Chapter 1
Introduction and Approaches of Disaster Risk Reduction in Pakistan

Atta-Ur-Rahman and Rajib Shaw

Abstract In Pakistan, the massive 2005 Kashmir earthquake was a turning point to rethink and restructure the disaster risk management system. As Pakistan has a long history of natural hazards occurrence that range from geophysical events to hydro-meteorological processes. Almost every year, the impacts of disasters put extra pressure on the country budget. Looking to the transition in economic system, the importance of disaster risk reduction (DRR) was realized and the issue was properly addressed and the national disaster management commission (NDMC) was established in 2006 to proactively respond to various disasters. In this regard, national disaster management authority (NDMA), a focal body was assigned a task to implement policies, strategies and programs for disaster risk reduction. Eventually, national disaster risk management framework (NDRMF) was developed in 2007, which provides guidelines for all the key stakeholders and in 2013 national disaster risk reduction policy (NDRRP) was developed. However, there is a need of sustainable socio-economic and environmental development to properly mainstream DRR in the policies and programs and especially to cater the poor and marginalized people of the country. To make the country more resilient, to a wide range of disasters, there is an emergent and consistent need of enhancement in social, physical, economic and institutional capacity at national, regional and local level. It is also pertinent that stress should remain on multi-scale and cross-sectoral disaster risk reduction approach. This chapter is divided into seven sections. Section 1.1 introduces the disaster risk reduction approaches practiced at global and country level. Section 1.2 highlights the background and progress of disaster risk reduction agenda at global level, whereas Sect. 1.3 highlights the disasters in the context of Pakistan. Section 1.4 of the chapter describes the disaster risk reduction legislations and institutional set-up in Pakistan, while Sect. 1.5 analytically discusses various risk

Atta-Ur-Rahman (✉)
Institute of Geography, Urban and Regional Planning, University of Peshawar, Peshawar, Pakistan
e-mail: atta_urp@yahoo.com

R. Shaw
Graduate School of Global Environmental Studies, Kyoto University, Kyoto, Japan

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reduction approaches applied in Pakistan. Section 1.6 discusses the key challenges faced Pakistan in mainstreaming disaster risk reduction, whereas conclusion is given in the final section.

Keywords Disaster risk reduction • Approaches • Hazards • Climate change • NDMA

1.1 Introduction

Globally, disasters have increasing impacts on human use system. Each year, massive disaster events of earthquake, floods, drought, heat waves, cyclones, tsunamis etc. killing thousands of people and render hundreds of thousand injuries and cause billions of economic loss (GECHS 2008). The disaster impact largely varies from country to country depending upon the physical and socio-economic resilience of a community. In developed countries, the economic losses due to extreme phenomenon have been registered as higher than the developing nations, whereas it is vice versa for the estimates of human casualties (Rahman 2010). Developing countries are the hot spot for disaster events. It is developing nations, where disasters represent a major source of risk for the poor and can potentially destroy development gains and accumulated wealth (World Bank 2005).

The CRED (2014) estimate shows that the frequency of disaster events are on rise from mere 100 disasters per decade (1900–1940), to over 2,080 extreme events during 1990–2000. In all these disaster events, the occurrences of hydro-meteorological disasters have been increased, whereas the number of geo-physical events has remained fairly steady (IPCC 2007; UNISDR 2009). The CRED report (2014) also reveals that on average each year 373 country-level disasters occur, which kill over 100,000 people, with estimated economic loss of 156 billion US dollars. In 2013, Asia was the hard hit region with an estimated fatality of 88 % from all type of disaster events as against 62 % decadal average. Analysis on the basis of type of disaster indicates that flood and storms were responsible for over 80 % (flood 43 % and storms 41 %) human casualties. In terms of occurrences, mortalities and population affected, more than 80 % is attributed to floods and storm surges (hydro-meteorological disasters), which is attributed to the climate change exacerbations. The IPCC fourth assessment report suggests that climate change is likely to accelerate the intensity, duration and frequency of floods, storms, heat waves, drought etc. The IPCC (2007) has identified impacts of climate change including significant increase in heavy precipitation, increase in tropical cyclone and longer drought periods. Similarly, during 2013 in the list of most affected countries, Pakistan was ranked at fifth position (CRED 2014), whereas German Watch ranged Pakistan at third amongst most affected nations (Kreft and Eckstein 2013).

Pakistan is part of south Asia and relatively bounded from the north by China, north-west by Afghanistan, west by Iran, east by India and south by Arabian Sea.

Geographically, the country extends from latitude 24° to 37° North and longitudes from 62° to 75° East (Khan 2003). The total geographical area of the country is approximately 796,095 km^2. Pakistan has five provinces namely Punjab, Sindh, Khyber Pakhtunkhwa, Baluchistan and a newly established province of Gilgit-Baltistan, a Capital territory and Federally Administered Tribal Areas (FATA; Khan 2010). In addition to these, there is a territory of Azad Jammu & Kashmir (AJK). Each province is further divided into divisions and the same is divided into administrative units called district.

Pakistan can broadly be divided into three physiographic units i.e. mountains, plateau and plains. The country is bordered on the two sides (on the north and west) by mountains. Almost 60 % of the country is mountainous and constitute the world famous mountains of Karakorum, Himalayas and Hindu Kush. The eastern Hindu Kush falls in Pakistan and borders with Afghanistan in the north-western section of the country. The western Karakorum and Himalayas are also located in the north and making a physical border with China. In Pakistan, there are five out of 14 peaks having altitude over 8,000 m above sea level (asl). Similarly, 108 peaks have above 7,000 m altitude (Rahman and Khan 2013). The world second highest peak lies in Karakorum (K2; 8,611 m), which is located in Gilgit-Baltistan, whereas, Nanga Parbat (8,126 m) in Himalaya, Gasherbrum-I (8,080 m) in Karakorum, Broad Peak (8,051 m) in Karakoram and Gasherbrum-II (8,035 m) in Karakoram.

The Karakorum, Himalayas and Hindu Kush are hosted by numerous large and small glaciers (Rahman and Khan 2013). In Pakistan, glaciers have covered around 17,000 km^2 areas. It is the second biggest mass of glacier outside the north and south poles. All these glaciers are the water towers and reservoirs for supplying fresh water. It feeds more than 50 small and large rivers in Pakistan (Khan 2013). The perennial supply of water from these glaciers is the life line for the people and economy of Pakistan. As the country is agro-based and heavily dependent on perennial supply of irrigation for agriculture, industrial use, hydro-power generation and the most important is the domestic utilization. Without these glaciers, the country would have been an uncongenial arid land to support the growing population. Due to climate change phenomenon, glaciers are retreating in northern Pakistan. As a consequence of glacier melting, it would have significant impacts on the agricultural production, hydro-power generation, industrial establishments and eco-biodiversity in the vast Indus plain of Pakistan. Besides this, these glaciers also attract large scale tourists, trackers and scientists from all over the world.

Contrary to this, Pakistan is vulnerable to wide range of hazards including earthquakes, landslides, floods, extreme weather phenomenon, Glacier Lake Outburst Floods (GLOF), snow avalanches etc. The country's extreme vulnerability to climate change is a feature of its geographic location, elevation as well as demographics. Pakistan lies on a steep incline, dropping sharply from almost 8,500 m down to sea level within an aerial distance of less than 2,000 km. This situation is augmented by the presence of huge glacial reserves in the north. Through consistent process of ablation in summer and accumulation in winter, it contributes more than 70 % water to river discharge. This frozen "blue gold" is the country's most precious resource and sustain the agro-based economy aided by the unpredictable summer monsoon rain.

Heavy glacial melt and monsoonal rain supplement sufficient water for irrigation, needed for the arid country but, ironically it increases the risk of both flash and river floods. Over 70 % of the country population is living in the floodplains is directly affected by frequent flooding and reinforces the country's vulnerability. Beside this, the country is exposed to frequent seismic activity and the massive earthquakes of 2005 and 2013 have witnessed the extent of vulnerability.

The climate change has increased the frequency and intensity of hydro-metrological events and also enhanced the unpredictability of the monsoons and posed a major threat to food, water and energy security in the country. In addition to this, the coastal and marine environment, agriculture and livestock sector, forests and biodiversity and health are other areas that will be seriously affected as the climate induced melting of glaciers, heat waves, cyclonic storm surges, diseases/epidemics, floods, intense precipitation, droughts and variable monsoons have been turned into an inevitable future reality for Pakistan.

Disaster Risk Reduction Approaches are well established within the international development community (Mercer 2010) but still there is a long way and gaps in the strength of knowledge and skill, right from adaptation to prevention, mitigation, preparedness, emergency response and early recovery, which need to be effectively utilized to an ultimate extent. The scientific community, practitioners etc. are struggling to explore and introduce innovative ideas and approaches to effectively address disaster risk reduction and minimize the adverse consequences of disasters. In certain cases, the disaster manager learnt from their experiences and recovered by building safer and better one. Pakistan has also made a shift in the policy, strategies and plans and still in the process of mainstreaming disaster risk reduction in development planning. Vulnerability and risk assessment, emergency response force and mechanism, establishment of multi-hazard early warning system, raising awareness, and disaster and climate change education are one of the long listed strategies to proactively respond to increasing disasters and climate change adaptations. In this changing scenario, the role and responsibility of national disaster management authority is of key concern and need special attention of decision-makers in building capacity and strengthening the disaster management institutions at national, provincial and district level. The challenging task for all disaster related organizations is to effectively manage disaster risk within the country limited financial resources.

1.2 Background and Progress of Disaster Risk Reduction Agenda

Globally there is a paradigm shift in the disaster risk management system from exclusively active approach to proactive one. The concept of disaster management has long been used by the scientific community and practitioners since 1970s. Disaster risk reduction is a crossing cutting discipline and has grown in wider range

of holistic approach right from the causing factors to reduction of disaster impacts. In the past few decades, disaster risk reduction policy, strategies and plans consider disasters as social, economic and physical origin. DRR is a systematic process of policies and strategies development for reducing vulnerabilities and building resilience against the unforeseen events (UNISDR 2004). DRR is an organised methodology to identify, assess and minimise the disaster risk and reduce the overall people vulnerability to environmental hazards. Disaster risk reduction focuses on addressing the underlying risk factors in minimizing the potential loss of lives and properties.

1.2.1 Creation of the United Nations Disaster Relief Office

In 1971, general assembly has passed a resolution and as a result the United Nations Disaster Relief Office (UNDRO) was established with its headquarter in Geneva. The purpose of UNDRO was to study natural disasters, assist governments in providing advices and improve disaster warning system. In addition to this, the UNDRO role was to reduce the impacts of disasters and provide technical and financial assistance to disaster prone countries. In 1992, after the establishment of Department of Humanitarian Affair (DHA), the UNDRO was merged under the UN resolution. In 1998, DHA was reorganized into the Office of the United Nations Coordination of Humanitarian Affairs (UNOCHA).

1.2.2 International Decade for Natural Disaster Reduction (1990–1999)

In 1989, the United Nations General assembly designated the period 1990–1999 as the International Decade for Natural Disaster Reduction (IDNDR 1990–1999). The aim of IDNDR was to reduce the human losses and socio-economic disruption caused by disasters. The IDNDR was an attempt to promote disaster risk reduction through rigorous international actions, scientific and technical knowledge. In order to effectively appraise and implement the UN resolution, a Secretariat was established at the United Nations Office in Geneva.

1.2.3 International Strategy for Disaster Reduction

After successful completion of IDNDR (1990–1999), a successor agency under the name of International Strategy for Disaster Reduction (ISDR) was established. In 2002, the World Summit on Sustainable Development, in Johannesburg provided

ISDR with objectives of joint venture of sustainable development agenda, where both the Inter-Agency Task Force on Disaster Reduction and the UNISDR secretariat will work. The objectives of public UNISDR was to increase public commitments, establish linkages to sustainable development and strengthen the networking and partnership.

Under the UNISDR portfolio the International Strategy means to shift from traditional way of dealing with disasters in the form of response to proactive approach of disaster risk reduction, and to promote the culture of disaster prevention. UNISDR (2009) has elaborated that DRR is a concept and practice of minimizing risk by an organized process to analyse and minimize the factors of causing disasters and reduce human exposure to hazards and minimize the people vulnerability. The severity of disasters largely depends on the extent of hazard/s impact/s on a community and environment. The scale of disaster impact is closely associated with the priorities for the type of livelihoods and intervention in environment. The actions which are taken may either enhance the vulnerability to disasters or build resilience against the hazards. It is fact that higher the government, community and individuals understanding of disaster risk and vulnerability, the better equipped would be to cope with and minimize losses.

1.2.4 Millennium Development Goals

In 2000, during United Nations Millennium Summit eight Millennium Development Goals (MDGs) were set-up and all the member states agreed to adopt and accomplish the goals. Out of eight MDGs, four (MDG 1, 3, 7 and 8) are directly related to disaster risk reduction agenda including eradication of poverty and hunger, promote gender equality and women empowerment, ensure environmental sustainability and develop a global partnership for development. In Pakistan, the National Disaster Management Authority is trying to achieve goal 1 through community based disaster risk management and community infrastructural development for building resilience, save lives and protect sources of livelihood earnings. Similarly, a system of compensation for the disaster affectees is already in practice. The risk insurance mechanism is also steadily gaining importance. Regarding MDGoal 2, gender mainstreaming in disaster risk management planning and gender and climate change have already been established. Special attention has been given to provide equal opportunity to women disaster risk management and capacity building. In Pakistan, the Ministry of Climate Change specifically dealing with the MDG 7 to ensure environmental sustainability through introduction of climate change adaptation strategies in disaster risk reduction and introduction of bio-engineering solution. The 8th MDG focuses on development of global partnership for sharing knowledge and best practice. This process however helps the disaster management authority to learn about the best practices and chances of its replication in the home country.

1.2.5 Hyogo Framework of Action (2005–2015)

The 2004 Indian Ocean earthquake followed by Tsunami was a turning point in the history of global disaster risk management system. After fall of Indian Ocean Tsunami, the United Nations call for World Conference on Disaster Reduction, it was held on 18th to 22nd January 2005 at Kobe-Japan. The UNWCDR has provided a platform to bring together the scientific community, government stakeholders and practitioners under a single but comprehensive agenda of reducing disaster vulnerabilities. The Hyogo Framework for Action (HFA 2005–2015) was the outcome of UNWCDR 2005, which insist the nations to explicitly work on five priority areas (GoP 2012b).

The mission of Hyogo Framework of Action (HFA 2005–2015) is to initiate and regularly monitor the progress of building nations and communities' resilience to disasters. UNISDR (2009) highlighted that HFA provides principle and practical guidelines for building disaster resilience. In response, the countries have endorsed DRR in their policies, programmes and development planning process. However, the climate change has further intensified and exacerbated the frequency and intensity of hydro-meteorological disasters. The International Disaster Risk Reduction Community is consistently introducing new tools and techniques to integrate the indigenous and non-indigenous approaches of handling disasters. HFA aims to substantially minimize impacts of disasters and build the resilience of communities and nations. The five key priority areas include:

Priority Action 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation. It stress on the nations to devise policies, institutions and legislative framework for DRR. Population growth, economic development and increasing urban development are the major drivers of escalating trends of disaster impacts. If countries act rigorously can save lives and properties. It further insists on the countries for preparing strategies to quantify the progress in various sectors of the society.

Priority Action 2: Identify, assess and monitor disaster risks and enhance early warning. Increase disaster resilience and climate change adaptation needs knowledge of various hazards, type of vulnerabilities and risk assessment and management are specifically required at the community level. It is poor section of the society, who is hit hard by the disasters because of their high vulnerability. According to World Bank (2014) over 70 % of the disaster hot spot lies in the low income countries. Low income nations accounted for only 9 % disaster events, but fatalities are more than 47 %. With changing variability in climate related disasters, there is utmost need of multi-hazard early warning system and dissemination of the same to the target population. Risk assessment and early warning system is not a one-time activity, it needs periodic monitoring and updating.

Priority Action 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels. Disaster and climate change education is a key

to enhance community resilience. Mainstreaming disaster risk reduction approach into policy, planning and development is one of the effective approaches in minimizing disaster impacts. Capacity building at all levels can help in minimizing the impacts of disasters. It is fact that culture of well–informed and motivated citizen has the potential to prevent and cope better the unforeseen events.

Priority Action 4: Reduce the underlying risk factors. The disaster risk pertaining to human intervention in eco-environmental condition and impacts of hazard associated with geo-physical and climate change need to be properly addressed in development plans and programs. The disaster management authorities should focus on mainstreaming disaster risk reduction in development planning.

Priority Action 5: Strengthen disaster preparedness for effective response at all levels. Disaster preparedness and emergency response are the most critical and sensitive stage of disaster risk management process. The impact of disasters can be minimized if the disaster risk management authorities, community and individuals are fully prepared and ready to skilfully respond to extreme event.

1.3 Disasters in the Context of Pakistan

During the past three decades (1980–2012), a total of about 21,000 natural disasters have been reported, out of which one-third (6,800) is reported from Asia alone (CRED 2014; Munich Re 2014). During the same period, 2.3 million human fatalities were occurred, out of which more than half (52 %: 1.18 million) is reported from Asia. Globally in the year 2012, a total of 905 natural catastrophes were recorded (Munich Re 2014), out of which 76 % were hydro-meteorological events. It is reported from all the six inhabitant continents. In these events, approximately 9,600 human death casualties have been registered, out of which 75 % were attributed to the hydro-meteorological events. Continent-wise distribution indicates that out of total events (905), 37 % is reported from Asia with 64 % fatalities, indicating the low resilience and high exposure to natural catastrophes. The analysis reveals that since 1980 the frequency of natural disasters is on rise. The number of meteorological, hydrological and climatological events has been increased, whereas fluctuation is recorded in the geophysical events.

In Pakistan, during 2001–2013 (13-year span), a total of 25 extreme events has been reported, out of which six earthquake, six landslides and almost each year a flood event is registered (Fig. 1.1). During this 13 year span, 80,415 human lives were lost with a highest figure of 74,484 attributed to earthquake followed by flood (5,722) and landslides 209 fatalities. In terms of frequency, floods lead over all other disasters, however earthquake surpasses due to its intensity and the massive 2005 Kashmir earthquake.

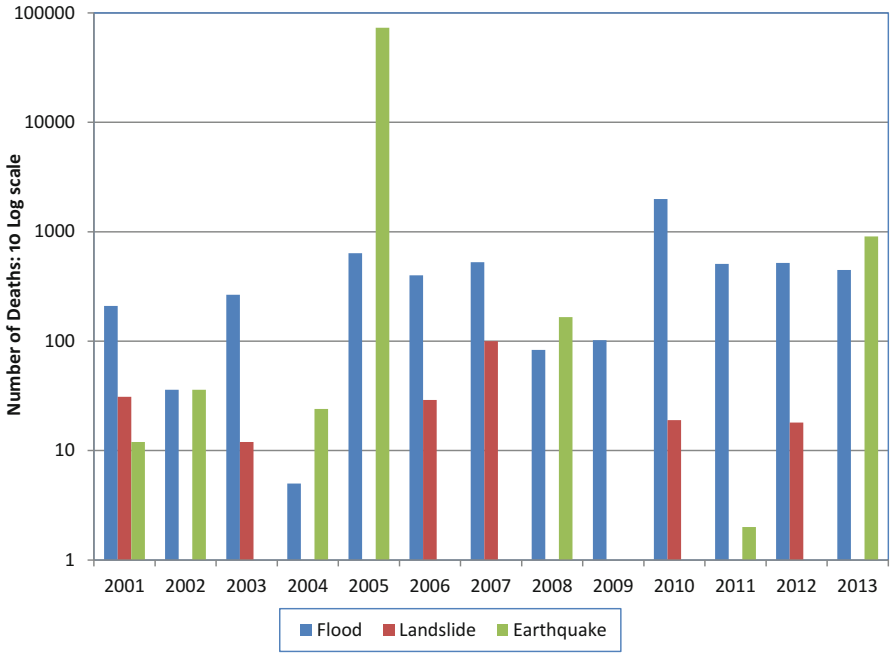

Fig. 1.1 Pakistan, number of geophysical events 2001–2013 (After EM-DAT 2014)

1.4 Disaster Risk Reduction Legislations and Institutional Set-up in Pakistan

Disasters have become a policy requirement for global, regional and local level planning agencies. It demands for effective national strategy, institutional framework and legislation. The disaster risk cannot be eliminated; however, its impact can be minimized through disaster risk reduction (DRR) approaches, systematically. Considering the significance of DRR approaches in minimizing the impacts of disasters, it needs to analyse the disaster resilience, institutional capacity, legislations and practices in Pakistan. The national disaster risk reduction efforts are in progress and trying to systematically mainstream into policies, development planning and programmes.

Keeping in view, the radical changes in the institutional development, the Government of Pakistan has recently established ministry of climate change, climate change policy, National Disaster Risk Reduction Policy and framework to address DRR effectively under the Hyogo Framework of Action (HFA). As HFA priority-1 is more focused on disaster legislations and provides legal basis for other priority areas. The country requires effective legislation and policy framework for institutional development, community participation, resource mobilisation and make these policies and legislations instrumental in mainstreaming DRR in the development plans and programmes.

1.4.1 National Calamity Act 1958

The National Calamities Act of Pakistan 1958 was the only legal document to regulate the relief, rehabilitation and reconstruction. It was only the reactive disaster related legal document functioned throughout the country for a long time. Under this regulation, there was an emergency relief cell within the cabinet division. Again it is refereeing just relief /compensation in either disaster phase or post-disaster period. Under the Calamity Act, in each province there were relief commissioners, who supervised and coordinated the relief and rehabilitation efforts. Few provinces have also developed Disaster Plan such as NWFP Disaster Plan 1978, where list of hazards are available to which the province is susceptible (Rahman 2010). Similarly, it has also highlighted disaster related government line departments and their respective primary and secondary roles and responsibilities particularly in the disaster phase. The Provincial Board of Revenue has been made responsible for collecting information about the damages caused by individual disaster and also to keep record of compensation made to the victims.

1.4.2 UNISDR, HFA and Pakistan

The United Nations General Assembly has created United Nations International Strategy for Disaster Reduction (UNISDR) in 1999/2000. The secretariat of UNISDR is the focal agency in the UN system for the coordination of disaster risk reduction and implementation of the international disaster risk reduction, the HFA (2005–2015). It was adopted under the "Hyogo Declaration" in the World Conference on Disaster Reduction, held in Hyogo prefecture Kobe, Japan in 2005. Its core areas includes ensuring disaster risk reduction (DRR) and climate change adaptation, increasing investments for DRR, building disaster-resilient cities, schools and hospitals, and strengthening the international system for DRR. UNISDR's vision is based on the three strategic goals of the Hyogo Framework for Action: integrating DRR into sustainable development policies and planning, developing and strengthening institutions, mechanisms and capacities to build resilience to hazards, and incorporating risk reduction approaches into emergency preparedness, response, and recovery programmes. The UNISDR introduced new concept to shift from a reactive to a proactive approach HFA (2005–2015) and Pakistan is amongst the 168 signatories of Hyogo Framework of Action (UNISDR 2009). In Pakistan, National Disaster Management Authority (NDMA) is a focal agency for reporting HFA progress. So far Pakistan has been regularly submitting progress reports including the 2007–2009 HFA progress report, 2009–2011 HFA progress report and the recent interim report of 2011–2013.

1.4.3 National Disaster Management Ordinance

After 2005 Kashmir earthquake and one of the signatories of HFA (2005), the Government of Pakistan was stimulated towards institutionalisation for disaster risk reduction. There was high time for capacity building of disaster related agencies at national, provincial, district and local level. As after the earthquake, numerous challenges emerged and encounter the situation. Keeping in view this alarming state, the then president of Pakistan promulgated the National Disaster Management Ordinance (NDMO; now Act) in 2006 (GoP 2012a). Under this ordinance, National Disaster Management System was introduced in the country. Similarly, the National Disaster Management Commission (NDMC) was established at the federal and provincial/state/FATA/G-B Disaster Management Commission at the regional level. The NDMC was assigned the task of preparing and approving guidelines, policies and plan for disaster risk reduction. Eventually, the National Disaster Management Authority (NDMA) was established to follow-up the directives of the commission.

1.4.4 National Disaster Management Authority

In Pakistan, the National Disaster Management Authority (NDMA) was established in 2007. Under the NDMO, the NDMA was made a focal point and held responsible for coordinating, implementing and monitoring body for DRR in the country. Under the Ordinance (now Act), the National Disaster Risk Management Framework (NDRMF) was prepared by the NDMA in March 2007 (GoP 2012b), which serves an overall guideline for disaster risk management at national, provincial and district levels. In March 2010, the NDMA formulated the National Disaster Response Plan (NDRP) for identifying specific roles and responsibilities of the key relevant stakeholders in emergency response including Standard Operation Procedures (SOPs). In addition to this, the NDMA, in collaboration with national and international partners has been in the process of strengthening the disaster risk management system in the country.

1.4.5 Pakistan National Disaster Risk Management Framework

In Pakistan, the National Disaster Management Commission was established at national level and its entities at regional level. The regional commissions namely: Punjab Provincial Disaster Management Commission, Sindh Provincial Disaster Management Commission, Khyber Pakhtunkhwa Disaster Management Commission, Baluchistan Disaster Management Commission, Gilgit-Baltistan Disaster Management Commission, State Disaster Management Commission and

FATA Disaster Management Commission. Each regional commission is headed by chief executive of respective region such as in case of province, the Chief Minister. This was a paradigm shift in disaster management system from active approach to proactive one. Beside these regional entities, the National Disaster Management Authority was set a focal body and held responsible to effectively promote the DRR agenda, develop close liaison and implement the same in coordination with the regional and local disaster management authorities. In this regard, in 2007 the National Disaster Risk Management Framework was developed to identify and guide all the stakeholders. The vision of framework is to achieve sustainable socio-economic and environmental development through minimizing vulnerabilities and risk specifically marginalized groups, emergency response and early recovery. The framework has identified nine priority areas including Institutional and legal arrangements for Disaster Risk Management; hazard and vulnerability assessment; training, awareness and education; planning for disaster risk management; community and local level programming; Multi-hazard early warning system; Mainstreaming disaster risk reduction into development; Emergency response system, and Capacity development for post disaster recovery (NDMA 2007).

1.4.6 National Disaster Management Act

The Pakistan National Disaster Management Ordinance was approved by the parliament in December 2010 and became the Act called as Pakistan National Disaster Management Act (DMA) 2010 (GoP 2010). The Act provides the establishment of national disaster management system in Pakistan. Under DMA three levels of disaster risk management has been established i.e. national, provincial and district levels. The DMA provides the comprehensive guidelines and legislative backup for entire disaster risk management system in the country. Chapter 2 of the DMA highlight the power and function of national disaster management commission and establishment of national disaster management authority, whereas Chap. 3 focuses on the power and function of provincial disaster management commission and establishment of provincial disaster management authority (PDMA). However, Chap. 4 is related to third tier namely district disaster management authority. The Act further elaborates the measures to be taken by the government for disaster management function of local authorities, establishment of national institute of disaster management, establishment of national disaster response force, provision of budget and audit, offences and penalties.

1.4.7 National Disaster Management Plan (2012–2022)

The country faces wide range of hazards, which requires country ability to effectively handle these challenges through comprehensive national approach of disaster risk management. During 2008–2009, on the request of Government of

Pakistan, JICA has studied the entire legal and administrative set-up of DRM in Pakistan and a project document on formulation of a National Disaster Management Plan (NDMP) for Pakistan (GoP 2012b). In 2012, with technical assistance of JAICA, national disaster management plan was prepared. The government of Pakistan approved the project which span on long 10 years (2012–2022) with an estimated cost of 1.040 Billion US Dollars. The plan was aimed at enhancing the capacity to prepare and respond to disasters by proactive approach for dealing through disaster risk management in line with the National Disaster Management Act.

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

1.4.8 Disaster Risk Reduction and Partner Organizations

In Pakistan, the National Disaster Management Authority and its regional entities provincial disaster management authorities and district disaster management authorities are working in collaboration with scientific community as well as national and International partner organizations. The disaster management authorities in collaboration with the key partner organizations are in the process of strengthening the disaster management system. The UN agencies, Oxfam Pakistan, Muslim Aid Pakistan/UK, Church world services, save the children, Action Aid Pakistan, Islamic relief, Red Crescent Pakistan, WWF, USAID, Relief international, IRC, ACTED, Response international, World vision, Intercooperation, OCHA, AKDN, SEED Foundation and JAICA are partially or wholly working in disaster risk management sector. The Japan International Cooperation Agency (JICA) remained one of the key partner organization since 2005 Kashmir earthquake. All the partner non-governmental organizations are registered. These organizations are working on disaster risk reduction and most often working in vulnerable community independently. Beside this, there is a long list of national and regional level NGOs working in disaster relief and rehabilitation.

1.5 Disaster Risk Reduction Approaches in Pakistan

The concept of disaster is used since long but in recent literature the shift is from response to Disaster Risk Reduction (DRR), which means to minimize the losses caused by hazards like tsunami, floods, earthquakes, cyclones, droughts, landslide, cyclone etc. DRR is a concept and practice of reducing disaster risks through systematic efforts. Disaster risk reduction is related to devising and applying policies, plans and practices to minimise vulnerabilities and disaster risks. It is a systematic approach to identify, assess and reduce the disaster risk. It aims to reduce socio-economic vulnerabilities to disaster as well as dealing with the environmental and other hazards that trigger them. For effective addressing disaster risk reduction in existing set-up, it is particularly important to get first-hand knowledge about the area which is thickly populated urban areas, trend of urbanization and risk profile (Sharma et al. 2011). Generally, the disaster risk reduction approaches varies from location to location depending upon the physiography, climate, ecological system, socio-economic and political system of the focused area. There is no sole solution to disaster risk reduction which fit everywhere. It is therefore the practitioners have endorsed solution sensitive to the local environment need to be taken for minimizing disaster risk. AMCEN (2011) described that now-a-days promoting local capacity, minimizing vulnerabilities and building disaster resilience at community level has been stimulated both in policy development and practice.

After 2005 Kashmir earthquake, the government of Pakistan has realized the significance of disaster risk management and shifted purely active approach to proactive one and embarked upon establishing appropriate policy, legal and institutional framework and to implement strategies and programs for minimizing risk and vulnerabilities at all levels (GoP 2012b). The Disaster Management Authorities were established at all level to effectively endorse DRR and climate change adaptation in policy, programmes and plan. In this regard, National Disaster Risk Management Framework has been established to guide the work of entire system in the area of disaster risk management. It is time to achieve sustainable socio-economic and environmental development through reducing disaster risks and vulnerabilities, particularly those of the poor and marginalized section of the society.

In Pakistan, the disaster risk reduction approaches are of many fold and the strategies largely varies depending on the type of hazard, location of hazard, type of vulnerability, extent and level of exposure and capacity of institutions, community and individual. The disaster risks are handled by applying the structural risk reduction strategies, non-structural measures and most often integrated approach are preferred with an intention to save lives and reduce disaster impacts. Implement disaster risk reduction strategies and strengthen disaster preparedness and capacities of institutions, community and individual to effectively respond to emergency situation. The hazard analysis reveals that hazards are handled following the major guidelines for disaster risk reduction, which include multi-hazard approach; vulnerability and risk assessment; strengthening resilience of individual, community and institutions; sharing of role and responsibilities; inter-organization coordination;

accountability and transparency. In Pakistan, following are some of the approaches applied for disaster risk reduction:

1.5.1 Disaster Mitigation

Disaster mitigation is defined as measures taken prior to the impacts of disasters to reduce the effects. Some time it is also refers to all those structural and non-structural measures adopted save lives and reduce impacts of hazards. For example construction of protective marginal embankment to limit water within the channel and minimize the risk of flood water inundation or plantation/regeneration of mangroves along the coastline and reduce the risk of tsunami/tidal surges or increasing hazard awareness is also one of the non-structural mitigation strategies. In Pakistan, disaster mitigation is one the most widely applied strategy of reducing disaster risk.

1.5.2 Disaster Preparedness

Disaster preparedness is a pre-disaster phase and deals with the measures taken in anticipation of a disaster to ensure that appropriate, timely and effective measures are taken. Effective disaster preparedness, early warning system and response mechanism particularly for the rapid on-set events is a key component of disaster risk reduction (Parvin et al. 2013). Disaster preparedness actions embedded with risk minimization strategies and promote disaster prevention and saving human lives and properties. It needs to ensure that in community response mechanism has strong back-up by close risk free community, disaster management authorities, volunteers, national and international response teams. In Pakistan, limited disaster preparedness measures are undertaken. In case of flood, the member of federal flood commission meet at least twice during pre-monsoon period (to devise strategies for vulnerable areas) and post-monsoon (to evaluate the flood period and viability of risk reduction approaches and lesson learnt for the future planning). In case of major urban centres, only few cities have so far addressed some of these issues but there is need to implement it across the board. Experiences show that community involvement in disaster preparedness, early warning and response have always played effective role in minimizing the impacts of disasters.

1.5.3 Vulnerability and Capacity Assessment

Vulnerability and Capacity Assessment are the two parameters help in measuring the extent of community exposure to various hazards and the coping capacity of the target population against the unforeseen events. It is an activity related to disaster

preparedness stage and provides feedback to build resilience of community against the natural hazards. In this process, the key stakeholders include community, local authority and development organizations. In vulnerability and capacity assessment process, participation of community can play a significant role in devising strategies for risk management. Undertaking such king of activity at national level, helps in identifying the key risk areas and to suggest what strategies need to be taken to minimize the disaster risk. HFA and national disaster management plan of Pakistan specifically stress on vulnerability and capacity assessment as preparedness strategies.

1.5.4 Cross-Sectoral and Multi-scale Approach

In the recent DRR literature, the stress remained on adoption of multi-scale, cross-sectoral and integrated approach to link disaster risk reduction and climate change adaptation in policy, programmes and planning (Birkmann and vonTeichman 2010). Similarly, mainstreaming disaster risk reduction and climate change adaptation approaches, across the board in activities on sustainable development has been introduced recently. In Pakistan, the disaster related line agencies are working in isolation and lack horizontal coordination and most often overlapping roles and responsibilities have been observed (Rahman 2010). This cross-sectoral and multi-scale disaster risk reduction planning approach is particularly lacking in Pakistan. The introduction of disaster related legislations and disaster management are the hopes for multi-hazard risk management in the country. In national disaster management plan (2012–2022), an integrated attempt has been made to deal with various hazards. One of the best examples is the introduction and establishment of multi-hazard early warning system.

1.5.5 Community Based Disaster Risk Reduction

The role of local community is of paramount significance right from mitigation, preparedness, early warning and emergency response to early recovery. The local community remains the frontline players in minimizing vulnerability and enhancing disaster resilience. The practitioners agree on effective role of community in disaster risk reduction and enhancing their capacity in handling climate change issues. Gaillard (2010) elaborated that community participation in risk assessment, vulnerability reduction, capacity development and building disaster resilience need to be promoted at the local level. Community based disaster risk reduction empower local population with self-sustained efforts to withstand or resist against the unforeseen event. The community based risk management strategies usually applied with intention to enhance and rely on locally available resources rather than waiting for the external sources while coping with extreme event. The assistance from the external sources is only required when there is massive disaster impacts and it is beyond the

carrying capacity of local community. In Pakistan, CBDRR has been introduced and steadily expanding its roots in the vulnerable community. It is a positive sign toward local level risk reduction with available resources and strength.

1.5.6 Building Codes and Land Use Regulations

Risk and loss reduction call for a comprehensive approach to handle the increasing impacts of disasters. However, there are three major pillars in risk reduction including the government, vulnerable population and the insurance industry (Munich Re 2014). Nevertheless, the role and responsibility of government is of key significance. It attempts to mitigate, establish the forecasting and early warning system, emergency response and early recovery. One way of minimizing disaster risk is the identification of hazard zones and its depiction on hazard zonation map, which guide and enables the disaster managers and resource planners for risk reduction.

Building codes and regulations provide procedures, guidelines and recommendations for structural design and selection of material in various condition. Building codes and regulations are enforced with aim to protect public health, safety and welfare pertaining to buildings and structures. Keeping in view this challenging scenario, the ministry of housing and works, government of Pakistan has recently assigned the task to NESPAK for preparing building codes of Pakistan with intention to ensure public safety (MOHW 2007). Quetta building codes are there but effective implementation is a critical issue for the urban authority. Country-wise enforcement of building codes and regulations particularly in the urban areas is need of the hour. Parallel to this, it is also important to raise awareness of government officials and community about the disaster resilience buildings and structures. In this context print, electronic media can play a vital role. Similarly, training workshop for masons, builders and community members would further enhance their capacity about the importance and development of structures while applying building codes.

1.5.7 Urban Risk Reduction

In Pakistan, almost all the cities have been reportedly facing the impacts of disasters in one way or the other. Some cities have been threatened seriously while others are at the verge. The mega cities including Karachi, Lahore, Rawalpindi, Islamabad and Peshawar have already come across serious episodes of urban flooding during the past one decade. Intensive heat wave is another notable disaster faced by the urban centres. In addition to this, heavy downpour, drought, storm surges, urban flooding are some of the key effects of climate change scenario. Cities are as vulnerable as they are powerful that's why the urban authorities should formulate effective institutional framework for urban resilience and climate change adaptation in a systematic way.

It is estimated that in the next decade, half of the country population will be living in cities and towns. The major share of urban population will be residing in major cities. This is due to limited financial and institutional capacities to manage both historical rooted and emerging risks and its exacerbations. With the growing urban population, it has been explored that if disaster and climate change is not properly mainstreamed in the urban policies and plans; the urban risks will further grow and would have more serious implications on the urban dwellers particularly the slum dwellers who is often without the benefit of safety nets (WEF 2014). Construction of high rise buildings and ignoring the building bye-laws may further increase the vulnerability and can maximize the exposure to massive life and property damages. Urban authorities should take the responsibility of enhancing city resilience through risk assessment, risk reduction, preparedness, emergency response and early recovery.

1.5.8 Establishment of Early Warning System

The timely provision of information about the hazards, enable citizen/community/authority to take measures to cope and effectively minimize the impacts of disasters. Forecasting and dissemination of early warning to the vulnerable community is a pre-disaster phase. The early warning system is different for different hazard events. However, multi-hazard early warning system is a latest approach. It is the responsibility of disaster management authorities to establish multi-hazard early warning system and develop an effective liaison with the national and regional forecasting agencies in sharing forecasting information and timely provision of factual data to the multi-hazard warning centre for onward transmission. Involvement of key stakeholders may further enhance the coping capacity against the extreme events. While devising early warning mechanism, an effective network of community /people centred is of paramount importance. The early warning dissemination (message) should be understandable, fully trusted by and relevant to the vulnerable community. The early warning is of no value until it reaches in time to the population at risk. This also requires appropriate training and capacity building of community to respond effectively to an approaching hazard. In Pakistan, the National Seismic & Tsunami Early Warning Centre, Tropical Cyclone Warning Centre, Flood forecasting and Warning centre, National drought monitoring centre etc. are some of the early warning systems established but need further strengthening.

1.5.9 Emergency Response System

The establishment of emergency response system at national, provincial, district and community level can help in minimizing the impacts of disasters. The National Disaster Management Act has specifically heighted the significance of emergency

response system. The national Disaster Management Authority should develop disaster response plan at all levels to effectively respond to emergency situation. In national disaster management Act has also stressed on the formation of rapid response force at all levels. Inadequate response capacity and ignorance of disaster related implementing agencies have brought into notice the dire need of a specialized response system. Such a mechanism is particularly worthwhile for carrying out search & rescue, and evacuation operation in both urban and rural set-up. This requires enhancing emergency response mechanism and capacity building at all level. However, preference and priority need to be given for building emergency response system such as emergency operation centres, rapid response force, civil defence, search and rescue teams at district and community level.

1.5.10 Disaster Risk Reduction and Climate Change Adaptation

Global warming has dramatically changed the climate and is frequently introducing new paradigm of disaster events, which is explicitly the human contribution. The increasing intensity and frequency in hydro-meteorological phenomenon is the direct outcome of climate change phenomenon. It is expected to further multiply the accumulation of greenhouse gases in the atmosphere as a consequence of both stationery sources like industries and movable sources in the form of vehicles, aircrafts etc. Similarly, rapid deforestation has also reduced the carbon sinking points. In some parts of the world these changes are very obvious and the trend is alarming.

Climate Change is globally posing one of the most pressing challenges to the pursuit of sustainable development. This is especially true for developing countries that are particularly vulnerable to the unavoidable impacts of this new and emerging issue. There is an inescapable linkage between climate change and sustainable development. The Global Risks 2014 report highlights that risks are not only interconnected but also have systemic impacts. To manage risks effectively and build resilience to their impacts, better efforts are needed to understand, measure and foresee the evolution of interdependencies between risks, supplementing traditional risk-management tools with new concepts designed for uncertain environments (WEF 2014). Recent advancement in scientific knowledge, effective DRR policy formulation and local level mitigation strategies need to be mainstreamed and to make it in-line with the changing climate scenario (AMCEN 2011). If global risks are not effectively addressed, their social, economic and political fallouts would be far-reaching (WEF 2014).

The IPCC (2007) defined climate change adaptation as “an adjustment in natural or human use system in response to actual or expected climatic stimuli or their effects, which moderate harms or exploit beneficial opportunities”. Disaster risk and climate change are the major challenging issue in the human use system. In this regard, there is growing call for building resilience of nations and communities to disasters. Shifting vulnerable population from risk area is not technically viable

solution, because the same location provides numerous opportunities for the local population. In case of floodplain, inundation remained a serious threat to the local population but at the same time it provides fertile soil and water to grow food and cash crops and fulfil household needs. Similarly, in case of coastal zone, on the one hand coastal population exposed to various coastal hazards but at the same time it provides the opportunity of fisheries, forest and food item, which are the major sources of livelihood earnings in the coastal communities. However, with the climate change phenomenon there is increasing trends both in frequency and intensity of hydro-meteorological events, which particularly needs government attention to enhance people capacity to effectively respond to climate related hazards.

In Pakistan, the trend of hazard indicates that occurrence of disasters has been a recurrently occurring phenomenon. Climate change and variability of hydro-meteorological disaster is intensifying the hazards and due to which the cost of damages have been multiplied during the past decades. Due to poverty and the booming population, the people are frequently encroaching towards high risk areas and increasing the exposure to climate induced hazards. These are challenging issues for the decision-makers and planners that in future the climate related disasters will be more frequent, with high intensity and their impacts will be much more severe on the socio-economic, physical and environmental sectors. During the past decade, the episode of drought (1997–2004), flood of 2003, 2005, 2007, 2008, super flood-2010, 2011, 2012, 2013, followed by heavy snowfall over the northern mountain system in 2005–2013, and drought of 2013–2014 and heat waves of 2010, 2014, cyclones of 2007, torrential and prolonged rainfalls, and triggering of numerous rain-induced landslides are some of the glaring examples of climate change exacerbations. The recent scientific literature reveals that in wake of changing climate scenario, there is consistent change in the hydro-meteorological and climatological phenomenon, which poses new risks to the country population. It is time to think and plan effectively to mitigate or improve adaptation with the climate change consequences.

1.5.11 Early Recovery

Early recovery is a process, undertaken to fully recover from the effects of disasters and restore the affected community to pre-disaster level of functioning (Rahman 2010). Early recovery is a costly approach and usually takes long time to restore particularly the damage structures. In the early recovery phase, decisions and actions are taken after fall of a disaster with an intention to recover the pre-disaster condition of the affected community and also ensure that adjustment measures have also been taken to reduce disaster risk. The recovery should be carried out with intention to build back better in a sense to make it more resilient to extreme events. It is therefore, one school of thought is of the opinion that disasters encourage development.

1.6 Challenges in Disaster Risk Reduction

In the past two decades, Pakistan has faced numerous disasters, which cost over 20 billion US dollars. This has put tremendous pressure on the country economy and almost paralysed the economic growth rate. It is because of these frequent incidences of emergency situation, the Millennium Development Goals and Hyogo Framework of Action was hardly achieved. The country has very good disaster risk reduction policies, programmes and plans but lack of financial capability is a major hurdle in effective implementation. The frequent occurrences of disasters have placed the federal, regional, district and local government institutions pre-occupied and busy with response and recover process. The hazard forecasting and early warning system either lacking or if exist it has certain weaknesses and need further strengthening towards multi-hazard early warning system and timely dissemination to the vulnerable population.

After 2005, several institutions were established at federal, provincial and district level to effectively respond to unforeseen events. These institutions are new and mostly lack capacity of handling emergency situation. In case of provincial and local level authorities, absence of technical personnel is one of the major deficiencies found in devising and implementing disaster risk reduction policies and development plans in true spirit. In Pakistan, disaster and climate change education is lacking at all levels. Therefore, mainstreaming disaster risk reduction in education, community and at institutional level can help in building individual, community and institutional capacity and may enhance disaster resilience. Non-availability of data for disaster risk management planning remained a major challenge in almost all developing countries including Pakistan.

In the country, universities, research organizations and scientific community are consistently working on various aspects of disaster risk assessment and management but there is lack of coordination between the disaster management institutions/authorities and academia. Most often overlapping research has been observed, which is wastages of time and resources, which is unbearable and beyond the financial carrying capacity of a country like Pakistan. There should be strong linkages, sharing technical innovative knowledge and best practices in the public interest.

1.7 About the Book

The book covers all different types of disasters face Pakistan, including geo-physical and hydro-meteorological hazards. The book attempts to incorporate and draw some of the key lessons learnt right from pre-disaster phase, disaster phase to post-disaster phase and provides an effective framework in the form of lessons learnt. The content is rich and based on a selection of available documents, a consultative workshop with academicians from different universities undertaking DRR higher education programs, and the editors' own knowledge and experience in the field. Special emphasis

is given to analysing field experiences from academic perspectives, and pinpointing key issues and the policy relevance of disaster risk reduction.

The book is organized into three parts, where part I provides the outline and basics of Disaster Risk Reduction Strategies Applied at country level with supporting examples from the global review. Part II specifically highlights the wide ranges of hazards experiencing Pakistan and drawing examples, policy options, institutional set-up, risk reduction strategies and key lessons learned. Third part of the book is given to approaches and issues of DRR practices and certain examples of disaster responses. The book is classified into 20 chapters.

Chapter 1 focuses on introduction and disaster risk reduction approaches in Pakistan. Pakistan is a country exposed to wide range of disasters and a long history of recurrent occurrences. In the recent past, the massive 2005 Kashmir earthquake and flood-2010 were the eye opening for disaster risk managers and paved way for the institutionalization, policy initiatives and paradigm shift from reactive approach to proactive ones. At country level, National disaster management commission and national disaster management authority were established and at regional level provincial disaster management authorities and district disaster management authorities were constituted at district level. This chapter introduces the disaster risk reduction approaches practiced at global and country level. I also highlighted the background and progress of disaster risk reduction agenda at global level, whereas disasters in the context of Pakistan have been discussed. The chapter describes the disaster risk reduction legislations and institutional set-up in Pakistan. Similarly, the chapter also elaborated various risk reduction approaches applied in Pakistan. The chapter finally focuses on the key challenges faced Pakistan in mainstreaming disaster risk reduction.

Chapter 2 highlighted the concept and assessment of hazard, vulnerability and disaster risk in the context of Pakistan. In the initial part, conceptual background has been supported with examples from the real world situation. The chapter also focuses on various tools and techniques so far applied for carrying out hazard, vulnerability and disaster risk assessment and management. Here a section also elaborated the hazard profile of Pakistan and focuses on the frequently occurring hazards including floods, earthquakes, landslides, drought, GLOF, cyclones, heat waves etc.

Chapter 3 has been focused on generic overview of disaster resilience and in case of Pakistan specific discern has been made on building urban and rural resilience. In Pakistan, there are certain key challenges in building disaster resilience including exposure to hazard events, low level of risk awareness, low level of development risk conscious, absence of multi-hazard risk assessment, lack of mainstreaming DRR in policies and plans and poor DRR capacity in the context of prevention, preparedness, response and recovery. The chapter also discusses the concept of disaster resilience, dimensions, indicators, linkages of disaster resilience and environmental system, disaster resilience and sustainability, disaster resilience and climate risk. Similarly, DRR legislations and resilience issues in Pakistan and how to build disaster resilience at various levels and promote adaptive strategies have been elaborated.

Chapter 4 deals with the flood risk and reduction approaches in Pakistan. As Pakistan is one of the flood prone countries, because of its physical and climatic

set-up. It has been estimated that Pakistan is suffering from frequent flood disasters and the resultant losses is multiplying. Since the inception of Pakistan, efforts have been made for building resilience against recurrent flood events. The existing flood risk reduction strategies range from structural to non-structural approaches. The chapter also highlight a review of risks associated with flash and river flooding and analytically discusses past flood events and their adverse impacts.

Chapter 5 analyses the earthquake hazards and risk mitigation in the context of Pakistan. Pakistan is located in one of the earthquake prone regions with a bad history of devastating impacts. The chapter also discusses earthquake hazard assessment across the country and suggest for earthquake risk mitigation. However, the magnitude of prevailing earthquake induced risk needs detailed earthquake hazard assessment, design earthquake resistant structures; implement the seismic building codes and public awareness to adopt for earthquake risk reduction.

Chapter 6 discusses the Tsunami risk, preparedness and warning system in Pakistan. The chapter reviews the tsunami risk posed to the southern coasts of Pakistan and Iran by potential earthquakes from the Makran subduction zone and present a structure for a regional tsunami warning system. Historical data of earthquake in the Makran region shows that the region is susceptible to large earthquakes, which are capable of producing destructive tsunamis. The study suggests for tsunami warning system in the region based on seismic waveforms and using a database of pre-calculated tsunami scenarios. At least 2 deep-water tsunami gauges and 50 coastal gauges are necessary for tsunami understanding and early warnings in the region and strong support from international cooperation between the countries in the region.

Chapter 7 deals with the drought risk and reduction approaches in Pakistan. It is unique among all the other environmental hazards and has long prediction time between the first indications to a point when it begins to impact significantly upon the population of the affected areas. During the past century, several time the territory of Pakistan hit by severe drought. This chapter is focuses on the types of drought, quantification of drought, factors contributing to drought vulnerability, overview of drought in Pakistan, adverse impacts of drought and drought risk reduction strategies in Pakistan.

Chapter 8 focuses on the landslide risk and reduction approaches in Pakistan. In Pakistan, landslides like other extreme events frequently occur in the north and north-western mountains. The chapter also elaborated various causes of landslides, which mainly includes immature geology, wide variation in climate and degradation of natural resource base and intense structural deformation. The chapter highlighted various landslide risk and risk reduction approaches so far adopted in reducing the impacts of landslides. This chapter also discerned the institutional framework and landslide risk management mechanism in the country.

Chapter 9 discusses the desertification risk and reduction approaches in Pakistan. Desertification is a serious global problem and more acute in case of Pakistan. In the country, almost 3/4th of the land is either already affected or likely to be affected by it. The Desertification occurs in both rain-fed and irrigated lands. Pakistan is mainly a dryland country, where 80 % of its land is arid and semi-arid. In recent years,

number of Federal and provincial agencies are engaged to combat desertification. However, the efforts made by the line departments and NGOs hardly fill the gap between its increasing intensity and disaster risk reduction.

Chapter 10 analyses sea level change, causes and its impact on the coastal belt of Pakistan. The chapter elaborates the role of glacio-eustatic and Tecto-Eustatic mechanisms, which are the determining factors in explaining the long term global and local changes in sea-level. Several geomorphological and archaeological evidences confirm the glacio-eustatic and Tecto-Eustatic change of sea-level in the Pleistocene and the Holocene epoch. The evidences of current sea level rise reveal that tectonic mechanism and intrusion of sea in the deltaic region of the River Indus is due to reduction of river inflow not because of global warming phenomenon, are the main factors of sea-level change along the coast of Pakistan.

Chapter 11 examines the climate change risk and reduction approaches in Pakistan. Pakistan is one of the most vulnerable countries facing the risk of climate change, despite contributing very little to the global greenhouse gas emissions. The 2010 Global Climate Risk Index of Germanwatch ranked it first among some 180 nations of the world. The country's vulnerabilities are high due to heavy dependence of its economy on agriculture, which is highly climate sensitive. This Chapter examines the present and potential impact of climate change in Pakistan, and reviews national policies and plans to analyse the approaches to climate-related issues. The chapter also identifies the key measures that need to be included in the Climate Change Action Plan of Pakistan and stresses their mainstreaming into the national development policies and planning process.

Chapter 12 reveals the GLOF risk and reduction approaches in Pakistan. The Hindu Kush, Karakoram and Himalayan ranges in Pakistan offer the most rugged and the hostile natural environment for the human habitation. There are over 2,000 glacial lakes in the upper catchments of major rivers of Pakistan. This chapter presents the overall situation of GLOFs in Pakistan and the GLOF risk reduction strategy. This chapter also includes discussion about the mitigation options to reduce the GLOF risk. A comprehensive methodology is recommended in this chapter for the risk assessment of any remote glacial lake using the integrated approach of bringing the field data, numerical relations together with the GIS and remote sensing. The chapter finally recommends how to handle GLOF risk and to have safer communities.

Chapter 13 analyses the national strategies and law for disaster risk reduction and institutional framework for DRR in Pakistan. Prior to 2005 Kashmir earthquake, the DRR strategy was mainly a reactive approach. A paradigm shift has been noted towards the pro-active one in the form of policy development, institutional establishment and disaster management plan at national, provincial and district level. The chapter highlighted the causes of Pakistan's vulnerability to disasters and climate change impacts as well as legal framework for disaster management, Institutional and reorganization and challenges in the current system.

Chapter 14 deals with disaster risk reduction at the local government level in Pakistan. The HFA specifically stresses on mainstreaming DRR at local level and it is the individuals, households and communities responsibilities, which are at

forefront of either escaping from or fighting against disasters. This chapter also discusses the key actors at national, provincial, district and local level and analyses the decentralization of disaster risk management institutions, and the role of local actors. The chapter describes the community resilience and local government system, disaster resilience and local government challenges and policy options in mainstreaming DRR in local government system.

Chapter 15 highlights the role of NGOs and disaster risk reduction in Pakistan. The Non-Government Organizations play a vital role in disaster risk reduction. The donor's agencies and International NGOs not only support the NDMA, PDMAs and FDMA to perform their functions effectively but also provide guidelines on policy matter. In Pakistan, local NGOs, CBOs and volunteers closely working with community and thus enhance their risk reduction and emergency response capacities.

Chapter 16 describes the urban risk and reduction approaches in Pakistan. The investment on urban risk reduction is much more effective than picking up the pieces afterwards. It is cities, which empower the societies and hub of industrial and commercial services. Urban resilience is largely a function of resilience and resourceful citizens. In Pakistan, large cities are at risk to various hazards and they have been threatened seriously, while others are at the verge. The mega cities including Karachi, Lahore, Rawalpindi, Islamabad and Peshawar have already come a across serious episodes of urban flooding during the past one decade. In addition to this, heavy downpour, heat waves, drought, storm surges, flash flooding are some of the key effects of climate change exacerbations on urban areas. The chapter discusses growth and development of urban areas, cities and underlying risk factors, impacts of urban disasters and urban risk reduction approaches in Pakistan. This chapter also stimulate new arena for thinking and devising innovative approaches for sustainable urban development in the country.

Chapter 17 focuses on the disaster and climate change education in Pakistan. Pakistan is vulnerable to wide range of hazards and rooting from weather, hydrological, geophysical and human induced disasters. Efforts have been made by the government to endorse disaster and climate change education, and so far variety of initiatives and activities have been planned and some of them implemented. The chapter also stress on strengthening existing disaster and climate change science in the related institutions and universities. This chapter discusses the disaster and climate change education, Pakistan's vulnerability to Disaster and Climate Change, Growth and Development of Disaster's Legislations and Institutions, Disaster and Climate Change Education at School, College, University, Professional and Technical Institutions, National Institute for Disaster Management, Religious Institutions, Community Level, and in the State Departments, Civil Services Academies and promotion of Research environment in the country.

Chapter 18 examines the financing for disaster risk reduction in Pakistan. Disaster's record in Pakistan shows severe impacts both on the citizens and Government and the trend is escalating. This paper analyses the past and present mechanisms to finance disaster management in Pakistan. An empirical analysis reveals that investments in DRR have been scarce and spending on disaster preparedness has not been given priority in the national development plans. Moreover,

for every dollar spent on disaster management, only a tiny fraction was spent on. The study found that there is still a big vacuum, which can be filled only by the development of a comprehensive risk financing strategy with a range of instruments. It further recommends financing through public-private partnerships for the promotion of cost-effective solutions.

Chapter 19 scans the community based disaster risk management in Pakistan. It is pertinent to note that active involvement and empowerment of local population is necessary for successful community development. The chapter discusses the community based disaster risk management a theory of participation, paradigm shift in process and practice of CBDRR, role of community in risk reduction planning and implementation. The chapter also examines the key case studies pertaining to CBDR management in Pakistan.

Chapter 20 analyses gender and disaster risk reduction in Pakistan. When disaster occurs, it does not discriminate the gender and its impacts vary for male and female. The chapter also discusses that in any disaster the worst affected section of the community is the women and children and its impacts varies depending on resilience capacity of individuals, households and community and to recover from the impacts of disasters. It is women, children and disables, usually hit the hard because of their high vulnerability and low resilience. The chapter also discusses the tools for gender mainstreaming and engendered government policy, women and disaster impacts, gender in recovery phase, causes of women vulnerability, women are at risk and gender and DRR in Pakistan.

The primary target groups for this book are students and researchers in the fields of Environment Sciences, Geography, Geology, Earth Sciences, disaster risk reduction, and climate change studies. The book will ultimately provide a strong idea of current research trend in respective field and will furnish basic knowledge on this important topic in Pakistan. Another target group comprises practitioners and policy makers, who will be able to apply collective wisdom into policy and decision making.

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