches of the Indus Basin, flood waters spilling over the river banks generally return to the river. However, in the lower reaches of the Indus River, which is flowing for the most part at a higher elevation than adjoining lands, overflows do not return to the river. This extends the period of inundation, resulting in extensive damage. Although embankments have been built for flood protection along almost the entire length of the river in Sindh Province and in many locations in the upper reaches, embankment breaches still occur. Such breaches often cause greater damage than would have been the case had there been no embankments, because of the intensification of land use following the provision of flood protection.

The existing discharge capacity of some of the infrastructure (barrages and rail or road bridges) on the Indus, Chenab, and Ravi is inadequate. During exceptionally high floods this results in afflux on the upstream side, which sometimes results in breaches in flood embankments. At times, the flood embankments have to be deliberately breached at pre-selected locations to save the main barrages and other vital settlements and installations.

Table 1 gives an idea of losses caused by flooding and the economic costs over the last fifty-eight years. Damage to agricultural and communication infrastructure alone by the ten largest floods cost Rs 225 billion (US\$ 4 billion).

Table 1: Historical flood damage in Pakistan

Year	Value of Property Damaged (million Rs)		Lives Lost	Villages Affected
	Unadjusted	Adjusted		
1950	200	11,282	2,190	10,000
1956	156	7,356	160	11,609
1957	152	6,958	83	4,498
1973	5,137	118,684	474	9,719
1976	5,880	80,504	425	18,390
1978	4,478	51,489	393	9,199
1988	6,879	25,630	508	1,000
1992	34,751	69,580	1,008	13,208
1995	6,125	8,698	591	6,852
2001	45	450	219	50
2003	5,175	5,175	484	4,376
2004	15	15	85	47
2005	Not Reported		59	1,931
Total	64,208	380,631	6,051	84,525

For the years from 1950 to 2001, the costs are adjusted to 2002 price levels.

Source: Federal Ministry of Water and Power

Flash floods

Whereas most large-scale floods are associated with overflow of rivers, flash floods are caused by intense rainfall in a limited area in a short span of time. Typically, flash floods occur when there is an abundance of atmospheric moisture, combined with absence of vertical wind shear. Flash flooding can be produced by large, slow-moving storms or as a result of 'train effect' storms (i.e., sequential mature storms that release precipitation over the same area). Train effect storms can be part of a multi-cell cluster or squall line storm systems. Flash floods can also result from an unanticipated break in or collapse of a flood protection embankment when stored water engulfs vast areas outside the natural flood plains with a sudden rise and speed. This precludes adequate warning and proper evacuation measures.

Flash floods move at incredible speeds, can roll boulders, tear out trees, destroy buildings and bridges, and scour out new channels. Murderous walls of water reach 10–20 ft in height. On small streams, especially near the headwaters of river basins, water levels may rise quickly in heavy rainstorms, and flash floods can begin before the rain stops falling. There is little time between detection and flood crest. Swift action is essential for the protection of life and property.

A large tract of mountainous country in both the north (Karakoram, Hindu Kush, and the Himalayas) and in the west (the Khyber-Kurram-Wiziristan-Suliaman-Kirtahar belt)

is characterised by moderate to very steep slopes and, during the monsoons, they are susceptible to flash floods. Although the mountains in Pakistan experience the monsoons in the waning stages after they have swept through India and other areas of Pakistan, every few years or so the monsoons can be exceptionally intense and still moisture-laden when they strike the mountain fronts in Pakistan. Such incidences cause flash floods in parts of Kashmir, Hazara, Swat, and the Peshawar Plain. Less commonly, a similar phenomenon is observed in the western mountainous belt.

The steep, sediment-laden slopes in the hinterlands in the Himalayas, Karakoram, and Hindu Kush are prone to mass movements of rocks and sediment in the wake of flash floods. The region is, however, characterised by an arid climate with a very little annual rainfall, and this helps keep a delicate balance intact. Every ten to fifteen years, this exception is over-ruled when monsoons are so intense that they cross mountain barriers in the frontal region reaching as far inside as Baltistan, Hunza, Kohistan, and Chitral. When this happens, torrential rains of the least intensity can trigger severe flash floods giving rise to highly dangerous debris and mud flows. Almost the entire population in this region inhabits alluvial and debris fans located on river banks, leaving them highly susceptible to flash floods and associated debris flow hazards.

Almost every year one or more parts of the mountainous areas suffer from flash floods, although there are no systematic records of them. In 2006, however, records show that several mountain areas were subjected to flash floods: 1) Bolan-Sibi area in Baluchistan, 2) Charsada, Mardan, Mansehra, and Batagram districts in NWFP, and 3) Baltistan district in the Karakoram.

Earthquakes

Pakistan is bounded by active plate boundaries marked by the collision of India and Eurasia in the north and India and the Afghan Block in the west. Although the initial collision occurred at ~60 Ma (Beck et al. 1995), the compression is ongoing as shown by an up to 35 mm/year shortening across the Himalayas, reflected in recent data acquired using global positioning system technology (Bendick et al. 2007). Bilham et al. (2001) rightly pointed out that the Pakistan Himalayas, which had not had an earthquake in the recent past, was susceptible to an earthquake of a magnitude of ~8 in response to strain accumulation caused by ongoing compression in the region. The Kashmir earthquake of 2005 (7.6 M) is a product of that compression and killed over 80,000 people and made another 400,000 homeless. With the exception of this Kashmir earthquake of 2005, the Pakistan Himalayas, Karakoram, and Hindu Kush had not had an earthquake of $M > 7$ in a 100 years according to historical records, although there had been others through the centuries (Bilham 2004). This shows that the lack of earthquakes in the Pakistan Himalayas in the recent past was not because of lack of seismic activity in the region, but rather because of the long

recurrence intervals associated with earthquakes in this part of the world. Seismic activity causing moderate to small earthquakes <7 M is frequent, suggesting that the region is seismically active. Table 2 presents several earthquakes in the recent past with magnitudes of from 5-7 M.

Table 2: Significant earthquakes in Pakistan and its immediate surroundings

Year	Epicentral Location	Magnitude	Fatalities	Source
Northern Pakistan				
2002-11-20	Astor	6.5	25	Hughes 2003
1981-09-12	Darel	6.0		Jackson & Yielding 1983
1972-09-03	Haraman	6.0		Jackson & Yielding 1983
2005-10-08	Kashmir-Hazara	7.6	80,361	ERRA 2006
1974-12-28	Pattan	6.0	994 killed, 1845 disabled	Ambraseys et al. 1975; 1981; Jackson & Yielding 1983
Western Pakistan				
1945-11-28	Makran coast.	8.3	4,000	Gates et al. 1997
1935-05-30	Quetta	7.5	30,000-60,000	
1992	Chaman		?	
1931	Machh	7.3	?	
Southeastern Pakistan				
1819-06-16	Allah Bund, Rann of Kuchch	7.7	?	Bilham 1998
2001-06-21	Bhuj (India)	Mw 7.7, Ms8	20,000	Rastogi 2001; Hough et al. 2002

Unlike the northern boundary, the western boundary of Pakistan defined by the Chaman strike-slip fault, Sulaiman-Kirthar ranges, and the Makran subduction zone have had several major earthquakes in the last 100 years (Table 2). Of these the deadliest earthquake was that in Quetta in 1935 that killed over 30,000 people, although the Makran 1945 earthquake was largest in terms of magnitude (8.3).

A third region of significant seismic potential lies in the southeastern corner of Pakistan called the Kuchch Seismic Zone. In the past 200 years two major earthquakes have occurred at or close to Pakistan's border with Gujarat in India (Table 2). None of these two major earthquakes caused any damage to Karachi, although the Bhuj earthquake (2001) resulted in the deaths of 16 people in Hyderabad and its surrounding areas.

With a tectonic locale near the active plate boundaries with potential for great earthquakes ($M > 8$), and a population growth rate $> 2\%$ /year, Pakistan is extremely vulnerable to earthquakes, and none of the other natural hazards facing Pakistan has greater potential for loss of lives and livelihoods. Since there is no definite technique for predicting an earthquake, mitigation and preparedness revolves around realistic

seismic hazard assessment. This helps to identify areas and regions vulnerable to earthquakes and the expected range of seismic shaking in terms of peak ground acceleration (PGA), development of building codes appropriate to PGA expected, and well-prepared planning and execution of search, rescue, evacuation, relief, and rehabilitation operations.

Landslides

Landslides are different from floods and earthquakes in that they are typically restricted to mountainous areas. Of the mountainous areas of the country, Hazara and Swat are particularly vulnerable because of steep unstable slopes, higher than average rainfall, and large populations (total population ~10 million). Chitral, Kohistan, Gilgit, and Baltistan further to the north are high mountain areas, with even steeper slopes than Hazara and Swat, but have relatively less annual rainfall and smaller populations. These regions have important regional as well as international routes (e.g., the Karakoram Highway linking Pakistan to China) which are constantly under threat from landslides.

Landslides in Pakistan are triggered by natural causes as well as by man-made activities. Activities like uncontrolled deforestation, excavation (for foundations, roads, and irrigation channels), and disturbing the natural drainage upset the critical slope-stability balance triggering landslides. A recent example of a landslide triggered by human activities was reported from Swat in 2006: several houses were carried away by a landslide killing 17 people. This was triggered by blockage of an irrigation channel on a steep slope.

Steep, unstable slopes trigger landslides because of natural causes like unusually heavy rains and earthquake tremors. Huge landslides bring heavy rock falls, some of the rocks weigh tons.

Areas that are extremely prone to landslides are located in the northern mountains. South-central Karakoram has a zone of active faulting and NW-directed thrusting in the Nanga Parbat-Haramosh region (Madin et al. 1989) characterised by a very high rate of denudation and river incision (as much as 8mm/yr since the last Pliocene) (Zeitler et al. 1989; Burbank et al. 1996). Geomorphic activity is extreme by global standards, especially the work of snow avalanches, glaciers, rock falls, rockslides, and debris flows (Hewitt 1968, 1993; Goudie et al. 1984). The earliest historical accounts of large mass movements are found in Conway (1894), de Filippi (1912), and Godwin-Austen (1864). First-hand accounts also testify to the great scale and devastation of landslides triggered by earthquakes (Mason 1914; Cockerill 1902; Hewitt 1998a, b). A well-cited example is from 1841 from the slopes of Nanga Parbat on the western side of the Indus River near Bunji. The landslide dammed the Indus for six months before it drained to cause the largest recorded flood on this river (Hewitt 1968; Shroder 1993).

The second largest flood also came from the outburst of a landslide dam that blocked the Hunza River for seven months in 1858 (Becher 1859; Todd 1930). Rock avalanches have been widespread in the Karakoram and Himalayas. In the Karokaram, the slopes are often steeper than 45° and with elevation ranges of 500m that promote rockslide and rock fall events of great size.

Landslides may be the dominant erosive force in the Himalayas, but the construction of roads through a particular area increases the susceptibility of that region from 'normal' to 'high' (Dhakal et al. 1999). In an ICIMOD project (landslide hazard management and control in Pakistan) by Malik and Farooq (1996) landslide types, causes, analysis, and remedial measures have been studied along the important routes in Northern Pakistan.

Thousands of rock falls and landslides were triggered by the Kashmir earthquake in 2005. In the Balakot-Muzaffarabad area alone, more than 70 landslides have been identified (only those of >7 sq m) and the total area covered by these landslides is 6.73 sq km, while the area covered by the reactivated landslides is 3.74 sq km.

Disaster Preparedness at National Level

Natural Hazard management in Pakistan has been restricted in perspective to rescue and relief. There is a general feeling also that disaster management is the exclusive responsibility of the Pakistan Army. Every time there is an emergency in the wake of a flood, earthquake, or landslide, the Pakistan Army is called to the rescue and to provide relief. There is a consensus that, on every such occasion, the Pakistan Army has responded effectively and efficiently to the emergency. This is mainly because of its strength in being the only institution in the country with sufficient resources in terms of manpower, transportation, communications, and, above all, discipline and unity of command. Although the army should continue to play a leading role in natural disaster response and relief, increased participation from the civilian administration at all levels and from communities affected is essential. The responsibility for disaster management, especially in mitigation, preparedness, and long-term relief and rehabilitation should be jointly that of all sectors of the population. On many occasions in the recent past, although the Pakistan Army responded effectively to an emergency, once the rescue and immediate relief phase was over, people were left stranded to solve their rehabilitation problems on their own. Civilian institutions are necessary to ensure reconstruction and rehabilitation.

The level of preparedness for flood disasters is in far better shape than preparedness for other natural hazards. Severe floods in the mid seventies forced the government to take serious action in terms of mitigation of flood hazards. Two ten-year plans spanning from 1977 to 1998, accompanied by several sector projects, have resulted in sound efforts on mitigation of flood hazards. Torrential rain in isolated mountain areas, as well as in congested cities, still causes many casualties every year. The country has sufficient capacity through structural interventions to stop the overflowing of rivers and, where such measures are not possible, early warning systems are in place to lower the risks. Coordination between agencies responsible for flood warning, protection, and rescue is reasonably efficient and relief is available and is in full operation at the time of floods. However, many lives are lost every year, not because of lack of early warning systems or lack of rescue and relief resources, but simply because of sheer negligence on the part of the local governments and the public.

National strategy for disaster management

Emergencies, especially those related to security issues, are monitored by the Ministry of the Interior through the National Crisis Management Cell, which has a round-the-clock operational control room for collecting information. It coordinates with the provincial Crisis Management Cells and all other security agencies to provide an updated knowledge base for any emergency situation. It is also responsible for calling for immediate response through the relevant departments and agencies. In practice, in the past, this key institution has been less effective in responding to emergencies arising out of natural disasters. The earthquake disaster of October 8, 2005, exposed this critical shortcoming in Pakistan's preparedness strategy.

In case of an emergency, the entire government machinery is placed on alert through directives from the Ministry of the Interior, or through a direct call from the President's or Prime Minister's Secretariat. Practically, apart from the community affected, it is the Pakistan Army which, because of its superior communications, transportation facilities, and skilled human resources, gives the first and most effective response. This response is concentrated on rescue of lives and property; restoration of the communication system including telephone, roads, and rail links; and provision of first aid, food, and water. In case of floods, engineers from the Pakistan Army are stationed at embankments to strengthen the embankments, spurs, gabions, and flood walls and to fill the breaches. Likewise, many landslide and debris flow hazards, especially those blocking the principal roads in mountainous areas of the north are cleared by army engineers or their affiliated bodies such as the Frontier Works' Organisation.

The Emergency Relief Cell (ERC), established in the Cabinet Division, serves as the focal point for relief activities. In coordination with provincial relief cells, the ERC is responsible for arrangement and collection of relief items, immediate distribution of relief goods to the people affected, and receipt of grants, donations, and funds for distribution through the President's or Prime Minister's Disaster Relief Fund.

Institutional framework for disaster management

A variety of organisations and departments at federal (as well as provincial) level are involved in disaster management. Most of these institutions, prior to the 2005 earthquake, were geared towards flood disasters, some of them being exclusively dedicated to deal with mitigation and preparedness for flood disasters (e.g., Pakistan Flood Commission and the Flood Forecasting Division). None of the other natural disasters received such priority.

Pre-2005 disaster management institutions in Pakistan can be classified into three broad categories: 1) mitigation and preparedness; 2) response (call, search, rescue, and evacuation); and 3) relief. The concept of reconstruction and rehabilitation did not exist prior to the 2005 Kashmir earthquake. Institutions assigned with responsibilities for disaster preparedness in Pakistan and details about their responsibilities are given below.

Mitigation and preparedness in federal government institutions

Pakistan Meteorological Department (PMD)

The Pakistan Meteorological Department (PMD) was established in 1947 from the previous Central Meteorological Organisation (British India). It is both a scientific and a service department, and functions under the Ministry of Defence. It is responsible for the following.

- Meteorological expertise; services and information with the objective of traffic safety in the air, on land, and at sea; agricultural development based on the climatic potential of the country; and weather forecasts
- Information on geophysical matters
- Mitigation of weather-related as well as seismic hazards

The department has established the following services.

- A network of observing stations to generate meteorological, geophysical, and phonological data
- A telecommunication system for speedy dissemination of data
- Meteorological offices to analyse data for issuing forecasts and warnings for aviation, agriculture, shipping, sports, and irrigation
- Climatological and data processing units to scrutinise, compare, and publish data for appraisal of long-term weather trends and earthquakes

Over the years, the Department has widened its focus to areas of expertise in agrometeorology, hydrology, astronomy and astrophysics (including solar physics), geomagnetism, atmospheric electricity and studies of the ionosphere and cosmic rays, global warming, and climate change.

Flood Forecasting Division (FFD)

The Flood Forecasting Division (FFD) is a subsidiary of the Pakistan Meteorological Department. It plays a central role in flood forecasting and warning. The department receives hydro-meteorological data from various national and international sources, including satellite data, to prepare flood forecasts that are disseminated to various flood management and relief organisations.

With help from the Asian Development Bank, a comprehensive Indus Flood Forecasting System has been developed since the heavy floods of 1992. The system involved installation of radar in the upper catchment area for rainfall estimation, and a decision-support system was developed for improved flood management.

The above-mentioned programme also emphasised the need for better communication among various government agencies and departments involved in flood management. This objective was achieved by acquiring and installing high frequency (HF) radio sets in various agencies and departments. A flood warning manual was prepared that defines the tasks of various government departments in the event of flood emergency. The manual also spells out the measures that are to be undertaken by various departments for prompt and efficient management of flood events. One important aspect that has been addressed in the manual is the dissemination of flood forecasts to the public in an orderly and coordinated way to avoid the confusion of statements being issued by various departments. In addition, the improvements in the flood forecasting system are being achieved by preparing computer models for the simulation of runoff from the rainfall data acquired in real-time and for routing this runoff through the river system.

Water and Power Development Authority (WAPDA)

The Water and Power Development Authority (WAPDA) was established in 1958 as a semi- autonomous body for the purpose of carrying out accelerated and unified development of water and power resources, which until then were being dealt with by the provisional government.

The authority contributes to flood management by 1) reservoir management through regulating the release of water from the country's reservoirs such as the Mangla and Tarbela dams and 2) contributing to flood forecasting by collection and dissemination of rainfall data from telemetric rain-gauge stations and flood data at various locations in the Indus River system. The data acquisition apparatus for rainfall and flood water at WAPDA's gauge stations has recently been upgraded with new equipment using the meteorburst communication (MBC) system. WAPDA supports another hydrometric data measurement and transmission system through the Surface Water Hydrology Project.

Coordination between FFD and WAPDA improved considerably after the flood in 1992. WAPDA's telemetric network is directly linked to the Flood Forecasting Division. Additionally there daily meetings take place in the office of the General Manager (Planning), and these ensure coordination between the crucial flood-controlling agencies, especially when serious floods are forecast.

Being the custodian of Pakistan's major water reservoirs, the WAPDA established major seismic observatories in the early sixties. The Tarbela seismic observatory has produced

valuable data for more than 40 years; and this has led to recognition of several seismic zones in north Pakistan, including the Indus Kohistan Seismic Zone (Jacob et al. 1979; Seeber and Armbruster 1979), which was involved in the 2005 Kashmir earthquake. Out of a few strong-motion instruments, three belonged to WAPDA and they recorded valuable strong-motion data during the event.

Federal Flood Commission of Pakistan (FFC)

Up to 1976, Provincial Irrigation Departments were responsible for the planning and execution of flood protection works. The disastrous floods of 1973 and 1976 resulted in heavy losses of life and property, indicating that the existing flood protection facilities were inadequate to provide effective measures for the country. This resulted in the establishment of the Federal Flood Commission (FFC) in January 1977 under the auspices of the Ministry of Water and Power. FFC is the lead federal agency providing the necessary institutional framework to support provincial flood management measures. The Commission has been successful in modernising the flood management policy of the country through two major projects: Flood Protection Sector Projects I and II. The second project is currently underway and is expected to increase the flood forecasting capabilities of the Flood Forecasting Division substantially. In addition, construction of added embankments and spurs along major rivers will be undertaken by this project. The Commission has also been instrumental in preparing the National Water Policy.

The primary objectives of the FFC are given below.

- a) Preparation of the National Flood Protection Plan
- b) Approval of flood control schemes prepared by federal agencies and provincial governments
- c) Review of flood damage to public sector infrastructure and review of plans for restoration and reconstruction
- d) Measures for improvement in the flood forecasting and warning system
- e) Standardisation of designs and specifications for flood protection works
- f) Evaluation and monitoring of the implementation of the National Flood Protection Plan (NFPP) and Comprehensive Flood Management Plan
- g) Preparation of a research programme for flood control and protection
- h) Recommendations regarding the regulation of reservoirs for flood control

The Indus River Commission

Much of the catchment area for the Indus River system lies outside Pakistan in India, China, and Afghanistan. In addition, upstream controlling structures such as dams and barrages occur outside the territory of Pakistan where water release is beyond its government's control. Effective flood-control management in Pakistan is not possible, therefore, without rainfall and flood-water data from across its borders, especially from

India. Consequently, an agreement was signed between the two countries establishing the Indus River Commission. Each country has a Commissioner for the Indus Waters and they communicate through their respective Commissioners for the Indus Waters, and it includes a provision to receive from India river flow and rainfall data that are considered important for flood forecasting in Pakistan. Several river flow stations have been identified for this purpose. Normally, the data are received by the Pakistan Commissioner for the Indus Waters once a day; and the Commission for Indus Waters is then responsible for providing these data to the Chief Meteorologist, FFD Lahore, for use in flood forecasting models. The frequency of data reception is increased to six hourly and even to hourly depending upon the prevailing flood situation in Pakistan. The Commission for the Indus Waters is the only forum through which any clarification or information can be obtained from India with regard to flood data or flood control structures.

Dam Safety Council

In 1987 a Dam Safety Council (Ministry of Water and Power) was established to carry out periodic inspections of dams, review the planning for new dams, and liaise with international organisations. Its objectives are as follows.

- To carry out periodic inspections of dams and advise WAPDA and provincial governments about the repair and maintenance of dams and reservoirs
- To review the plans for new dams to ensure adequate structural safety
- To review the plans and specifications for enlargement, modification, major repairs, revival, or abandoning of dams or reservoirs.
- To supply technical data and maintain general liaison with the World Bank and UN organisations.
- To liaise closely with the International Commission on Large Dams based in Paris, France

Pakistan Engineering Council (PEC)

The Pakistan Engineering Council is a statutory body established by an Act of Parliament (1976). The purpose of the council is to regulate the engineering profession and contribute to its rapid and sustainable growth in all national economic and social fields. The council is to set and maintain realistic and internationally relevant standards of professional competence and ethics for engineers.

The Council's main statutory functions include registration of engineers and consulting engineers, accreditation of engineering programmes run by universities or institutions, ensuring and managing continuing professional development, assisting the federal government as a think tank, and establishing standards for engineering products and services as well as safeguarding the interests of its members. The council encourages, facilitates, and regulates the professional engineering bodies for creativity and sound engineering practices.

PEC interacts with the government, at both federal and provincial levels, by participating in commissions, committees, and advisory bodies. PEC has also been providing support to the government in carrying out technical enquiries and recommending remedial measures on the referred subjects. It forms an effective bridge between government, industry, and education. PEC maintains a secretariat at its headquarters in Islamabad and branch offices in all the provincial capitals.

Geological Survey of Pakistan

As a component of the Ministry of Petroleum and Natural Resources, the Geological Survey of Pakistan was derived from the Geological Survey of (British) India. The survey is responsible for the study of geology in all pertinent details and to assess resource potential. In the context of natural hazards, the Geological Survey plays an important role in preparing engineering geology maps of landslides and related mass movements and suggesting remedial measures. Mapping of fault structures and measuring their kinematic properties (e.g., sense, direction, and rate of slips) are an important data input in calculating the potential hazards of earthquakes. The Geological Survey also undertakes geophysical studies to supplement the understanding of tectonic structures.

The functions and responsibilities of the Geological Survey of Pakistan relevant to disaster preparedness planning include the following.

- Geological mapping of the country on appropriate scales
- Geological investigations in connection with the construction of heavy civil engineering projects, soil conservation, range and watershed management, agricultural development, and land use and town planning
- Study and evaluation of geological hazards associated with earthquakes, volcanic activity, waste disposal, landslides, subsidence, and other ground failures; and to develop methods for hazard prediction and mitigation
- Improvement of existing mapping techniques and development of new skills for the collection, analysis, and interpretation of geoscientific data
- Provision of scientific support and technical advice for legislative, regulatory, and policy decisions by the federal, provincial, and local governments
- Geoscience-based environmental impact analysis (EIA)
- Education and popularisation of geology and related fields and creating public awareness about geological issues and problems of societal value

Survey of Pakistan (SOP)

The responsibility for topographic mapping and aerial photography lies with the Surveyor General of Pakistan. Established in 1947, the Survey of Pakistan is a component of the Ministry of Defence and is based in Rawalpindi with a number of regional offices distributed at urban centres throughout Pakistan.

Topographic mapping and aerial photograph procurement, photogrammetry, printing and map publication, and survey training are among its services. The SOP is the central mapping agency for Pakistan.

Pakistan Space and Upper Atmosphere Research Commission

Pakistan's national space agency, namely Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), was established in 1961 as a committee and was granted the status of a commission in 1981. It worked under the Cabinet Division of the Federal Government until 2000, when it was placed under the direct control of the National Command Authority.

SUPARCO is devoted to research and development work in space sciences and space technology, and their applications for the peaceful uses of outer space. It works towards developing indigenous capabilities in space technology and to promote space applications for the socioeconomic upliftment of the country.

The SUPARCO launched its first satellite in 1962 called Rehbar-I, followed by Rehbar II the same year. The data received from Rehbar-I and Rehbar-II gave scientists information on wind shear and structure in the layers of the upper atmosphere extending beyond the stratosphere. The data collected also helped in the study of cloud formation, cyclones, and weather over the Arabian Sea. SUPARCO launched Pakistan's first experimental satellite BADR-1 in 1990 and the second, Badar –B in 2001.

The main functions of the SUPARCO relevant to disaster preparedness planning are summarised below.

- Research and pilot studies based on the applications of satellite remote sensing (SRS) data and geographic information system's (GIS) technology to natural resource surveying, mapping, and environmental monitoring
- Research studies in space and atmospheric sciences including satellite meteorology, satellite radiance, troposphere and stratosphere studies, atmospheric pollution, satellite geodesy, and astronomy
- Research studies relating to the ionosphere and associated radio wave propagation and geomagnetism
- Development, design, fabrication, assembly, and launching of:
 - sounding rockets for upper and middle atmospheric research,
 - earth observation satellites for various scientific and technological applications,
 - acquisition of data for atmospheric and meteorological studies, and
 - reception of signals from vehicles in distress under the satellite-aided search and rescue COSPAS-SARSAT programme.

Response (first calls for action, rescue and evacuation) in federal government institutions

Prior to the 2005 earthquake, Pakistan did have in place institutions to respond to natural disasters for operations like alert and call for action and mobilisation; search, rescue, and evacuation; landslide and debris clearance; and restoration of communications. Despite the loose structure that did link these institutions, a written and rehearsed plan for coordination between these institutions and specifications of functions and responsibilities during the course of disaster response was not in evidence.

National Crisis Management Cell

The National Crisis Management Cell operates under the Ministry of the Interior. The cell is assigned the responsibility of monitoring emergencies, including those caused by natural hazards, on a round the clock basis through an operation room. In coordination with Provincial Crisis Management Cells and relevant security agencies, the cell is responsible for coordinating plans for emergency response services in case of emergency or disaster.

Civil Defence Department

The Civil Defence Department was established through an ordinance in 1951 as a component of the Interior Ministry. It is now governed through the 1952 Civil Defence Act and assigned with the additional task during peace times to take remedial measures against natural or man-made disasters. Specifically, the Civil Defence Department is assigned to 1) assist local administration and the army in rescue, evacuation, and relief measures; 2) supplement the anti-flood equipment of the army; and 3) provide personnel for anti-flood training in rescue and relief work.

Pakistan Army

The Pakistan Army has an efficient system of peace-time disaster management. In the wake of a disaster, first-hand damage assessment helps the army to move necessary material and human resources not only for search and rescue but also for immediate relief in terms of food, medical assistance, and shelter. Army engineers concentrate on clearing the roads from landslide debris and on re-establishing the communication and road network. Several army organisations performed functions that were important to the civilian sector across the country. For example, the National Logistics Cell was responsible for transporting food and other goods across the country; the Frontier Works' Organisation built the Karakoram Highway to China; and the Special Communication Organisation maintained communications' networks in remote parts of Pakistan.

Over the years, the Pakistan Army has developed sound expertise in flood disaster management. The Engineering Corps is responsible for providing the necessary help to civil authorities to carry out rescue and relief operations during and after floods. It is the responsibility of the provincial governments (see following chapter) to provide all the support equipment (boats, life jackets, vehicles, tents, etc) to the army for such operations.

The army is actively involved in all stages of flood disaster management. Pre-flood meetings are held to help coordinate the activities of other organisations and agencies providing support to the army. Pre-flood inspections of flood-protection structures are also carried out by the respective commanders of the corps of engineers in their respective areas to ensure that structures (bunds, barrages, spurs, and so on) are in satisfactory condition. Weaknesses, if any, are brought to the notice of the Relief Commissioner. Since the 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 4th Corps of Army Engineers stationed in Lahore acts as a liaison for the purpose.

An army officer is placed on duty in the Flood Warning Centre, Lahore, to keep a close watch on the flood situation. All flood forecasts and warnings are communicated to the Engineering Corps. As the flood arrives, army personnel move out to their respective areas of responsibility to carry out relief and rescue operations in coordination with the civil administration. A post-flood meeting is held to discuss the performance of all the agencies involved in flood management with the objective of making improvements in future.

Frontier Works' Organisation

This is a subsidiary of the Pakistan Army, under the Ministry of Defence, and it was established during the 1966-1978 construction of the Karakoram Highway in the northern areas. After the road opened in 1978, it needed clearing and maintenance continually because of landslides and debris flows. The Frontier Works' Organisation is in charge of maintaining all roads subject to landslides and rock falls, and is the main organisation after the Engineering Corps to respond to landslide disasters: its focus is on clearing the roads.

Army Aviation Corps

Pakistan Army Aviation Corps gained autonomy from the Pakistan Air Force in 1958, and gained full corps status in 1977. The corps has a fleet of helicopters and aircraft which facilitate speedy transport of expert manpower to disaster areas and help with medical evacuation and transportation of relief supplies to disaster sites.

Army Engineers Corps

Dominated by qualified civil engineers, the Army Engineers Corps play a major role in disaster response. They are particularly well prepared for floods, with a dedicated Flood Commission at their headquarters. They have a close lien with the Federal Flood Commission, Flood Forecasting Division, WAPDA, and the federal and provincial relief departments. These corps are regularly called for flood protection engineering work, clearing roads from debris and landslides, and building temporary bridges.

Army Medical Corps

The role of the Army Medical Corps is exemplary in terms of the efficiency of emergency medical services. They have trained doctors and para-medical staff with expertise in emergency situations. Ranging from first aid to surgery, the Corps is capable of providing on-site medical emergency services through temporary and mobile dispensaries and hospitals.

Relief organisation of federal government institutions

Emergency Relief Cell (ERC)

The Emergency Relief Cell (ERC) works under the Cabinet Division and is supervised by the Cabinet Secretary. The Cell is headed by the Director General, Relief.

Responsibilities

- Planning and assessment of relief requirements for major disasters
- Stockpiling of basic necessities for emergencies and establishing a central inventory of resources
- Establishing an emergency fund upon the declaration of any part of the country as affected by a calamity
- Providing in cash as well as kind to supplement the resources of the provincial governments in the event of major disasters
- Coordinating the activities of federal ministries, provincial governments, and government, semi-government, international, and national aid agencies in carrying out operations for disaster relief
- Maintaining contact with international aid agencies and voluntary organisations and donor countries for disaster relief measures.
- Administering relief funds maintained at the federal level
- Making arrangements for disaster relief assistance from other countries
- Providing assistance to calamity-stricken, friendly countries

Operations

- The ERC maintains an Emergency Control Room which coordinates the situation during calamities by liaising with relevant agencies such as the National Crisis Management Cell, Federal Flood Commission, Pakistan Meteorological Department, and the provincial governments.
- The ERC maintains a warehouse in the capital, Islamabad, which stocks essential non-perishable items such as medicines, blankets, clothing, and tents.
- The Relief Goods' Dispatch Organisation, Karachi, receives and dispatches all relief goods from foreign and local agencies in the event of a disaster. (During the Kashmir earthquake, a similar organisation was temporarily established in Islamabad to receive the unprecedented supply of relief goods from abroad and to arrange their immediate dispatch and distribution to the earthquake hit area.)
- ERC has access to a fleet of helicopters belonging to the Army Aviation Corps and these are used by the ERC for relief missions.

Changes in the institutional framework after the 2005 earthquake

The unprecedented dimensions of the disaster caused by the 2005 Kashmir earthquake resulted in almost instant realisation on the part of the Government of Pakistan that immediate establishment of institutions, beyond and above the existing institutions responsible for disaster response, was necessary. Commencing from the establishment of the Federal Relief Commission within two days of the disaster, authorities were established at federal, provincial, and state levels for reconstruction and rehabilitation of the communities affected, followed by the establishment of a commission (the most recent) encompassing authorities from national to district levels dedicated to disaster management.

Federal Relief Commission

The Federal Relief Commission was established on October 11, 2005, by the Prime Minister's Secretariat. The commission was assigned the immediate task of coordination of the massive rescue and relief operations following the Kashmir earthquake. The commission was asked to streamline relief operations in collaboration with the provincial governments, the relevant ministries, non-government organisations (NGOs), the Red Crescent, and other international agencies.

The commission completed its work on March 31, 2006, and handed over the residual relief work to the Earthquake Reconstruction and Rehabilitation Authority, which then became the focal organisation for disaster preparedness and planning.

Earthquake Reconstruction and Rehabilitation Authority (ERRA)

The Government of Pakistan established ERRA on October 25, 2006, to carry out post-disaster damage assessment and reconstruction and rehabilitation of the October 8, 2005, earthquake-affected areas. The headquarters of the authority were established in the Prime Minister's Secretariat, Islamabad, with two counterpart authorities at provincial and state level; one called Provincial Earthquake Reconstruction and Rehabilitation Authority in Peshawar, the capital of NWFP, and the other called State Earthquake Reconstruction and Rehabilitation Authority in Muzaffargarh, capital of Azad Jammu and Kashmir.

The authority is administered by a council under the chairmanship of the Prime Minister. Other members are the Chief Minister of Azad Jammu and Kashmir (AJK); Chief Minister of NWFP; the Federal Minister for Kashmir Affairs and Northern Areas; the Adviser to the Prime Minister for Finance; Deputy Chairman, Planning Commission; and a Member and Chairman of ERRA. The authority is governed by a board under the Chairman of ERRA. The board is responsible for the implementation of the approved programmes, projects, and policy decisions of the council as well as for the day-to-day operations through the administrative and financial authority delegated to it by the council

The authority and its provincial and state subsidiaries will run for three years initially. Most probably this authority will then be merged with the newly established National Disaster Management Authority (NDMA).

Responsibilities

- Reconstruction, rehabilitation, and development of earthquake-affected areas through surveys to assess damage and needs in those areas and formulate comprehensive development programmes to provide for:
 - planned settlements, housing, government buildings and offices, utilities and services, infrastructure, health and education facilities, irrigation and agricultural facilities as well as defence requirements
 - rebuilding the environment, including cleaning of watersheds, reforestation programmes, and other environmental interventions to restore the ecosystems
 - preparing resettlement plans for the people affected in consultation with local communities, ensuring an appropriate mechanism for the resolution of land titles and land tenure issues
- Getting general approval of its comprehensive development programme from the Executive Committee of the National Economic Council
- Identifying, preparing, approving, and executing projects

- Taking measures to ensure execution of the approved projects and development programmes in accordance with the time schedule approved by the council
- Prescribing cost-effective technology, building codes, architectural designs, specifications, and construction material for housing and other buildings in earthquake-prone areas to protect against future seismic activity
- Reviewing the building codes of various urban development authorities and recommending appropriate changes to ensure quality construction and maintain building standards
- Facilitating the establishment of reconstruction enterprises in the zones affected
- Performing any other function assigned to it by the federal government that is related to any of the aforesaid functions

ERRA is involved in preparation and reconstruction activities. Seismic zone and fault mapping, surveys of vulnerable groups, development of databases, and reconstruction packages are among its vital preparatory activities. In terms of housing to withstand earthquakes, a master plan for Muzaffargarh has been prepared and a first draft plan for Bagh city. Plans for Balakot and Rawkot are in process. Assistance comes from the Japanese Agency for International Development (JICA), the World Bank (WB), Asian Development Bank (ADB), and the International Development Bank. ERRA is also involved in livelihoods, education, health, water supply, and sanitation and other infrastructural projects. Support comes from the UNDP, ADB, and other international donors. ERRA has formulated a comprehensive earthquake monitoring and evaluation framework.

National Disaster Management Commission (NDMC) and Authority (NDMA)

On December 23, 2006, the President of Pakistan promulgated the National Disaster Management Ordinance, paving the way for establishment of the National Disaster Management Commission. The ordinance also provides for establishment of the National Disaster Management Authority to act as the implementing, coordinating, and monitoring body for disaster management. Similar disaster management authorities are being established at provincial, district, and municipal levels. The NDMA will provide technical guidance to national and provincial stakeholders about formulation of plans, strategies, and programmes for disaster risk management. The NDMA would also work towards capacity building of national, provincial, and local stakeholders in collaboration with provincial and district authorities.

The United Nations Development Programme (UNDP) assisted the government in formulating a 'National Disaster Risk Management Framework' to guide the work of the entire system in the area of disaster risk management. Broad-based consultations were carried out with stakeholders from local, provincial, and national levels to formulate the framework.

The framework envisions: “achieving sustainable social, economic, and environmental development in Pakistan through reducing risks and vulnerabilities, particularly those to the poor and marginalised groups, and by effectively responding to and recovering from disaster impact.”

Nine priority areas were identified to establish and strengthen policies, institutions, and capacities over the next five years, and they include, i) institutional and legal arrangements for disaster risk management; ii) hazard and vulnerability assessment; iii) training, education, and awareness; iv) disaster risk management planning; v) community- and local-level programming; vi) a multi-hazard early warning system; vii) mainstreaming disaster risk reduction into development; viii) an emergency response system; and ix) capacity building for post-disaster recovery.

The roles and responsibilities of key national, provincial, and local stakeholders have been defined in the framework. Broadly speaking, all stakeholders are expected to undertake the following actions to promote disaster risk management: i) integrate risk assessment in the planning and design stages of all new infrastructure and projects; ii) assess the vulnerability of people, infrastructure, assets, and services related to their sector; iii) develop disaster risk management plans; iv) integrate vulnerability reduction measures in new construction; v) develop the technical capacities of their departments or sectors to implement disaster risk management strategies; and vi) allocate funds for disaster risk management in annual development budgets. Other responsibilities include i) conducting post-disaster damage and loss assessments; ii) organising emergency response as per the mandate of the department; and iii) organising recovery and rehabilitation as per the mandate. The principles established in the framework are, i) promoting multi-stakeholder, multi-sectoral, and multi-disciplinary approaches; ii) reducing the vulnerability of the most vulnerable social groups; iii) strengthening community- and local-level risk reduction capacities; iv) combining scientific and local knowledge; v) developing culturally, socially, economically, and environmentally relevant technologies; vi) strengthening sustainable livelihood practices; vii) acquiring specific capacities in view of the hazard-risk profile of the area and country; and viii) working with other countries and the international community to promote disaster risk reduction. Figure 1 depicts the flow chart of the framework.

National Disaster Management Commission

Structure

- The Prime Minister of Pakistan who shall be the Chairperson, ex-officio
- Leader of the Opposition in the Senate
- Leader of the Opposition in the National Assembly
- Minister of Defence
- Minister of Communications
- Minister of Finance



Figure 1: Flow chart showing the broad structure of the newly established National Disaster Management Framework in Pakistan (December 2006)

- Minister of the Interior
- Governor the NWFP (for the Federally Administered Tribal Areas [FATA])
- Chief Ministers of the Provinces
- Prime Minister, AJ&K
- Chief Executive, Northern Areas
- Chairman, Joint Chiefs of Staff Committee (JCSC) or his nominee
- Representative(s) of Civil Society or any other person appointed by the Prime Minister.
- The Director General of NDMA shall act as the ex officio Secretary of the National Commission.

Functions

- Lay down policies on disaster management.
- Approve the national plan.
- Approve plans prepared by the ministries or divisions of the federal government in accordance with the national plan.
- Lay down guidelines to be followed by the federal and provincial authorities.

- Arrange for, and oversee, the provision of funds for mitigation measures, preparedness, and response.
- Provide support to other countries affected by major disasters as determined by the federal government.
- Take such other measures as considered necessary for the prevention of disaster, its mitigation, or preparedness and capacity building.

National Disaster Management Authority

Structure

The NDMA will be headed by a chairperson as Director General, equivalent in status to the Federal Secretary and appointed by the Prime Minister. He will be assisted by members, advisors, and directors, but these have not been fully defined to date.

Powers and functions

- The National Disaster Management Authority acts as the implementing, coordinating, and monitoring body for disaster management.
- It prepares the National Plan to be approved by the National Commission.
- It implements, coordinates, and monitors implementation of the national policy.
- It lays down guidelines for ministries, departments, and the provincial authorities for development of disaster management plans.
- It provides necessary technical assistance to the provincial governments and the provincial authorities for preparation of disaster management plans in accordance with the guidelines issued by the National Commission.
- It coordinates response in the event of a potential disaster situation or disaster and issues guidelines and directs the ministries or provincial governments or authorities concerned regarding measures to be taken by them in response to any potential or actual disaster.
- It requires any department or agency of the government to make available to the national or provincial authority the human or material resources available for the purposes of rescue and relief.
- It promotes general education and awareness about disaster management and carries out any other functions required by the National Commission.
- It determines measures to be taken for the prevention of disasters or the mitigation of their effects.
- It determines measures to be taken for the integration of mitigation measures into development plans.
- It determines measures to be taken for preparedness and capacity building to respond effectively to any potential or actual disaster.
- It determines the roles and responsibilities of different ministries or divisions of the government in the context of disaster management.
- It is responsible for the annual review and revision of the National Plan.

- It ensures that appropriate provisions shall be made by the federal government to finance the measures to be carried out under the National Plan.
- Subject to the directions of the National Commission, the National Authority shall lay down guidelines for the minimum standards of relief to be provided to persons affected by disaster, including the minimum requirements to be provided in the relief camps in relation to shelter, food, drinking water, medical cover, and sanitation. (Special provisions are to be made for widows and orphans.)
- It provides *ex gratia* assistance on account of loss of life and assistance for damage to houses and for restoration of means of livelihood.
- It provides other types of relief as necessary. Subject to the directions of the National Commission, the National Authority may, in cases of disasters of severe magnitude, give directions regarding relief in repayment of loans or for grants of fresh loans to persons affected by disaster.

National disaster management plans

Pakistan started national development plans in 1957, each with a scope of five years. The First Five Year Plan (1955-1960) did not include any specific measures, strategies, or programmes relevant to disaster management. It was the Fourth Five Year Plan (1970-75) which included, for the first time, a flood control programme in East Pakistan. The Fifth (1979-83), Sixth (1983-88), Seventh (1988-1993), and Eighth (1993-98) Plans did not even mention any measures or strategies for disaster management. The Five Year Plan of 1998-2003 did include objectives related to disaster management, however. Unfortunately this, the Ninth Plan, became virtually redundant because of international sanctions following nuclear tests by India and Pakistan and then the attack on the World Trade Centre in New York. The Tenth Plan (2001-2011) suffered the same fate. Meanwhile the government changed. Now, finally, the Government of Pakistan, through the Planning Commission, launched a Medium Term Development Framework (MTDF) 2005-2010, and this drives the current development programmes. In the following passages, a brief outline is given of the three recent development plans highlighting the aspects related to disaster management components.

Ninth Five-Year Plan (1998-2003)

Disaster management in Pakistan's development plans first appeared in the Ninth Plan (1998-2003). This was limited to water resource management with an emphasis on flood warning and forecasting systems. The clauses included the following.

- Effective use of surface and groundwater
- Equitable and assured distribution of water
- Use of river water flood surpluses through storage or carry-over dams
- Limiting the extent of waterlogged lands
- Prompting water-related research studies

- Using flood flows, including harnessing of hill torrents, to augment water supplies for irrigation
- Augmenting investments in flood control management, including flood warning and forecasting systems

Tenth Perspective Development Plan (2001-2011)

This ten-year perspective development plan includes measures for protection of land and infrastructure from water logging, salinity, floods, and soil erosion. Flood control and protection was included in this plan. A Risk Mitigation Fund of US\$5 million was established to assist the poor in case of loss of income-generating assets due to circumstances beyond their control.

National Medium Term Development Plan (2005-2010)

The MTDf 2005-2010 reflects disaster management for the first time in Pakistan's development programme as a tool for poverty reduction. In the wake of the 2004 tsunami, followed by the 2005 Kashmir earthquake, the MTDf 2005-2010 included a pledge to prepare and implement a multi-sectoral and multi-disciplinary programme for disaster risk reduction. The proposed five-year programme estimated a cost of US\$ 15.5 million for undertaking a comprehensive review of the existing capacity of the government sector and civil society for disaster preparedness and management.

The proposal included establishment of structures and a mechanism for early warning, preparedness, coordination, and mitigation in the country. It also included the preparation of a national policy, legislation, and plans for an all-risk reduction approach to disaster management. The programme included establishment of a National Disaster Management Agency (NDMA) in the Cabinet Division to serve as the national strategic and policy coordinating body for preparedness, mitigation, early warning, relief, rehabilitation, and recovery activities and establishment of structures and mechanisms at provincial and local levels with the capacity to plan and undertake activities for management of situations emerging from various natural and human-induced disasters.

Legislation for disaster management

Legislation in Pakistan is promulgated through the national or provincial parliaments in the form of a Parliament Act. At times, the legislation can be promulgated by direct notification of the President (at national level) and from the Governor (at the provincial level) in the form of an ordinance, which may be later approved by the parliaments in the form of an act.

Disaster management legislation is rare in Pakistan. Existing acts and ordinances only deal with emergency relief in the context of floods (Annex 1).

Three legislature acts and ordinances are noteworthy in the context of disaster management. One of the earliest legislations was the National Calamities (Prevention and Relief) Act, 1958, passed by the then West Pakistan Assembly (Parliament) on April 3, 1958. This act provides a framework for maintenance and restoration of order in areas affected by certain calamities and for the prevention and control of and relief against such calamities. The office of the Provincial Relief Commissioner was established and assigned the responsibility for disaster management as outlined in the act. Later, under the Federal Government Rules of Business 1973, the responsibility for disaster relief at national level was assigned to the Cabinet Division. An Emergency Relief Cell was established in the Cabinet Division and was assigned responsibility for work related to disaster relief at national level.

A framework for emergency services was drafted for the approval of the President through an ordinance called the Pakistan Emergency Services' Ordinance 2002. This ordinance aimed to deal with emergencies in an effective manner and deal with threats to the public from modern warfare, terrorism, and disasters. The ordinance defines responsibilities at each level. This draft ordinance proposed the establishment of a National Council to monitor the performance of the emergency services and ensure continuity in laying down procedures for the management of emergencies and disasters during peace time. Further the provincial governments were given administrative powers, with the establishment of District Emergency Officers, to enable them to manage the service.

Non-government participation in disaster management

Several non-government national and international organisations have been participating in response and recovery stages of natural calamities (Table 3). In particular, their response to the 2005 Earthquake in Kashmir and Hazara region was unprecedented and extremely effective. These agencies not only helped in search, rescue, and temporary relief but are continuing also in effective rehabilitation more than a year after the disaster. In essence, a major component of the reconstruction of educational and health institutions in the said region is being undertaken by these national and international non-government agencies.

For several years, some of the international agencies have been advising the government to develop an integrated disaster management plan, offering both financial and technical support. In this context, the UNDP (United Nations Development Programme)

Table 3: A partial list of international and national non-government organisations active in disaster management in Pakistan

Organisations	Disaster Management	Emergency Relief	Environment and Natural Resource Management
Action Aid	X	X	X
Catholic Relief Services	X	X	
Concern	X	X	
European Commission	X	X	X
Food & Agriculture Organisation	X		X
Oxfam	X	X	
Save the Children – UK	X	X	
World Food Programme		X	
World Health Organisation	X	X	
UNICEF	X	X	
UNDP	X	X	X
Shell Pakistan		X	
World Bank	X		X
Church World Service		X	
Department for International Development		X	
Asian Development Bank	X		X
AusAid		X	X
Embassy of Japan – GRA			X
NORAD			X
JICA			X
South Asia Partnership – Pakistan			X
Swiss Agency for Development and Cooperation		X	X
Civil Society HID Programme International			X
Rural Development Policy Institute	X		X
Focus Humanitarian Assistance Pakistan	X	X	

carried out a survey of Pakistan's preparedness for disasters caused by natural hazards in 2004 and proposed the formulation of a disaster management authority to meet the challenge effectively. Finally, the President promulgated the National Disaster Management Ordinance on December 23, 2006, paving the way for establishment of the National Disaster Management Commission. The ordinance also provides for setting up the National Disaster Management Authority to act as the implementing, coordinating, and monitoring body for disaster management.

Whereas a great majority of NGOs and international organisations are focused on emergency response, especially relief, a few have started effective programmes in capacity building for disaster management and preparedness at community level. As an example, FOCUS Humanitarian Assistance, Pakistan, had plans in place and a fair level of execution prior to the 2005 Kashmir earthquake. Some of the initiatives of this NGO include the following.

Volunteer training – focused on the northern areas of Pakistan which are most vulnerable to natural disasters. Thousands of people have been selected from the community and trained in disaster risk management such as basic safety practices, first aid, and search and rescue operations. According to a recent estimate, 30,000 trained volunteers are now available throughout Pakistan for disaster response.

Vulnerability assessment – FOCUS has introduced a programme for multi-hazard vulnerability mapping in the northern areas of Pakistan. This programme focuses on developing maps and inventories of landslides, debris flows, and river-incision hazards as the basis for development of vulnerability maps. This information, although in its early stages, is expected to contribute effectively to suitable mitigation and preparedness plans.

A description of disaster-management activities carried out by some of the international organisations is given in Annex 2.

Disaster Preparedness at Provincial Level

Provincial strategies for disaster management

As already noted in chapter four, there has been an overwhelming reliance on the Pakistan army to take the lead in disaster management at both national and provincial level. This has meant that, in the past, most strategies have been limited to response and relief. Following the devastating Kashmir earthquake, the government took steps to devolve some of the authority and responsibility for disaster response, and to a certain extent preparedness, to the provinces and districts. Examples of linkages have been given in Chapter 4; for example, it has already been mentioned that, in case of army mobilisation, it is the responsibility of the provincial governments to provide all the support equipment. There is a cantonment of the 4th Corps of Army Engineers in Lahore for flood liaison and two counterpart authorities of ERRA, the Provincial Earthquake Reconstruction and Rehabilitation Authority in Peshawar, the capital of NWFP, and the other called State Earthquake Reconstruction and Rehabilitation Authority in Muzaffarabad, capital of Azad Jammu and Kashmir (AJ&K).

Hence it is not that disaster management is run exclusively from the Centre. Below are brief overviews of disaster management at provincial level.

The Kashmir earthquake of 2005 was an unprecedented disaster causing more than 73,000 deaths, 128,309 injuries, and destroying over 500,000 houses and displacing 3.5 million people (ERRA 2006). The establishment of ERRA by the President of Pakistan is a result of this earthquake; and it took over the remaining relief work from the Relief Commission at its inception. On December 23rd 2006 a National Disaster Management Ordinance was promulgated and a National Disaster Commission established: it is this body that was responsible for setting up the disaster management authorities at national and provincial level. Other initiatives launched at that time include a vulnerability atlas for Pakistan funded by the UNDP; an Earthquake Prediction Centre which is being launched at the Centre of Physics, Quaid-i-Azam University, Islamabad, while the Earthquake Centres at Nadirshaw Edulji Dinshaw University, Karachi, and

Punjab University, Lahore, have been reactivated. There is also a centre of earthquake engineering at Peshawar University; and these initiatives are all to involve the provinces and districts of the nation as a whole.

Mitigation and preparedness in provincial government institutions

Briefs on the roles of the different institutions involved in disaster management at provincial and district level are given below.

Provincial disaster management authority

Structure

The National Disaster Commission directs every Provincial Government, as soon as possible after the issue of the notification under sub section (1) of section 3 of the act, by notification in the Official Gazette, to establish a Provincial Disaster Management Commission for the Province. A Provincial Commission is to consist of as many members, as may be prescribed by the Provincial Government but should include the following.

- The Chief Minister of the Province, who is the Chairperson, ex officio
- Other members to be nominated by the Chief Minister
- The Chairperson of the Provincial Commission may designate one of the members nominated under sub-section (b) to be the Vice-Chairperson

Powers and functions

Subject to the provisions of the act, the Provincial Commission has the responsibility for laying down policies and plans for disaster management in the province. Without prejudice to the generality of provisions contained in sub-section (1), the Provincial Commission may do the following.

- Formulate a provincial disaster management policy.
- Formulate a provincial plan In accordance with the guidelines laid down by the National Commission.
- Approve the disaster management plans prepared by the departments of the Provincial Government.
- Review the implementation of the plan.
- Oversee the provision of funds for mitigation and preparedness measures.
- Review the development plans of different departments of the province and ensure that prevention and mitigation measures are integrated therein.
- Review the measures being taken for mitigation, capacity building, and preparedness by the departments of the Provincial Government and issue such guidelines or directions as may be necessary.
- The Chairperson of the Provincial Commission shall, in the case of emergency, have power to exercise all or any of the powers of the Provincial Commission, but the

exercise of such powers shall be subject to post facto ratification of the Provincial Commission.

- Every Provincial Government shall as soon as may be, after the notification under sub-section 1 of Section 3 by notification in the official gazette, establish a Provincial Disaster Management Authority for the Province.
- The Provincial Authority shall consist of as many members as may be prescribed and shall include as its Chairperson the Provincial Director General or Provincial Relief Commissioner.
- There shall be a Director General of the Provincial Authority, to be appointed by the Provincial Government, with the status and powers of a Secretary of the Provincial Government, on such terms and conditions as the Provincial Government may prescribe.

District Disaster Management Authority

Structure

Every Provincial Government shall, as soon as possible, after issue of notification under sub-section (1) of section 13, by notification in the Official Gazette, establish a District Disaster Management Authority for every district in the Province. The District Authority shall consist of the number of members prescribed by the Provincial Government and, unless the rules otherwise state, it shall consist of the following members.

- Nazim of the District who shall be the Chairperson, ex officio
- The District Coordination Officer
- The District Police Officer, ex officio
- The Executive District Officer (EDO) Health
- Such other district-level officers, to be appointed by the District Government.

Powers and functions

- The Chairperson of the District Authority shall, in the case of an emergency, be authorised to exercise all or any of the powers of the District Authority, but the exercise of these powers shall be subject to *post facto* ratification of the District Authority. The District Authority shall act as the district planning; coordinating and implementing body for disaster management and undertake every measure for the purposes of disaster management in the district in accordance with the guidelines laid down by the National Authority and the Provincial Authority. Without prejudice to the generality of the provisions of sub-section (1), the District Authorities are responsible for plans for disaster management for every district of the Province. The District Plan shall be prepared by the District Authority, having coordinated with the National Plan and the Provincial Plan. The District Plan shall be reviewed and updated annually. For the purpose of assisting, protecting, or providing relief to the community, in response to any disaster, the District Authority may give directions for the release and use of resources available with any department of the government and the local authority in the district, remove debris, carry out search

and rescue operations, and provide shelter, food, drinking water and essential provisions, health care, and services. It should also make provisions to establish emergency communication systems in the affected area and make arrangements for the disposal of unclaimed dead bodies. It can direct any department of the Government of the Province, any authority, or body under the district level to take such measures as are necessary in its opinion.

Departments of the provincial governments involved in disaster management

Planning and Development Departments (P & D Department)

All four provinces have P & D Departments as a component of the Provincial Government. These are the principal planning bodies at the provincial level. They formulate, coordinate, and monitor development programmes and activities of various departments of the provincial government. The departments prepare medium-term development frameworks of development activities in the province.

The main objectives of the Planning and Development departments are as follows.

- Assessment of the material and human resources in the province
- Formulation of long- and short-term plans
- Recommendations concerning prevailing economic conditions, economic policies, or measures
- Examination of such economic problems as may be referred to it for advice
- Coordination of all economic activities in the provincial government

Although none of its functions directly involve disaster preparedness and management as such, the fact that these departments have the overview of financial and human resources in the provinces and development planning and projects, and liaise with external assistance, makes them linchpins in the provinces for activities leading to disaster preparedness and planning.

Irrigation Department

Until 1976, Provincial Irrigation Departments were responsible for the planning and execution of flood protection works. These departments continue to play this role but under the guidance of the Federal Flood Commission (FFC). Located at the provincial government secretariats, the departments play a prominent role in flood management through planning, designing, constructing, and maintaining flood protection works. They also carry out flow measurements on specific rivers and at irrigation canal sites.

The major flood-related functions include the following.

- Flow measurement at specific sites on rivers, canals, and 'nullah'
- Planning, design, construction, and maintenance of flood protection works

- Maintenance of data communication networks to provide river flow data to the Flood Forecasting Division (FFD), Lahore
- Supervision of the Flood Warning Centre (on behalf of the Relief Commissioner) to ensure timely dissemination of flood forecasts and warnings
- Director (Floods), IPD, in his capacity as a member FFD maintains close coordination with the Chief Meteorologist FFD for issuing disseminating flood forecasts and warnings
- Occasional updating of flood-fighting plans and execution of such plans during floods
- Implementation of flood fighting plans for activities to be taken before, during, and after the flood emergency

Response of provincial government institutions

Provincial Crisis Management Cells or Centres (PCMC)

Each province has a Crisis Management Cell under the Directorate of Civil Defence, but governed by the Ministry of Home Affairs. These cells or centres are linked to the National Crisis Management Cell at federal level. Like its federal government counterpart, the PCMC is responsible for monitoring and issuing the first call for action during the course of an emergency. It coordinates with the Civil Defence Directorate and other relevant agencies in rescue and evacuation efforts.

Police Department

The police department under the provincial government is not only responsible for the law and order situation during an emergency, but also plays an important role in monitoring and giving the first report of a disaster. Pakistan has a substantial network of police stations with accessibility extending to village level, and this enables the police to play an important role in the first reports of incidents related to natural disasters. Police departments carry out these functions.

- To operate through the police telecommunication, i.e., the wireless and tele-printer network for information and messages to all relevant departments and agencies
- To ensure law and order during the emergency
- To provide assistance in flood warning, rescue, relief, and evacuation operations

Relief organisation of provincial government institutions

Provincial Relief Departments

Each of the four provinces in Pakistan has Provincial Relief Departments, headed by Provincial Relief Commissioners. The Relief Commissioner is normally a Member of the Board of Revenue and is assigned the functions of the Relief Commissioner in addition to his normal duties. Provincial Relief Departments are given the responsibility for disaster preparedness, emergency response, and post disaster activities. These

departments are an essential link between the disaster management agencies at federal level and the district, city, and local governments as well as the communities. The Relief Department primarily functions through control and coordination of the personnel and resources of other government departments. Relief functions at the district and tehsil levels are performed through the District and Tehsil Coordinators (formerly Deputy Commissioners and Assistant Commissioners) who coordinate with the other departments at these levels to execute disaster response.

The responsibilities of the Provincial Relief Departments include the following.

- To provide adequate resources to the district administration through coordination with provincial government departments and agencies
- To provide necessary funds to the district administration for relief work
- To oversee the working area of administration for relief work
- To obtain field reports of losses and report to the provincial and federal governments
- To assess and evaluate losses and give suggestions to the federal and provincial governments concerning relief for the people affected

The Provincial Relief Departments undertake flood preparatory actions such as inspection of flood protection measures and establishment of flood warning and flood relief centres at the local government level. Flood preparatory actions to be taken by the Relief Commissioner include the following.

- Arranging inspection of flood protection works by the Irrigation Department and Pakistan Army to ensure that all vital flood protection bunds are in a satisfactory condition
- Establishing flood warning centres and flood centres at district and tehsil levels
- Ensuring that all flood-related agencies and departments involved in flood mitigation are fully geared to perform the functions in their respective areas in the process of flood mitigation
- Ensuring that flood forecasts and warnings are disseminated without loss of time to all concerned and that they are fully aware of the actions to be taken in each situation

Provincial Health Departments

Health is a provincial subject in Pakistan. One of the immediate and most crucial responses to disasters is provision of emergency medical services. Provincial health departments are assigned the following tasks.

- To establish a system of high alert and a list of personnel to be mobilised when a danger warning is received or impact of disaster reported

- To establish an emergency cell (medical) to ensure better coordination in disaster situations
- To set-up medical camps and organise mobile medical teams to be sent to the scene of the disaster with minimum delay
- To ensure communication links between hospitals and the scene of the disaster
- To activate emergency field medical units

Provincial Food Departments

Besides health, provision of food to people affected by disasters is one of the highest priorities, not only immediately after the disaster, but also on a mid- to long-term basis. Provincial food departments are assigned to assist the relief cells in:

- ensuring adequate availability of food stocks in a disaster situation and
- organising ration depots in various locations as required by the local authorities.

Provincial Agriculture and Livestock Departments

In case of natural disasters, livelihoods, which in much of rural Pakistan are dependent on agriculture and livestock, need immediate rehabilitation: provincial departments are assigned:

- to assist in saving crops, agricultural land, and livestock in disaster situations;
- to make inputs like seeds , fertilizers, and agricultural equipment available to the victims of disasters on credit basis; and
- to survey and investigate the extent of damage to the crops and livestock and recommend compensation.

Department of Communication and Works

Provincial Departments of Works and Communications are expected to respond to disasters by:

- supervising, directing, and controlling protection of roads and structures;
- coordinating survey investigations of the extent of damage to roads and structures; and
- organising emergency repairs for restoration of public transport routes.

Legislation for disaster management

Legislation in Pakistan is promulgated (as already stated in Chapter 4) through national or provincial parliaments in the form of an Act of Parliament. At times, the legislation can be promulgated by a direct notification from the Provincial Governor in the form of an ordinance, which may be later approved by the parliaments in the form of an act.

The office of Provincial Relief Commissioner was created and assigned the responsibilities for disaster management as outlined in the act.

Administrative powers were delegated to the provincial governments through establishment of the office of the District Emergency Officer.

In 2001, the provincial governments in Pakistan promulgated the Local Government Ordinance to establish a new, integrated Local Government System allowing the public to participate in decision-making. The new system provides for a three-tier local government structure comprising of district, tehsil (sub-district), and union council (village) administrations, each headed by and comprised of elected members of the public. Some of the responsibilities related to disaster management outlined in this ordinance are the following.

- Natural disaster and civil defence planning
- Water source development and management, storage, treatment plants, and macro-distribution
- Tertiary and secondary sewerage networks, treatment plants, and disposal
- Storm-water drainage networks and disposal
- Flood-control protection and rapid response contingency plans
- Solid waste management, treatment, and disposal, including landfill sites and recycling plants
- Toxic and hazardous waste treatment and disposal from industries and hospitals
- Environmental control, including control of air, water, and soil pollution in accordance with federal and provincial laws and standards
- Master planning, land use, zoning and classification, and reclassification
- Urban design and urban renewal programmes and promulgation of building rules and planning standards

Hazard-specific Preparedness

Floods

Pakistan has faced several flood disasters since its independence in 1947. This led to development of strategies and institutions dedicated to flood-disaster preparedness. Whereas the rescue and evacuation operations remained in the control of the Pakistan Army, institutions such as the Federal Flood Commission, WAPDA, and the Flood Forecast Division developed strategies for mitigation and preparedness.

The existing flood management strategies in practice are outlined below.

Structural measures

- a. Construction of embankments
- b. Construction of spurs and battery of spurs
- c. Construction of dykes, gabion walls, and flood walls
- d. Construction of dispersion and diversion structures
- e. Channelling of flood waters
- f. Construction of delay action dams
- g. Construction of bypass structures

Non-structural measures

Improved flood forecasting systems through the following.

- a. An effective system of data collection and dissemination
- b. Collection of real-time rainfall and river flow data
- c. Prediction of weather by radar
- d. A modern system of transmitting flood forecasts
- e. An improved early flood-warning system:
 - i) giving early flood warnings based on effective flood forecasts, and
 - ii) reliable interaction between all flood-control and relief agencies
- f. Timely warning and evacuation arrangements by provincial relief departments and district administrations

Flood protection plans and works

As shown in Table (4), several flood protection plans have been adopted since 1977, of which two plans, each of 10 years covering the period until 1998, have already been implemented. A master feasibility study of hill torrents was also completed in 1998. A comprehensive Flood Protection Plan is in process; while a new 10-year Comprehensive Flood Protection Plan is now finalised and is in the implementation phase from 2006 to 2015. In total, ~ 6000 km of embankment works have been completed with the construction of over 1,300 spurs (Table 4). At the moment more than 170 spurs and embankments are being constructed at vulnerable points. Pakistan has made a reasonable investment in flood-protection works (Table 5). Significant progress has been made in the early flood-warning system in recent years (Table 6).

Table 4: A brief list of flood protection plans adopted and executed in Pakistan

Plan	Period of completion	No. of flood protection schemes completed	Investment cost (Rs in million)
National Flood Protection Plan PHASE-I, 1977 to 1987 (NFPP-I)	1988	350	1,767
National Flood Protection Plan PHASE-II, 1988 to 1998 (NFPP-II)	1998		7,576
<ul style="list-style-type: none"> ● Normal annual development programme ● Flood/rain damage restoration project ● Flood protection sector Project-I ● Flood/rain damage restoration project 	1998	170	2,541
	1988	2,065	2,300 (+US\$ 200m)
	1998	257	4,860 (+US\$ 131m)
	1992-1994	1,980	6,659 (+193m)
Master feasibility studies for harnessing of flood flows of hill torrents of Pakistan	1998		24,950
National Flood Protection Plan/ Comprehensive Flood Management Plan	To be completed by 2012		25,965
Perspective Five Year Plan for Flood Control, Development and Management (2005-06 to 2009-10)	2009-2010		14,500

Table 5: Summary of federal investment in flood protection works, 1977-6/2005

Name of Province/Federal Line Agency	Investment (Rs in million)	Percentage of total investment
Punjab	4,456	44.3%
Sindh	3,576	35.6%
NWFP	1043	10.4%
Baluchistan	750	7.5%
FATA	120	1.2%
Northern Areas (NA)	81	0.8%
Azad Jammu & Kashmir	29	0.3%
Total	10,056	100%

Table 6: Existing flood forecasting facilities, Pakistan Meteorological Department

1.	Preparation of rainfall-runoff models for upper catchments of the rivers Jhelum, Chenab, Ravi, and Sutlej and their tributary hill torrents and 'nullah'; these also included the tributary rivers and hill torrents and 'nullah' of the River Indus from Mandori to Taunsa
2.	Preparation of river flow models for the rivers Jhelum, Ravi and Sutlej. A model of Taunsa Guddu reaches of the Indus River was also prepared
3.	Combining of all the rainfall and river flow models under one user friendly computer package FEWS-Pakistan (Flood Early Warning System-Pakistan) for easy use by PMD (NFFB) and other relevant organisations
4.	Installation of 10-CM QPM weather radar at PMD, Lahore to provide reliable quantitative precipitation forecasts (QPF)
5.	Procurement and installation of 69 high frequency (HF) radio sets
6.	Procurement of a Meteorburst telecommunication (MBC) system for transmission of data to the National Flood Forecasting Bureau (NFFB) on a real-time basis
7.	Bathymetric surveys for the rivers Jhelum, Chenab, Ravi, and Sutlej and of the Indus River between Mithan Kot and downstream from Kotri (up to about 180 km downstream from Kotri); carrying out of discharge measurements at all locations of interest on the River Indus system (barrages and bridges across rivers) for defining and improving rating curves – also carried out by Innovation and Science Research Investments (ISRIP) (WAPDA)
8.	Preparation of a flood-warning manual which provides information on the different processes and steps involved in preparing flood forecasts and warnings and the dissemination of flood warnings to the relevant agencies and general public
9.	Establishment of a National Flood Forecasting Bureau under the auspices of PMD, Lahore

Activities in flood season

Flood season in Pakistan lasts from July to October. All the flood forecasting and warning agencies and data collection departments start functioning from June 15th every year and continue their rainfall and river flow data collection and flood-forecasting activities up to October 15th. During this period effective interaction and communication between various flood related provincial and federal departments and agencies are maintained on a round-the-clock basis in order to counter any eventuality due to rain or floods.

Summary of flood disaster management

Pakistan's strategy for flood preparedness revolves around structural measures for flood containment. These include construction of embankments; spurs; dykes, gabion walls, or flood walls; dispersion or diversion structures; delay action dams; bypass structures; and channelling of floodwaters. In this context, over 5,600 km of embankments have been constructed along major rivers and their tributaries along with more than 600 spurs to protect these embankments.

Development of a warning system is the second major focus of the flood disaster management policy in Pakistan. Following the devastating flood of 1992, a comprehensive programme for flood forecasting and warning capabilities was introduced with the help of Asian Development Bank under the auspices of the Federal

Flood Commission. The Indus Flood Forecasting System (IFFS) involved installation of weather radars, an HF radio system for communication, development of training and user manuals, and preparation of computer simulation models.

These mitigation measures are supplemented with an apparently well-drilled policy of disaster response. Based on the early warning system, army engineers are deployed at points of potential embankment breaches or spill-overs. These engineers are equipped with equipment and material to control the breaches to the extent possible. Army personnel are deployed in potentially dangerous areas to carry out rescue activities wherever required. Provincial relief, food, health, and law and order agencies are coordinated into a comprehensive relief effort.

Earthquakes

Despite the fact that Pakistan has suffered many earthquakes in the past 100 years, the impression was that earthquakes were infrequent, caused only local damage in remote parts of the country, and were not a major threat to urban society, in general, and major cities in particular. Disaster management for earthquakes, therefore, remained virtually negligible. No disaster plan specific to earthquake hazards was formulated. Even common mitigation strategies such as seismic hazard zonation and seismic resistant building codes were treated only casually and arbitrarily.

Status of seismic hazard zonation

Over the years, geological studies by the Geological Survey of Pakistan and supplemented by academia produced a reasonable understanding of the geodynamics of Pakistan. Several regional geological and tectonic maps of Pakistan were published by authors, such as Bakar and Jackson (1964), Kazmi and Rana (1982), Tahirkheli and Jan (1979), Searle and Khan (1996), and Tahirkheli (1996), which provide a sound database for seismogenic fault structures for inclusion in seismic hazard estimation. Further, the Geological Survey of Pakistan has 100% coverage of the country in terms of geological and tectonic maps on a scale of 1:250,000 and 75% coverage on a scale of 1:50,000, and these are valuable assets as they provide a sound geological database for estimation of seismic hazards.

Pakistan has a network of seismic stations, operated and maintained by the Pakistan Meteorological Department (PMD). Additionally, a network around Tarbela Dam has been operated by WAPDA since the early seventies. Pakistan Atomic Energy Commission has another nationwide network of seismic stations which was established in 1975. It has 24 short period and broad band seismometers to record a whole frequency spectrum generated by local, regional, and teleseismic events. Data from these seismic stations and those available from international networks yield a comprehensive catalogue of instrumental data.

The historical data for earthquakes occurring prior to the instrumental phase is based on research carried out by international scientists such as Oldham (1893), Quittmeyer et al. (1979), and Amraseys and Bilham (2003). There is a lot of scope for improvement as Pakistan completely lacks paleoseismicity data and, together with the scarcity of historical data, this places constraints on assessment of recurrence intervals associated with various seismogenic fault structures.

Despite data limitations, efforts have been made to construct preliminary seismic hazard zonation maps such as those drawn by the Pakistan Meteorological Department, Geological Survey of Pakistan, and the National Engineering Services Pakistan (NEPAK).

Building code 1986

The only possible mitigation against earthquakes is building structures that are earthquake resistant. Buildings can be constructed in such a way that they do not collapse on the occupants during an earthquake.

Pakistan developed a building code in 1986 based on a seismic hazard zonation map prepared jointly by the Geological Survey of Pakistan and NESPAK (Farah and Adhami 1986). A re-evaluation took place in 2000 as there was some discrepancy between the estimations of the 1986 map and the estimations of the United States Geological Survey Department. A Seismic Committee was established by the Association of Consulting Engineers and it proposed that Islamabad and Karachi should be assigned upper-moderate seismic hazard potentials (Zone 2b) (there were 7 zones in all).

Building code 2007: seismic provisions

The earthquake of 2005 invalidated the existing seismic hazard zonation maps of Pakistan that had assigned the entire region moderate seismic hazard potential status in 1986. The Government of Pakistan (Ministry of Housing and Works) assigned NESPAK to re-evaluate the seismic hazard map and include seismic provisions in the Building Code to be reviewed and approved by the Pakistan Engineering Council. The code has been prepared by NESPAK and has been reviewed by several sub-committees constituted by the Pakistan Engineering Council, including scientists in the fields of geology and geophysics.

There are now five seismic hazard zones (Table 7).

Table 7: Seismic zones of Pakistan

Seismic zone	Peak horizontal ground acceleration
1	0.05-0.08g
2A	0.08-0.16g
2B	0.16-0.24
3	0.24-0.32
4	>0.32g

According to this seismic zonation, much of the Himalayan region in the north, the Suleiman Range and Chaman Fault Zone region in the mid west, Makran coast in the southwest, and Thar-SE Sindh coastal area in the southeast have been assigned zones 3 and 4, implying a moderate to high seismic hazard risk. Based on this zonation, the new building code provides guidelines for seismic provisions – including site considerations, soils and foundations, structural design requirements, structural tests and inspections, reinforced concrete, structural steel, masonry, architectural elements, and mechanical systems.

Rescue and response to earthquakes

Pakistan does not have a specifically designed preparedness plan for earthquakes. Pakistan Meteorological Department is the earthquake monitoring agency and is responsible for reporting the various parameters of the earthquake such as time of occurrence, location of the epicentre in terms of longitude and latitude, and magnitude. These parameters determine the enormity of the disaster, pinpointing the area or the region affected and extent of damage expected. This information is conveyed to the National Crisis Management Cell, Interior Ministry, which is supposed to be the first to respond, followed by Federal and Provincial Emergency Relief Cells, and all the relevant federal and provincial ministries, divisions, and departments such as health, food, communications, and the police.

In practice, it is the community affected by the disaster which makes the first response. This is followed by the army. Non-government organisations, local and international, are next to step in, including volunteers from the public. Pakistan has a long way to go to attain an advanced degree of preparedness for earthquake disasters. Micro-zonation is the next step, but will take years to complete. Detailed slope stability analysis will need to be incorporated into rural and urban planning in future. Existing buildings need thorough structural inspection and retrofitting by qualified engineers or technicians.

Landslides

Pakistan has large tracts of mountainous terrain, and often it has extreme relief. Almost all the northern areas of Pakistan – Diamer, Gilgit, Hunza, Nagar, Ghizer, and Baltistan – are part of the Karakoram and are characterised by extreme altitudes with very steep slopes. Parts of the Northwest Frontier Province – Hazara Division, Kohistan, Chitral, Swat, and Dir – have equally high mountains with steep unstable slopes. Part of Punjab province (Murree Area) and much of Pakistani Kashmir are in the Higher or Lesser Himalayas and slope stability is a major issue. The mountains in the tribal belt as well those as in Baluchistan have moderately high landslide vulnerability.

Despite these facts, there is no preparedness plan for landslide disasters. As and when the landslide takes place, communities have to make the first response on their own.

Gaps and Shortcomings

Pakistan lacks coherent multi-hazard disaster preparedness plans at all levels of the government and public arenas. Only a few non-government organisations have formulated limited plans, but these are narrow in their scope and implementation, restricted to a few districts in the country at the most.

The existing strategy for disaster preparedness in the country revolves around mitigation for river-flood hazards through structural measures such as spurs, embankments, and related protection works. Lately, there has been additional emphasis on upgrading capabilities for early flood warning through the use of advanced technologies, e.g., radar, satellites, HF radios, and so on. In the case of river floods, over the years a plan has emerged for coordination between various early-warning, controlling, and disaster management institutions for mutual consultation for preparedness for an effective response and subsequent relief and rehabilitation. None of this has, however, been documented in the form of a preparedness plan.

Whereas, flood disasters associated with major river systems have been greatly controlled, flash floods caused by torrential rains are continuing to play havoc with lives and assets. Their unpredictability in terms of both time and locale make flash floods more difficult to mitigate and respond to than river floods. Further, the region threatened by flash flood hazards is much greater than that threatened by river floods. Whereas the issue is enormous, Pakistan's preparedness for meeting this challenge is virtually negligible. Only a few non-government agencies (e.g., FOCUS Pakistan) have started to tackle the issue by developing vulnerability maps in Pakistan's northern mountainous region – including Gilgit and Chitral. This effort is required on a much greater scale so that the entire country can be covered in terms of vulnerability maps; and then lead to the introduction of mitigation practices where required. At the moment, neither the federal nor the provincial authorities or agencies concerned with flood management are focusing on this issue. Likewise, almost all the major cities and towns in the country are least prepared for even an insignificant amount of rain. These cities either lack or have badly clogged drains, resulting in flood-like situations damaging houses and commercial areas, short circuiting the electricity, and even sweeping children away into open drains.

Whereas it is a great achievement to have developed effective government institutions dedicated to the mitigation of floods, one glaring flaw remains in the context of the minimum involvement of communities. There is hardly any evidence that vulnerable communities are trained to respond effectively to floods, let alone evidence of attempts to involve them in decision-making on the location or type of controlling structures. Further, is there effective communication between flood-forecasting agencies and the vulnerable communities? Despite the fact that there are manuals to bridge this gap, in practice much of the forecasting information is mere jargon for common people.

These flaws in flood-related disaster management, in particular, and management of all disasters, in general, will remain unless active community participation is ensured. The Local Government System (2001) that has been implemented in the country for the past five years has the potential to give greater empowerment of elected representatives at all levels than heretofore.

For other hazards, e.g., earthquakes and landslides, the status of preparedness is even bleaker than for floods. Disasters from these hazards can be avoided or at least minimised through vulnerability mapping. In the case of earthquakes, formulation and implementation of building codes ensuring earthquake resistant dwellings, especially in seismically vulnerable areas, forms the basis of preparedness. The British Government implemented strict building codes following the disastrous Quetta earthquake in 1935. Yet, instead of continuously revising, upgrading, and ensuring implementation of building codes, Pakistan made the building codes virtually redundant. Collapse of government buildings was ten times greater than the rates of collapse for private buildings in the Kashmir earthquake of 2005. This clearly demonstrates the status of earthquake preparedness in Pakistan.

In the case of landslides and the related disasters of debris flows and mass movements, Pakistan's preparedness is again restricted to the supply of relief as and when the need arises. Every year hundreds of lives and large amounts of property are lost to landslides. Like earthquakes, landslides can be completely unpredictable. However, in most instances fissures and cracks start developing hours and sometimes days in advance, with the commencement of rock falls and rise of dust. Not a single occasion has come to light in which an area or road segment has been declared vulnerable and evacuated or barred for use in response to such warnings. Firstly, such phenomena are highly localised and it is only the local population that can judge these warning signs, and they do not have the necessary authority or equipment to make decisions. Despite the existence of local governments at village, sub-district, and district level, somehow there seems to be no effective mechanism in place to use the local knowledge about prediction of landslides and related hazards and to decide in advance to ban activities in vulnerable areas and road segments to avoid frequent mishaps.

Discussions and Recommendations

Pakistan has successfully developed sound arrangements in terms of both institutional development as well as in coordination between the various stakeholders for controlling river-flood related hazards and disasters. There is an undocumented but well-drilled preparedness plan for response, relief, and recovery, involving dedicated agencies and departments at the federal, provincial, and local government levels. The same is, however, not true for the rest of the disasters arising out of natural hazards such as flash floods, earthquakes, and landslides. In essence, Pakistan's entire focus on disaster preparedness relies on mobilisation of the army corps or supply of relief items (tents, blankets, medicine, and food) through district relief offices. Civilian government institutions such as the civil defence, despite their existence since independence, have not been strengthened to respond to disasters and have fallen into disarray. In the following passages, the situation in Pakistan is evaluated in terms of mitigation and preparedness.

Pakistan's current status for mitigation of natural hazards can be rated from 90-100% for river-flood hazards and <10% for the rest of the natural hazards such as flash floods, earthquakes, and landslides. Multi-hazard vulnerability maps, which form the basis of mitigation as well as preparedness, are non-existent. Seismic hazard zonation and relevant earthquake-resistant building codes are either non-existent or not implemented. Mountainous dwellings and linking roads lack slope-stability data which, in combination with the lack of vulnerability maps, demonstrates the dismal state of mitigation against disasters.

As far as preparedness is concerned, a major disparity exists between the disasters caused by river floods and those caused by other natural hazards. Although undocumented, there is a well-practised and well-coordinated plan for response to river floods. All the participating government bodies clearly know their responsibilities at various stages of a disaster, including rescue, relief, first aid, temporary shelter, and restoration of communications. In contrast, for the rest of the disasters, no preparedness exists. For example, there are ambiguities in many of the following aspects of disaster preparedness.

Who will issue the first call for response? The Crisis Management Cell at the Cabinet Division is supposed to be responsible for this, but past history shows lapses on the part of this institution. For instance, for the disaster caused by the Kashmir earthquake 2005, it was the Secretariats of the President and Prime Minister that issued the call for action.

Who will conduct the search and rescue operation? Practically this phase is participated in by all the concerned, including the communities affected, local government, the police, army, and civil defence. However, this stage lacks clear unity of command and the efforts are badly coordinated. There is no rescue force trained in search and rescue for special disaster situations arising out of earthquakes, landslides, and debris flows.

Who will supervise evacuation of the survivors? Again this is handled in a completely haphazard manner. There is no unified command to supervise and carry out this crucial phase.

Who will provide the relief? This is the only component of disaster preparedness in Pakistan that is institutionalised. The Federal Emergency Relief Cell, through provincial relief commissioners and district relief offices, oversees the relief activity. The Emergency Relief Cell at federal level and the provincial relief departments play an effective role in collection of relief goods and their dispatch to disaster-stricken areas. In practice, in disasters the activities of relief departments are never on a par with the scale of the calamity, and it is the public and the non-government organisations that eventually participate in relief activities in terms of provision of temporary shelter, health, and food. Quite often there is no coordination between various agencies carrying out relief operations.

Who will carry out rehabilitation and reconstruction? Prior to the Kashmir earthquake 2005, the notion of rehabilitation was lacking completely. Every disaster the nation faced, the same scenario was observed repeatedly; a delayed response for rescue followed by an efficient relief effort. Once the dust was settled, communities were left on their own to cope with their reconstruction and rehabilitation needs.

There is no denying the effectiveness of the Pakistan Army in disaster response; but the dilemma is that this rather overwhelming role assumed by one agency has virtually barred the civilian government agencies and communities from taking on responsibility. Pakistan needs to develop civilian institutions, especially at local government and community level, to not only formulate preparedness plans but also respond effectively. Since it is the communities that suffer most from disasters caused by natural hazards, they must be empowered and prepared to respond to disasters.

In light of the considerations outlined in this report, the following recommendations are made to streamline disaster preparedness in Pakistan.

1. A dedicated institution is needed to address the issues related to disaster management. As outlined above, Pakistan has already taken a step in this direction through the establishment of a National Disaster Management Authority. Hopefully this institution will devolve to provincial, district, village, and community levels.
2. Mitigation efforts should be separated from disaster response: both need separate institutions. Whereas organisations like the Flood Commission, Frontier Works' Organisation, Pakistan Meteorological Department, Flood Forecasting Division, SUPARCO, and the Geological Survey of Pakistan carry out mitigation measures, the NDMA needs a Disaster Preparedness Plan that spells out the responsibilities, powers, and standard operation procedures (SOP) for all agencies involved in disaster management.
3. Disaster Preparedness Plans (DPP) should be rehearsed (drills) and should be constantly reviewed.
4. DPPs should include a comprehensive outline for coordination between all the relevant agencies and for communication with vulnerable communities.
5. The future DPPs must evolve by gradually shifting disaster response, recovery, and rehabilitation responsibilities from the army to the civilian government, from the civilian government to local governments, and, finally, from local governments to the communities themselves. These plans should ensure greater involvement of communities in decision-making as well as disaster response, recovery, and rehabilitation.
6. Pakistan needs a comprehensive emergency force, comprised of volunteers from every strata of society, and trained and well-versed in all disaster situations with the capability and resources for effective mobilisation. Practical training in higher secondary schools and universities can contribute to development of a sizeable volunteer force.
7. The public needs to be made aware of natural hazards and disaster management. Inclusion in the curricula at school level is one of the most promising solutions. It is at this level that practical training in first aid and general safety practices can be imparted to a sizeable population.
8. Research into disaster management that adapts to the cultural, geographic, and social system is the key to success. At the moment, teaching and research in disaster management is virtually non-existent. Dedicated research and education institutions need to be established.

Finally, Pakistan is already in an advantageous position to deal effectively with future natural disasters, because a) it has gone through the worst disaster perceivable in 2005 and experienced all the stages from first call for action, to search, rescue, evacuation, relief, reconstruction, and rehabilitation; b) it has institutions that have been dealing

with flood disasters effectively over the years and can broaden the scope of action and streamline the basic components into a disaster preparedness strategy; and c) it has a national character characterised by volunteerism, endowment, and sacrifice. The national response to the Kashmir earthquake 2005 is adequate witness to this special attribute.

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Annex 1: Terms of Reference

Preparation of a Status Report on Natural Disaster Preparedness Plans

Background

There is a growing concern within the international community to improve disaster management and preparedness. As a response, ICIMOD has initiated work on collating important information about disaster preparedness in the region through a project titled 'Living with Risks – Sharing Knowledge on Disaster Preparedness in the Himalayan Region'. The specific objective of the project is to support key practitioners with current knowledge in the field of disaster preparedness, mainly floods, landslides and earthquakes; and build capacity in multi-hazard risk assessment, as well as provide a platform for interaction and exchange of experiences. The prime target countries for the project are Bangladesh, India, Nepal and Pakistan, and with the mountain areas in these countries being of particular interest.

The project is funded by the European Commission Humanitarian Aid Department (DG ECHO) and will be implemented between 1 April 2006 and 30 June 2007.

As part of the activities, the project will promote exchange of experiences, best practices and cross-learning between practitioners through the arrangement of two regional workshops and the establishment of a website as the basis for knowledge networking.

The first workshop is anticipated to take place in early August. The workshop will focus on disaster preparedness in general and plans for disaster preparedness in particular. In this case, Plans on a national level are of prime interest, but plans on district and community levels are also of great importance.

Objective of the task

The objective is to provide an account on state-of-the-art on disaster preparedness plans in each of the four target countries: Bangladesh, India, Nepal and Pakistan. There will be a document for each country, with the aim to provide as complete account of existing plans as possible. The account will form basis for a gap analysis during the forthcoming workshop regarding Natural Disaster Preparedness Plans (NDPP) in the four target countries.

Scope of work

The consultant shall prepare a status report on Natural Disaster Preparedness Plans (NDPP) in his/her country.

- A) This report shall list all relevant Preparedness Plans on a national level in relation to three main natural hazards:
- Floods (including flash floods)
 - Landslides (and related land mass movements)
 - Earthquakes

When applicable, a mountain focus shall be taken.

Annex 2: Disaster Management Legislation

The National Calamities (Prevention and Relief) Act, 1958

This Act was passed by the West Pakistan Assembly on 3rd April, 1958; assented to by the Governor of West Pakistan on 19th April, 1958; and published in the West Pakistan Gazette (Extraordinary), dated 24th April, 1958, pp711-716. The Act provides for the maintenance and restoration of order in areas affected by certain calamities and for the prevention and control of and relief against such calamities.

Provincial Relief Commissioners (who also happen to be Senior Members of the Board of Revenue) have been given the responsibility of relief with the following powers under section 4 of the Act.

- To evacuate or segregate the population
- To requisition bulldozers, tractors, motor vehicles, carts, carriages, boats, and other means of transport by air, land or water, and beasts of burden
- To require the residents to declare surplus stocks of food, fodder, firewood, and clothing and bedding and to requisition all or any of these articles
- To requisition building materials
- To requisition any building or land
- To demolish any building or other structure
- To conscript labour
- To direct any person to abstain from a certain act or to take certain orders with regard to certain property in his possession or under his management

And after approval of the government --

- acquire any land and
- remit in whole or part any government dues payable by any person or in respect of any property affected by the calamity

Under section 11 of the Act, the government is asked to provide all or any of the following matters by rules.

- The procedure to be adopted in giving an alarm of an impending calamity
- The method of securing information with regard to floods or any other impending calamity
- The measures and precautions to be taken to avert any such calamity
- The procedure to be followed for surveying places of safety and the entry into any such place for the purpose of such survey after a proper notice
- The method of assessment and payment of compensation on account of requisition and acquisition of property under this Act
- The procedure with regard to revisions against an order passed under this Act and the period during which such revisions can be presented

The Punjab National Calamities (Prevention and Relief) Act, 1951, the Khairpur National Calamities (Prevention and Relief) Act, 1954, and the West Pakistan National Calamities (Prevention and Relief) Ordinance 1956 were repealed after this Act.

Emergency Services Ordinance, 2002

The Ordinance establishes emergency services to deal with emergencies in an effective manner and encounter threats to the public from modern warfare, terrorism, and disasters and defines responsibilities at each level. The National Council has also been established to regularly monitor the performance of this service and ensure continuity in the process of rule-making in the management of emergencies and disasters during peace time.

According to the Ordinance, the provincial governments shall have the administrative powers. Likewise, the District Emergency Officer has been made responsible for the functional management of the service.

The Federal Government will mainly be responsible for ensuring uniform standards for the service throughout the country, providing advance training to officers through the National Academy, and overseeing the performance of the provinces. The Ordinance includes definitions of disaster-related terms, i.e., natural and man-made disasters, emergencies, preparedness, response and support services, etc. Under the Emergency Services' Ordinance, the federal, provincial, and district governments shall set up emergency services, which shall be responsible for preparedness and rapid response to emergencies and disasters of any scale. The National and Provincial Crisis Management Cells, of the Ministry of the Interior and Home Departments respectively, shall coordinate the activities of all emergency services at the national and provincial levels.

Being an important organ of emergency services at the district level, the District Emergency Service shall be responsible for administrative control, incident response, communication, recruitment and training of volunteers, implementation of safety codes, community awareness programmes, collection and maintenance of incident response data, facilitation of non-government organisations for rescue and relief work, and provision and management of emergency ambulance services.

Local Government Ordinance 2001

The Local Government Ordinance (LGO) provided several new avenues for effective and context-specific disaster management. The institutional framework, functions, and responsibilities assigned to various local government officials are given below.

1. Zila (District) Nazim - Being the head of the district, the Zila Nazim is to “take charge, organise, and prepare for relief activities in disasters or natural calamities.”
2. Zila (District) Council - The Zila Council is to “make recommendations to the district government for enhancement of the care of disabled persons, paupers, the aged, sick, persons of unsound mind, abandoned minors, juvenile delinquents, drug addicts, abused children, and needy and disadvantaged persons.”
3. Zila Council in a City District - In the case of a City District, the Zila Council has the responsibility and powers to (a) approve master plans, zoning, land-use plans—including classification and reclassification of land— environmental control, urban design, urban renewal, and ecological balance; (b) review implementation of rules and bye-laws governing land use, housing, markets, zoning, the environment, roads, traffic, taxes, infrastructure and public utilities; and (c) review development of the integrated system of water reservoirs, water sources, treatment plants, drainage, liquid and solid waste disposal, sanitation, and other municipal services.
4. Tehsil (Sub District) Municipal Administration (TMA) - Under the LGO, the TMA is to provide, manage, operate, maintain, and improve the municipal infrastructure and services, including:
 - i. water supply and control and development of water sources, other than systems maintained by the union and village councils;
 - ii. sewerage, sewage, and sewage treatment and disposal;
 - iii. storm water drainage; and
 - iv. fire fighting.
5. Tehsil (Sub District) Council - The Tehsil Council is to approve land use, zoning, and master plans for Tehsil development and maintenance programmes or projects proposed by the Tehsil Municipal Administration. The Town Council also has similar powers and responsibilities to be executed under the LGO.
6. Union Administration - Unions are sub-divisions of the sub-district and consist of a group of villages depending upon their collective population and proximity to each other. The Union Administration is to assist the relevant authorities in disasters and natural calamities and assist in relief activities, including de-silting of canals.
7. Union Nazim - According to clause (f) of section 18 of the LGO, the Union Nazim shall report to the authorities concerned in respect of:
 - i. encroachment on state and local government property and violation of land use and building laws, rules, and bye-laws, and
 - ii. environmental and health hazards.
8. Union Council (UC) - Under the Local Government Ordinance the Union Council is to promote plantation of trees, landscaping, and beautification of public places in the Union.
9. Village Council (VC) - The VC is responsible for (a) developing and improving water supply sources; (b) making arrangements for sanitation, cleanliness, and disposal of garbage and carcasses; and (c) taking measures to prevent contamination of water.

Part D of the First Schedule of the Local Government Ordinance states that the City District Government may set up district municipal offices for integrated development and management of the following services.

- a. Water source development and management, storage, treatment plants, and macro-distribution
- b. Sewage tertiary and secondary networks, treatment plants, and disposal
- c. Storm water drainage networks and disposal
- d. Flood control protection and rapid response contingency plans
- e. Natural disaster and civil defence planning
- f. Solid waste management, treatment, and disposal, including landfill sites and recycling plants
- g. Treatment and disposal of hazardous and toxic waste from industries and hospitals
- h. Environmental control, including control of air, water, and soil pollution in accordance with federal and provincial laws and standards
- i. Urban design and urban renewal programmes, promulgation of building rules, and planning standards

Annex 3: Some International Organisations and Agencies Involved in Disaster Management in Pakistan

Some of the principal international donor agencies engaged in disaster management in Pakistan are listed below, together with a brief summary of their activities.

United Nations Development Programme (UNDP)

The Crisis Prevention and Recovery Unit (CPRU) of the United Nations Development Programme has been undertaking quite a number of activities pertaining to disaster relief and management. The Unit liaises between UN Agencies as well as NGOs and INGOS and the relevant authorities in the Government of Pakistan. It also acts as the Secretariat of the UN Disaster Management Team under the Chairmanship of the UN Resident Coordinator. Additionally, the Crisis Prevention and Recovery Unit has the responsibility of monitoring disasters and emergencies and providing up-to-date information on the situation.

Proposed National Disaster Management Agency

The UNDP has proposed a five-year programme to the federal government to be nationally executed by the National Disaster Management Agency (NDMA) within the structure of the Emergency Relief Cell. The proposal was submitted after reviewing the existing capacity of the government sector and civil society for disaster preparedness and management. The programme is designed to improve the efficiency and effectiveness of mechanisms at the federal, provincial, and district levels by management of both the risk and consequence of a disaster episode.

Vision – The vision of the programme proposed is to create a culture of prevention and preparedness to address everyday hazards and to meet the consequences of disasters by managing both the risk and impact of natural and human-induced catastrophes effectively.

Goal – To build disaster resilient urban and rural communities, by creating a culture of prevention to address everyday hazards and by managing the risk from natural and human-induced disasters.

The programme has been designed to achieve the following outcomes.

- Improved institutional capacity development of federal, provincial, and district government and civil society stakeholders with contemporary approaches, methods, and techniques in disaster-risk reduction

- National policy, legislation, and plans aimed at adopting an all-risk approach to disaster management
- Effective multidisciplinary, multi-sectoral, and inter-governmental disaster response and mitigation systems for all-risk disaster risk reduction formulated and applied

The institutional arrangements proposed for achieving the above-mentioned outcomes are as follows.

- The strengthening of the Emergency Relief Cell in the Cabinet Division with an expanded role and renaming it the National Disaster Management Agency (NDMA). The NDMA will serve as the secretariat to the National Disaster Management Commission (NDMC). The Agency shall undertake the following tasks.
 - i. To ensure the establishment and maintenance of incident command structures that enable efficient operational coordination for all disasters at all levels and promote awareness and capacity building at all levels
 - ii. To collect, analyse, process, and disseminate the intersectoral information required in all hazard management approaches
 - iii. To mobilise the financial and material resources required
 - iv. To carry out hazard mapping and vulnerability analyses
 - v. To establish emergency services
 - vi. To establish Disaster Management Committees incrementally at all levels
 - vii. To coordinate monitoring and reviews to assess the validity of the national disaster policy to see whether amendments are necessary
 - viii. To serve as the lead agency for international non-government agencies to ensure their performance matches accepted international standards
 - ix. To serve as the lead agency for the GoP in regional and international disaster management cooperation
 - x. To establish a National Disaster Prevention Day, the activities of which will be public awareness, exhibitions on disaster management, and fund raising for a National Disaster Emergency Fund
- To establish Disaster Management Committees at Provincial and District level
- To establish Disaster Management at Tehsil level
- To engage NGOs, other stakeholders, the media, and UN agencies in the process
- The new mechanism will be linked to a Regional Initiative for Disaster Risk Management by the UNDP. This initiative covers a network of eleven countries in Southwest and Central Asia and its objective is knowledge networking for disaster risk management in drought, earthquake, and floods and for cross-cutting themes.

The total estimated cost for the programme is US\$ 15.5 million, of which the UNDP has agreed to allocate US\$ 2.5 million. A modified version of this proposal has been recently implemented in Pakistan (December 2006).

INGO Forum for Disaster Preparedness and Response

A humanitarian forum for emergency response and preparedness was established in June 2003 with the following objectives.

- Regular information sharing
- Enhanced coordination with the government and other key players in the humanitarian sector
- Building linkages and collective representation before government and institutional donors
- Continual monitoring of all humanitarian responses in the country
- Standardisation and ensuring quality in emergency responses
- Capacity building and research and documentation

Currently, the Church World Service is acting as the forum secretariat. The founding members (organisations) include Islamic Relief (UK), Oxfam GB, Church World Service, Catholic Relief Service, Save the Children (UK, USA, and Sweden), Concern, Plan International, Mercy Corps International, and Relief International.

Emergency Resource Centre (ERC)

The Church World Service established the ERC in May 2004 with a mission to enhance the capacity of various stakeholders in civil society to combat natural and man-made disasters proactively and reactively. The ERC has the following objectives.

- To develop a comprehensive database on various aspects of emergencies
- To undertake academic research for the generation and synthesis of knowledge
- To acquire and extract knowledge from ground experiences
- To construct dialogue on the basis of knowledge generated with relevant stakeholders
- To encourage meaningful engagement and dialogue between all stakeholders on emergency-related issues

FOCUS Humanitarian Assistance

FOCUS Humanitarian Assistance is an international group of agencies established in Europe, North America, and South Asia to complement the provision of emergency relief, principally in the developing world. It is affiliated with the Aga Khan Development Network, a group of institutions. Unlike most of the NGOs active in rescue, relief, and rehabilitation, FOCUS also functions in mitigation areas. Some of the contributions of FOCUS in Pakistan include the following.

- Development of an inventory of landslides in three major districts (Chitral, Gilgit, and Ghizer) in the northern areas and initiation of engineering work on some selected landslides

- Development of an inventory of Debris Flow Hazards in Chitral, Ghizer, and Gilgit districts
- Training of over 30,000 volunteers in different areas of Pakistan, but more specifically in the Northern Areas and Chitral, in emergency preparedness, rescue, and relief
- Awareness programmes about safety measures and about natural hazards and disasters
- Trained and equipped Search and Rescue Teams capable of undertaking light-medium search and rescue
- One hundred members of the Disaster Assessment Response Team were trained to assess the immediate needs of the communities in case of a disaster.



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