STRATEGIC ENVIRONMENTAL ASSESSMENT OF NATIONAL DISASTER RISK REDUCTION POLICY, PAKISTAN

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Author's Declaration

I hereby declare that the work presented in this Thesis is my own effort, except where otherwise acknowledged and that the Thesis is my own composition. No part of this Thesis has been previously presented for any other degree.

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Abdul Waheed

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DEDICATION

This research work is dedicated to my father

Akbar Hussain Khan

List of Abbreviations

Acronyms	Abbreviation
AJK	Azad Jammu & Kashmir
BCM	Billion Cubic Meters
CBDRM	Community Based Disaster Risk Management
CIDA	Canadian International Development Agency
DDMA	District Disaster Management Authority
DM	Disaster Management
DR	Disaster Risk
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EIA	Environmental Impact Assessment
FEWS	Flood Early Warning System
FFC	Federal Flood Commission
FFD	Flood Forecasting Division
FRM	Flood Risk Management
FRR	Flood Risk Reduction
FSPP	Flood Sector Protection Project
GB	Gilgit Baltistan
GHGs	Green House Gasses
GLOF	Glacial Lake Outburst Floods
HFA	Hyogo Framework of Action
HKH	Himalaya-Karakorum-Hindu Kush
IPPs	Independent Power Plants
IPOE	International Panel of Experts
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
MDGs	Millennium Development Goals
MHEW	Multi Hazard Early Warning
NDM	National Disaster Management
NDMA	National Disaster Management Authority
NDMC	National Disaster Management Commission
NDMO	National Disaster Management Ordinance
NDMP	National Disaster Management Plan
NDMS	National Disaster Management System
NDRF	National Disaster Response Force

NDRMF	National Disaster Risk Management Framework
NDRRP	National Disaster Risk Reduction Policy
NEQS	National Environmental Quality Standards
NFPP	National Flood Protection Plan
NIAP	National Impact Assessment Programme
NIDM	National Institution of Disaster Management
NIO	National Institute of Oceanography
OECD	Organization of Economic Cooperation & Development
PDMA	Provincial Disaster Management Authority
PDMC	Provincial Disaster Management Commission
PIDA	Provincial Irrigation and Drainage Authorities
PIDs	Provincial Irrigation Departments
PMD	Pakistan Meteorological Department
PPs	Plans or Programmes
PPPs	Policies, Plans and Programmes
RR	Risk Reduction
SEA	Strategic Environmental Assessment
SEPSA	Strategic Environmental, Poverty and Social Assessment
UNISDR	International Strategy for Disaster Reduction
WAPDA	Water and Power Development Authority
WB	World Bank

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Abstract

The present study aimed at reviewing the existing national disaster management system in Pakistan. The research focused on identifying gaps, deficiencies and coherence or distortion in the context of environment and sustainability with special reference to floods. A critical review of the National Disaster Risk Reduction Policy, 2013 was carried out by investigating the environmental performance criteria in the policy document against in context of secondary data available. Moreover, the objectives of National Disaster Risk Reduction Policy 2013, others flood risk reduction documents like National Disaster Management Plan 2012-2022 and other related national polices were also considered. The assessment were carried out using semi-structured interviews from relevant stalholders and experts. The set objectives were assessed in the light of objectives and actions proposed in National Disaster Risk Reduction Policy, 2013 and other flood risk reduction documents like National Disaster Management Plan 2012-2022, to identify positive and negative impacts on environment and proposed measures to mitigate or reduce the negative impacts in future policies and disaster management system. Results indicated that assessment of objectives of strategic environmental assessment against the objectives and actions proposed for flood risk reduction of non-structural measures like flood early warning system had expected positive impacts. The negative impacts were likely from the objectives and actions related to structural measure e.g. construction of storage, modification of relief channel and river defenses. So the efficiency of the policy objectives, measures and actions related to structural and non-structural are linked with the planning, monitoring and auditing. Capacity building of the current organizations will be a criterion to achieve these objectives. Moreover the study proposed some strategic options and alternatives for flood risk reduction with inputs from the experts. A common understanding of sustainable development along with clear commitment is one of the fundamental elements of policy coherence, which has not been found in the present study .The present study also revealed that most of our national policies are in draft stage, and the biggest gap is the absence of National Flood Management or Flood Risk Reduction Policy in the country.

Chapter 1

INTRODUCTION

1.1. Disasters in global perspectives

Globally, disasters have increasing impacts on human life. Each year, enormous disaster events like earthquake, floods, drought, heat waves, cyclones, tsunamis, killing thousands of people and render hundreds of thousand injuries and cause billions of economic loss (GECHS, 2008). The disaster impacts vary from country to country. In developed countries, the economic losses due to extreme phenomenon have been registered as higher than the developing nations (Rahman, 2010). Developing countries are the hot spot for disaster events (World Bank, 2005). Similarly 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 (UNISDR, 2009). The report CRED (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 types of disaster events. Analysis on the basis of type of disaster indicates that floods 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). The IPCC (2007), 4th assessment report proposes that climate change is likely to accelerate the intensity, duration and frequency of floods. 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 with in the list of most affected countries, Pakistan was ranked fifth (CRED, 2014), whereas, German Watch ranked Pakistan at third amongst the most affected nations (Kreft and Eckstein, 2014).

1.2. Geographical setting of Pakistan and disasters

Pakistan is part of south Asia and bounded 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).

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 making a physical border with China. In Pakistan, there are five out of 14 peaks having altitude over 8,000 m above sea level. 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. The Karakorum, Himalayas and Hindu Kush are hosted by numerous large and small glaciers. In Pakistan, glaciers have covered around 17,000 km^2 area. All these glaciers are supplying fresh water and 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 depend on glaciers. Due to climate change phenomenon, glaciers are retreating in Pakistan (Rahman and Khan 2013). As a consequence of glacier melting, there will be 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, 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. The country extreme vulnerability to climate change is a feature of its geographic location, and altitude which increased the presence of massive glacial reserves in the north. Through regular process of melting of glaciers in summer and accumulation in winter, it contributes more than 70 % water to river discharge. Heavy glacial melt and monsoon rainfall adding sufficient water for irrigation, necessary for the arid state but, unluckily it increases the risk of floods. More than 70 % of the nation inhabitants is living in the floodplains is directly affected by frequent flooding and reinforces the country's

vulnerability. The climate change has augmented the frequency and intensity of floods and unpredictability of the monsoons in the country. In adding to this, other areas like agriculture, forests, biodiversity, the coastal and marine environment, and many others sectors will be affected due to climate change and disasters like floods etc.

Disaster Risk Reduction approaches are well established within the international development community (Mercer, 2010), but still gaps and deficiencies are in the DM system, right from all level of disaster management cycle which needs 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 DRR 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 DRR in development planning. The establishment of multi-hazard early warning system, raising awareness, and disaster and climate change education and risk and vulnerability assessment are 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 DM institutions at district, provincial and national level. The challenging task for all disaster related organizations is to effectively manage disaster risk within the country limited financial resources.

1.3. Floods Hazards in Pakistan

In Pakistan, flood is the most frequent and repeatedly occurring marvel and almost every year it experiences massive damages to both survives and belongings. Almost 60 % of the country is mountainous and the rest is occupied by Indus river system, where inhabitants are mostly exposed to the impacts of flooding. The state has experienced frequent shocking flood events since its independence and a large area in the state is vulnerable to flood. FFC through respective PIDA and PMD have been planning FRR strategies. Despites of spending billions of dollars, the state is still prone to flood disasters. In adding to this, the frequency and intensity of flood disasters has increased. The damages during marvelous flood 2010, 2011, 2012 and 2013 were significant. The 2010-flood were the era worst but even during the floods of 2011 about 10 million people were affected, 1.6 million houses were damaged, crops of over 9 million ha was lost and 120 thousands cattle heads were perished.

The Table 1.1 designate that during past 64-year duration (1950–2013), 32 lethal floods with over 100 mortalities hit the country. This explains that every second year the land was hit by an enormous flood event (EM-DAT, 2014). In terms of mortalities, the 1965 flood is well-thought-out as the most shocking with an overall 10,000 human losses. It was recognized to the tropical cyclone, which strike the shoreline primate city (Karachi) of the country. The data explains that there were ten flood occasions, where more than 500 people were killed by enormous floods. However, the shocking floods of 1950, 1992, 1998, and 2010 has been categorized as over 1,000 human losses and at minimum 10,000 villages flooded (Mustafa and Wrathall 2010, Paulikas and Rahman, 2014).

During rainy season (July and August) 2010, Pakistan experienced the ancient and century worst flood (Rahman, 2010). Heavy precipitation in the upper catchment area has caused floods in the north and north-western regions of the country including parts of KPK, GB & AJK and as a consequence created a combine moving water body roughly equal to the dimension of the UK travelling southwards passing through Punjab and Sindh. The high precipitation in KPK created extraordinary flood peaks in Swat River (Rahman and Khan, 2013). In addition to huge loss, it has uprooted Amandara Headworks and washed away the Munda Headworks, which assisted as a major irrigation structures in the Province. The joint movement of the Swat and Kabul Rivers created another exceptional flood peak at Nowshera town, causing severe damages to life and properties (Rahman, 2010). The floodwaters moved downstream through the barrages in Punjab and Sindh until they touched the Arabian Sea downstream of Kotri Barrage. Enormously high floods were recorded at Chashma and Taunsa Barrages and a historic flood peak was also recorded at Kotri Barrage. The 2010-flood has inundated almost one fifth of the country area. About 2,000 innocent lives were lost, thousands of villages were flooded and millions of people were left homeless. This exceptionally highflood-2010 has been registered as the century worst flood.

Table 1.1:-List of massive flood events in Pakistan with at least 100 fatalities, 1950–2013

Year	Region affected	Fatalities	No. of villages affected	Year	Region affected	Fatalities	No. of villages affected
1950	Punjab	2,900	10000	1996	Punjab	111	-
1954	Punjab, Sindh	300	-	1997	Punjab	140	-
1956	Punjab, Sindh	270	11609	1998	Baluchistan	1000	-
1959	Punjab	100	-	1999	Sindh	231a	
1964	Sindh	450a	-	2001	Islamabad	210	50
1965	Karachi	10,000a	-	2003	Sindh	230	
1973	Punjab, Sindh	474	9719	2005	Baluchistan	520	1931
1976	Punjab, Sindh, KP	338	18390	2006	KP, Punjab	233	2477
1977	Karachi	848	-	2007	Baluchistan,	242a	6500
1978	Punjab, Sindh	393	9199	2007	Sindh, KP	358	-
1988	Sindh, Punjab	196	1000	2010	Punjab, Sindh, KP,	1985	78 District
1992	AJK, Sindh, Punjab	1444	13208	2011	Sindh	509	23 District
1993	Sindh	609a	-	2012	Punjab	480	-
1994	Punjab, Sindh, KP	316	-	2013	Punjab, Sindh	446	-
1995	Punjab, Sindh, KP, AJK, Baluchistan	1051	6852	-	-	-	-

The excellence of policy and planning method interrupts the success of development and show a main part in the general development of a nation. Addition of environmental consideration in sectoral policies and their execution in relevant development PPs is a key to sustainable development (Lee, 2006). Even though globally, governments have started to create important changes in the institutional arrangements to allow organized consideration of the environment in traditional government arrangements, however techniques for addressing cross-sectoral and inter-generational disputes often display a dearth of coherence and integration. Legal and governmental hurdles are maintained for strong distribution of tasks and specialization of responsibilities among numerous sectors. Segmented work approaches united with lack of harmonization between sectors are major hindrances to attain sustainable development (OECD, 2002). Major distortions come from distinction view of stakeholders

and incompatibility of interests which provide stoppage in attaining a level of trade off in policy construction.

Disasters have a huge and important adverse impact on economy, societal and above all the environment, set-back to the sustainable development. Pakistani society, economy and environment are threatened by disasters. The DRR is among one of the concern where there is a need of integrating eco-friendly concerns for sustainable development through strategic planning. SEA of PPPs has gained much attention as a suitable instrument for disaster and risk management (Fischer, 2007).

Internationally there have been several initiatives to identify tools to aid in the implementation of HFA and mainstreaming DRR and environment in development sectors. SEA is one of them for mainstreaming DRR and environment in PPPs at national and sectorial levels. It develops an understanding of how different development choices can enhance or reduce community resilience and increase or diminish broader environmental sustainability (OECD, 2008) for SEA & DDR.

1.4. Problem statement

Pakistan is one of the most vulnerable nations facing the risk of climate change, regardless of contributing very slight to the global GHGs emissions. Global Climate Risk Index (GCRI) of German watch 2012 (Harmeling, 2011), categorized it straight higher eighth among over 180 nations of the world. Earlier, in 2010, GCRI had placed it first. Maple croft's (2011), index of vulnerability to climate change placed Pakistan 16th amongst 170 nations of the world. The country's vulnerabilities are high due to heavy dependence of its economy on agriculture, which is extremely climate sensitive; water resource of its rivers from glaciers, which are stated to be retreating due to global warming; and increased risks to its coast line areas and the Indus deltaic area due to sea level rise and growing cyclonic action. The extreme weather events are enhanced in their frequency and intensity in the state. Data analysis from 52 meteorological stations in Pakistan over a period of 40-year (1961–2000) shows that the frequency of highest daily temperature and heaviest precipitation events have increased by the passing decades (GCISC, 2009). Moreover in the first decade of the twenty-first century saw several extreme weather conditions events including the history's worst flood in 2010. In terms of risks, climate change attitudes a major hazard to sustainable development i.e. economic, social and environmental. It is likely to have general impacts across numerous

areas and ecosystems such as water, energy and food, forests and biodiversity, environment of the marine and coastal areas, as well as the incidence& intensity of climate related threats such as floods and droughts.

1.4.1. Financial vulnerability and risks

Economically direct negative impacts of climate change will be across diverse sectors including water, energy, food and agriculture, forests, and fisheries. Water security has vital importance for the economy as it is bound to have impacts on all fiscal sectors. Future increase in population and the need for financial development is expected to increase the claim for water substantially. Presently, the principal user of water in Pakistan is agriculture division, where request for water is likely to increase much quicker due to higher evapotranspiration as a result of increased temperatures in the wake of climate change. In relations of supply, both key sources the Glaciers of Hindu Kush – Karakoram – Himalayas (HKH) and rainfall/snow fall will be affected due to melting glaciers (first increasing the water and then decreasing) and unpredictable rainfall respectively. Hence, the ability of water use will need improvement in all the sectors of the economy, mainly agriculture, where average H_2O delivery efficiency due to age, misuse, and poor maintenance of canals and resulting leakage has reduced considerably (GOP, 2014).

Furthermore, water management strategy will also need improvement. At present on average, about 128 billion cubic meters (BCM) of the water flows, in Pakistan is diverted to the canal system. The least discharge to the sea below Kotri was as low as one BCM (in 2000–2001) and the extreme was as high as 113 BCM in1994–1995 (GOP, 2005). Water going to the sea in low flow years is so low that it is incapable to stop intrusion of seawater into the Indus deltaic section (IPOE, 2005). Future sea level increase due to climate change will raise the problem by increasing the least flow requirements. In current days the average 43 BCM of water flows to the sea yearly in flood period. There is a need to save every drop of this water to use it later in sustaining ideal environmental flow into the sea (GOP, 2007), and for fighting the droughts.

The energy security will be affected by both indirect and direct impacts on the energy sector. Directly by affecting the timing and quantity of water availability for hydropower generation or thermal power plant cooling, increased rate of sedimentation of major reservoirs, damage

to the energy infrastructure located in coastal areas due to sea level rise. Indirectly on sectors such as water, industry, agriculture and infrastructure, like higher temperatures and increasing evapotranspiration may demand energy for pumping ground water to compensate for water losses. Food security will be affected through impact on the agricultural production. Crops and livestock production will be affected due to heat stress and other adverse impacts of changes in climatic parameters including uncertainty in timely availability of irrigation water due to river flow changes as a result of glacier melting and altered precipitation pattern, increased intensity and frequency of extreme weather events like floods that damage crops and may destroy livestock; dominance of insects, pests and pathogens in a warmer climate that may damage the crop and livestock; degradation of rangeland as well as already declined cultivated land particularly those affected by water and erosion, water logging and salinity etc.

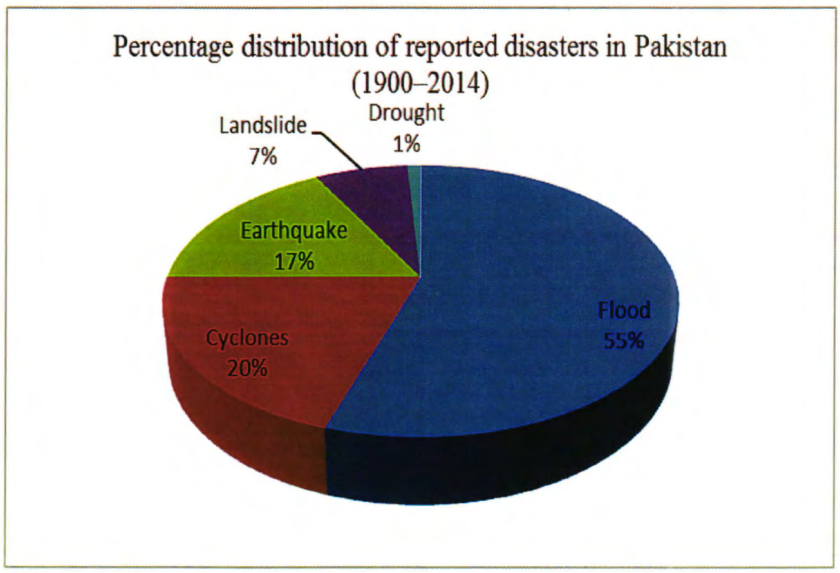
Significant efforts will be required to contest these climate change and flood related risks in sight of the time required for crop, livestock and fishery production systems to adapt the climate change. Achievement will center upon factors relating to biology, ecology, technology and management regimes. The well-known risks posed by climate change to various economic sectors need evaluation in economic terms, because this would give some idea to the national planners and policy makers on the total expenses that the country would need to acquire on handling tools such as adaptation measures (GOP, 2010).

1.4.2. Societal vulnerability and risks

Social impacts due to climate change related disaster like floods, droughts, or sea level rise are risks to health, displacement of people, drastic cut in their income and loss of jobs. It may also consequence of increase food prices and figure of people at-risk of food security and hunger. In terms of health, warmer temperatures and greater humidity would increase water, food, as well as vector-borne diseases. Intense extreme weather conditions triggered by climate change will also increase occurrence of pneumonia, heat strokes and heart attacks. The abilities of individuals, communities and societies in Pakistan to efficiently face such risks will depend upon a combination of natural, humanoid, societal, economic and physical factors, e.g. coastal populations and small farmers will be at higher risk. Rural houses built from mud and straw will be more at risk related to better quality houses in urban areas etc.

1.4.3. Environmental vulnerability and risks

Climate change brings biophysical/environmental risks as it can change the ecology and habitats; quantity and quality of available land, soil, water and biotic resources; level of the sea and ocean temperature and salinity. It may also boost the amount of weeds and pests, which in turn may worsen environmental changes. More risks will be posed to country's coastal and marine environment, forestry, biodiversity, rangelands, and mountain ecosystems etc. With a coastline of about a 1000 km, Pakistan has been among the nations which are most vulnerable to the effects of sea level rise (GOP, 2003). According to studies of the NIO, the sea level along the coast of Pakistan has been increasing approximately at 1.2 mm per year; slightly lower than the average worldwide increase of 1.7 mm per year over the last century. However, even at this rate, marine ecosystems and coastal zones, in specific in the Indus delta, could be damaged from increased saline water intrusion due to sea level rise. The NIO is of the explanation that the ground subsiding proportions in the Indus deltaic region due to lack of sediment flux and excessive ground water extraction are perhaps in the range of 2–4 mm per year. The ground subsidence has already caused in the seawater intrusion upstream of the delta extending up to 80 km in the coastal areas of Thatta, Hyderabad and Badin districts (Inam *et al., 2007*). The main impacts of sea level rise on the coastal zone include the risk of erosion of beaches, flooding and inundation of wetlands & lowlands, salinization of ground and surface waters, and adverse impact on coastal agriculture.



(Source: CRED, 2014)

1.4.4. Disaster risk reduction approach

Regarding DRR after Earthquake 2005 a comprehensive DRR Governance System has been recognized and made answerable for adapting approaches both for preparedness and management of disasters. It was established through the National DDMO in Dec 2006. The Ordinance delivered for the formation of an administrative NDMC; the NDMA to act as the implementing, coordinating, and monitoring arm of the NDMC as well as PDMAs and DDMAs. Other major steps taken in that direction were development of a DRMF 2007 -2012, NDM act 2010 and formulation of a DRR Policy 2013. The policy aims at the creation of a resilient Pakistan by introducing a proactive and anticipatory approach. It puts special stress on risk assessment, prevention, mitigation and preparedness.

The main proposition for this research is to strategically assess the environmental impacts of NDRR Policy 2013 in the context of flood management, flood risk reduction, and to identify the coherence and distortion among the selected DM documents like: NDRR Policy 3013 and NDMP 2012-2022, NDRMF 2007-2012 and NDMP 2012-2022, NDRR Policy 2013 and NDRMF 2007-2012, NDRR Policy 2013 NDM Act 2010, and NDM Act 2010 and NDMP 2012-2022.

To incorporate sustainability in disaster/flood management, flood risk reduction system of Pakistan and to provide alternatives and mitigation measures in order to achieve the desired actions /objectives to reduce / manage the flood risk. SEA is presented as an instrument that can help 'sensitize' flood management authorities to environmental considerations and lead toward greater coherence to floods/ disaster related policies, Plans, framework and act. The primary aim of SEA in this context is to provide information necessary to integrate environmental considerations into the decision-making process from the earliest stage of the PPPs development.

1.5. Scope of the study

In the past one decade, Pakistan has been experiencing wide variety of natural and human induced disasters in the form of floods, earthquakes landslides, drought, storms, heatwaves, heavy snowfalls, epidemics, accidents, explosions etc. However, the escalating frequency and intensity of hydro-meteorological disasters are on rise and scientists attribute the same with the climate change phenomenon. Such changing phenomenon prompted Pakistan to shift her traditional reactive and relief based approach to proactive one and endorse the DRR in policy,

planning and institutional development. It is also of paramount significance to bridge the policy with bottom- up and top-bottom approach in capacity building, identifying hazards, reduces vulnerabilities and stress on risk management strategies at community, regional and national level. This will have positive implications on the community, local disaster related organizations, practitioners and policy makers to prepare citizen to carefully handle the unforeseen extreme events with minimum losses and with higher resilience and strengths. Keeping in view this changing scenario particularly after 2005 Kashmir earthquake, the government of Pakistan reviewed weakness and gaps in policy, planning and institutions. In this regard, NDMC, NDRMF, NDMA, NDM Act and NDMP were the landmark decisions taken at the federal government and the circle was extended to provinces and subsequently to district level. After thorough consultation , policy and institutional analysis the national disaster risk management framework issued key guidelines and principles including expanding the horizons of multi-stakeholder, cross cutting issues and multi-disciplinary strategies; minimizing vulnerabilities of marginalized groups; promoting community level risk reduction initiatives; bridging disaster knowledge of practitioners, scientific community and indigenous rooted resources; introduction of economically capable, socially acceptable and technically viable risk reduction approaches and technologies; promoting sustainable development practices at all level; developing hazard-risk profile right from local area to national level; strengthening liaison and linkages with nations and worldwide community to promote DRR . Owing to the changing climate and resultant implications, it has left no choice for the countries but to rethink and devise risk reduction strategies. The challenges of reducing socio-economic vulnerabilities to extreme events specifically hydro meteorological hazards have been addressed under few important key research areas including poverty reduction, sustainable development, promoting disaster risk reduction strategies, enhancing disaster education and building disaster resilience.

Based on the work done (EU Fifth Environmental Action Programme, 1993), five financial sectors were nominated i.e. Agriculture, Energy, Industry, Tourism and Transportation. These were selected for significant impacts that they have or could have on the environment as a whole and because, by their nature, they have critical roles to play in the effort to attain sustainable development. These five economic sectors are badly affected by disasters in the world and in Pakistan due to frequent floods.

However, the study is limited to strategic environmental assessment of NDRR Policy 2013 in the context of flood, floods risk reduction strategies, strategically assess the impacts of the

proposed objectives /actions on environment as well as societal and fiscal concern associated with it. While other disasters like earthquakes, landslides, extreme weather phenomenon, GLOF, and snow avalanches etc. which although Pakistan is facing and also discussed in NDRRP 2013 will not be the part of the study.

1.6. Objectives of the Study

1.6.1. General objective

Key objective of the research is to find and identify coherence and distortion between the selected national disaster management documents like NDRMF 2007-2012, NDM act 2010, NDMP 2012-2022, NDM act 2010, NDRR Policy 2013, and NDRR Policy 2013 with other National policies and vision.

1.6.2. Specific objective

- To identify gaps and deficiencies in the current disaster (flood) risk management /reduction system in relation to environment and sustainable development and to suggest recommendations to remove the identified distortions, gaps and deficiencies.
- To assess the potential of using SEA as a tool for the assessment of NDRR Policy 2013 in context of flood management and FRR.
- To assess impacts of NDRR Policy 2013 in context of flood management and FRR on social health, fiscal and environment.

1.7. Significance of the study

After the SEA of the NDRR Policy 2013 in context of flood manage/flood risk reduction, it is projected that this study will provide input for incorporating sustainability to the DM system by giving sustainable and eco-friendly alternatives. This study will find actions and will recommend how to increase the positive impacts and minimize the negative impacts to achieve the desire actions. A baseline for further research will also be built, along with a knowledge base for policy development and policy's revision at provincial and national levels.

Chapter 2

LITERATURE REVIEW

2.1. Global perspective

SEA refers to the Environment Assessment of policies, plans and programs (PPPs) and has been in place since environmental impact assessment (EIA) was first introduced in 1969. SEA has developed, in part as a consequence of the emerging awareness that project EIA may occur too late in the planning process to ensure that all the alternatives and impacts relevant to sustainable development goals are adequately considered (Lee and Walsh, 1992). A lot of work has been carried out by experts as well as organizations on developing its process, methodology, tools and application in various sectors however; variability in policies making processes, socio-economic conditions, administrative and governance mechanism has remained the limiting factors in universal applicability of these methods, and processes. Moreover, examples related to application of SEA are more concentrated to programmes and plans levels with a limited number of SEA applied to policies particularly in disaster risk reduction.

SEA experiences in the UK for land use planning include Thérivel (1998), Russel (1999), Fischer (2003) and Short *et al.*, (2004). In other sectors, Marshall (2003), reported SEA related to energy planning and Thames Water (2000), on water management. Carter *et al.*, (2009), demonstrated the potential of SEA in reducing the risk of flooding from case studies in England.

2.2. SEA in Pakistan perspective

There is no formal SEA being practiced in Pakistan as it is not legally mandatory. The regional and international experiences and lessons on SEA are being assessed to be adopted through two pilot SEA studies to facilitate its legalization under the National Impact Assessment Programme. The National Impact Assessment Program (NIAP) is being implemented jointly by the Government of Pakistan (Planning Commission and Climate Change Division), all the Provincial, Azad Jammu Kashmir (AJK) and Gilgit Baltistan (GB)'s Environmental Protection Agencies and Environment Departments and International

Union for the Conservation of Nature Pakistan. The Program is being funded by the Royal Netherland Embassy and is aimed at strengthening the Environmental Impact Assessment (EIA) mechanism and introducing SEA in the country (Khan, 2011). In Pakistan, the cost of environmental degradation to economy was estimated around Rs. 365 billion per year (World Bank, 2006). In addition, the cost of adaptation to Climate Change is estimated to be up to $14 billion per year (Aslam, 2011). Socioeconomic uplift in the country largely depends on sustainable development that is highly dependent on strategic assessment of its policies, plans and programs. The environmental and climatic challenges were highlighted in Planning Commission of Pakistan's Task Force on Climate Change (GOP, 2010) and the National Climate Change Policy of Pakistan (GOP, 2013). Strategic Environmental Assessment (SEA) is a systematic decision support process, aiming to ensure that environmental and possibly other sustainability aspects are considered effectively in policy, plan and programme making. The National Conservation Strategy in 1992, the National Environment Action Plan in 2001 and Country Strategic Environmental Assessment in 2006 are a few examples that assessed the environmental aspects in the country at policy and sectoral levels. Informally, the Medium Term Development Framework (GOP 2005, MTDF 2005-10) was assessed for environmental integration to make it aligned with the National Environment Policy. However, all these efforts/practices were made without legal compulsion. The only SEA carried out in Pakistan was Strategic Environmental, Poverty and Social Assessment (SEPSA) of National Trade Corridor by the World Bank that has highlighted usefulness of the tool (Miglino, 2010). There is developing global consensus that climate change is humanity's greatest threat in modern times and is expected to have thoughtful consequences for socio-economic sectors. Pakistan's geographical location and socioeconomic fragility has made the most vulnerable to the environmental, social and economic consequences of climate change.

Environmental integration in development planning is considered essential for sustainable development in any country. It became more important for Pakistan due to increasing threats of Climate Change impacts in the form of different type of disasters like earthquakes, landslides, floods etc. causing a huge environmental, social and economic loss. EIA is useful at the project level and is mandatory under the current applicable laws in Pakistan for all the development projects that have potential for any environmental hazards due to their interventions. In practice, compliance has improved over the last decade; still a lot is to be desired. As far as the quantity/numbers of EIA is concerned, it is encouraging recently.

However, its quality is average to poor in general. The tool of EIA alone may not be very prudent for environmental integration in an efficient and effective manner. Hence, the addition of SEA as a tool would help in that regard.

2.2.1. SEA of thermal power generation policy, Pakistan

In a competition to attract foreign investment, the Government of Pakistan has provided unprecedented incentives that guarantee high profit to investors in thermal power generation. In return, the country stood to receive clear short-term economic gains. In pursuit of this goal, the Government set up a Private Power and Infrastructure Board, based in Islamabad, with a mandate to facilitate the establishment of power stations throughout Pakistan. It entered into over 30 agreements for independent power plants (IPPs).

The National Conservation Strategy (1992) recommends the location of highly polluting units away from populated and ecologically sensitive areas. According to the National Environmental Quality Standards (NEQS, 1993), oil-fired thermal power stations need to substantially reduce emissions, if installed in an already polluted environment. In 1994, with support from Canadian International Development Agency (CIDA), a National Power Plan was developed. However, the Government did not take this into account in negotiating agreements for foreign funding.

Government policy on thermal power generation gave investors the freedom to choose the site, the technology and the fuel. Contracts required investors in such projects to submit an EIA to the Government. Yet these EIAs had little influence on project location and design, and much less on the actual need for such projects. In 1994, IUCN-Pakistan undertook a study of a plan to meet the electricity needs of Karachi an already highly polluted city. This proposed several new oil-fired thermal power stations to meet projected power demand. The study found that, individually, each of the proposed stations was well within the NEQS maximum allowed limit of 500 tons of SO2 emission per day. But cumulatively, these stations would emit an additional 1000 tons of SO2 plus one ton of toxic metals daily.

Favorable terms were offered to foreign investors and soon led to an increase in electricity prices. As a consequence, many local industrialists pooled their resources and established their own power generation plants for their own use (captive units). This reduced the load on the National Grid System. But many of these plants were installed with little or no pollution control devices. Other industrial consumers signed agreements with the private power

companies. Due to public pressure, lobbying and a strong role by the media, several of the proposed plants (IPPs) were relocated. Use of SEA at an early stage would have avoided these problems. To mitigate similar problems, training workshops on SEA were organized in Pakistan by IUCN.

The Ministry of Environment wrote to IUCN-Pakistan giving an assurance that "because of the requirement for EIAs and the existence of the NEQS, the new IPPs would not pollute the environment''. This prompted IUCN-Pakistan to undertaken an SEA of the thermal power generation policy. It involved a desk exercise to develop scenarios for a range of conditions. These drew from past experience of power plant developments, particularly the preferences and tendencies of entrepreneurs in selecting sites (e.g. in or close to Karachi, or in remote areas close to water for cooling) and the problems of transporting oil to remote plants and connecting them to the national electricity grid.

A working document set out the environmental consequences under these scenarios. It was presented to staff of the Planning and Development Department senior officers from sections dealing with agriculture, industry, irrigation, population welfare and the power sector, etc. They had experience of dealing with thermal power plant issues and other large development projects. Subsequent discussion focused on the cumulative impacts on both a local and country-wide scale. The SEA revealed that whilst the Government was fully aware of the environmental dimensions associated with thermal power generation, assessment was based only on EIA.

The SEA made it clear to the policy-makers that EIA alone was not sufficient to guarantee sustainable development. EIA was used as a downstream decision-making tool applicable to individual projects, especially after deciding the site, technology and fuel. So its scope was very limited and missed the big picture. As a consequence, many thermal power stations using high-Sulphur furnace oil became clustered in one city and added to the already polluted air. Alternatively, they were developed in a scattered way in remote places. This made it difficult to supply them with furnace oil and to connect them with the National Grid System. This SEA was used as a case study to illustrate the need for an SEA as an upstream decision-making tool and to minimize all the foreseeable problems at the policy formulation stage. Following a training programme, the Planning and Development Department is beginning to request that SEAs are undertaken for major national and provincial-level initiatives at the policy level. Source Naim (1997, 1998).

2.3. Disaster resilience indicators

Several parameters have been tested to measure the resilience of individual, community, institutional capacity, economic feasibility and physical and technical viability. Joerin *et al.*, (2012), have applied ecological, social, economic, institutional, infrastructure and community competency as disaster resilience indicators. While assessing resilience from the perspective of ecological parameter, the ecological system is usually influenced by factors like biodiversity, response diversity, spatiality and governance and management plans (Adger, 2000).

In social resilience, key sub-indicators are demography, social networks, risk knowledge and risk communication, social norms and values and effectiveness of faith-based organizations (Joerin *et al.*, 2012). Building social resilience requires enhancement in risk communications, risk awareness, preparedness, emergency response and recovery process (Paton and Johnston, 2006). Similarly, the economic resilience to hazard events has so far been measured on the basis of impacts of disasters and the extent of recovery resilience (Joerin *et al., 2012*).

In building economic resilience, stress should always be made on how to minimize monetary losses from the impacts of disasters, which can be effectively reduced through adoption of prevention, mitigation, preparedness, response and early recover mechanism. Cutter *et al.*, (2008), has included income level, employment status, property value, wealth source, finances and revenue status as sub-indicators of economic resilience.

Institutional and organizational resilience includes the community involvement in hazard reduction initiatives, hazard mitigation plan, zoning regulations and building codes, inter-operable communication, emergency services and response plan and consistency of operational plan. It also requires assessment of organization and physical properties including number of technically trained personals, communication network, and emergency response assets. The organization should have hierarchical control, command system and horizontal coordination mechanism with sister organizations and integration in the disaster risk reduction (DRR) policies and plans. Organization resilience is sometimes judged that how the organization manage and respond to a particular extreme event.

Resilience of infrastructure includes the physical systems including transportation and communication life lines, irrigation and water storage system, water supply, electricity and gas supply networks, sewage and sewerage system, residential and housing stocks,

commercial, institutional and industrial establishments (Joerin *et al.*, 2012). Community competence is an important form of disaster resilience indicator and related to population wellness, local understanding of risk counselling services, education, health and quality of life. In disaster resilience context, the community competence is measured that how effectively community functions in pre, during and post-disaster phases.

2.4. Disaster resilience and climate risk

In Pakistan, there is dearth of information and analysis about the impacts of climate change on sea level rise, increasing glacier ablation, increase in acid rains, extremes in precipitation and temperature etc. Such increasing frequency of weather related events is partially attributed and endorsed as an impact of global climate change scenario (Rahman and Khan, 2013).

In Pakistan, there were record breaking wet spell of rainfall in the year 2010, which has caused devastating century worst flood and terrible damages to socio-economic and physical environment (Rahman, 2010). Climate change experts attribute this unusual phenomenon with a medium confidence level to climate change (Rahman and Khan, 2013). The latest literature reveals that there has been increase in the climate variability and extreme weather episodes with high monetary losses (Kreft and Eckstein, 2013). Due to the global climate change, it has been confirmed that less developed countries suffered more than the industrialized nations (Rahman and Khan, 2013).

2.5. Disaster resilience, sustainability and environment linkages

The community vulnerability and disaster resilience is directly linked with the sustainable utilization of resources and man-environment interaction. It is therefore, sustainability is a central point in the framework of hazards vulnerability and disaster resilience. In the context of disasters, sustainability can be defined as the capacity to bounce back and tolerate the potential adverse impacts of extreme phenomenon relying on locally available resources without jeopardizing the environment to reduce its potential for the succeeding generations and devoid of any assistance from outside.

Most often the environment is intensively utilized by unsustainable practices which as a result triggered more severe extreme environmental events. A cursory example of extensive deforestation is one of the key factor in increasing the flood runoff and resultant damages and

similarly degradation of wet coastal resources is another major factor responsible for coastal hazards. Such efforts not only required for minimizing the impacts of environmental hazards, but they are also much more in line with the generational equity concerns inherent in sustainability science (Cutter *et al.,* 2008). This calls to shift our DRR related reactive policies and strategies to more proactive one.

Around the globe, land use and land cover changes are eroding the natural buffers that protect communities from hazard risk. These same changes often erode people's capacity to recover from disaster. Other environmental changes, such as anthropogenic global warming, promise to create new challenges to the security and sustainability of communities around the world. There are, however, opportunities to reduce disaster risk, and enhance community resilience. The impacts of disasters, whether natural or man-made, not only have human dimensions, but environmental ones as well (UNEP, 2005).

2.6. History of floods / disasters events, impacts and investments

The territory of Pakistan has a bad history of flood events causing heavy damages to human and animal lives, standing crops, agricultural land, infrastructure as well as housing and other properties like:

Table 2.1:- Serious floods events and damage in Pakistan.

Events	Impact
Floods-1973	3 million homes were destroyed and 160 persons lost their lives.
Floods-1976	Flood demolished over 10 million homes while 425 lives were lost. With losses amounting to Rupees six billions.
Floods-1988	An unprecedented flood occurred towards the end of September inflicting Rs. 17 billion worth of damages to the country.
Floods-1992	Super flood of 1992 surpassed all previous records with damages estimated at Rs. 50 billion
Floods-1997	Very heavy rainfall in the last week of August, 1997 caused devastating floods in Punjab and Sindh that resulted villages affected 5891, person affected 2 million, houses damaged 130,000 and area affected 3.3 million acres.
Floods-2001	On July 23, 2001 an unprecedented and the highest ever recorded 24 hours rainfall of 624 mm occurred in Islamabad-Rawalpindi resulting flash flooding in Lai-Nallah with death of 74 people and which damaged 3000 homes.
Floods-2003	July-August 2003 heavy monsoon rains caused the worst flooding for a decade in Sindh that resulted in 230 deaths, one million people affected tens of thousands of houses destroyed, 45,000 acres of crops damaged and 20,000 cattle killed.
Floods-2010	In July-August 2010 abnormal monsoon rains resulted into the county unprecedented flash & riverine flooding. Population Affected 20.25 million, death 1985, houses damaged 1.89 million and area affected 132,000 Sq Km. Economic losses were to the tune of US $ 9.5 billion.
Floods-2011	Highest ever recorded four-week monsoon rainfall in Sindh caused devastating floods. The rainfall was more than five years average rainfall of the area. Persons affected 9.72 million, houses damaged 1.5 million, person died 456, cattle perished 1.15 million, and crop are damaged 6.6 million.
Floods-2012	Late September monsoon rains caused devastating floods in parts of Punjab, Sindh and Baluchistan. Villages affected were 14,370, crops damaged over 1.1 million acres, houses destroyed were 2, 75.023 and resulted loss of 9651 cattle livestock.

Source: NDMA & Flood Forecasting Division – Pakistan Meteorological Department

Table 2.2:- Damages due to different flood events during the past years.

S No	Year	Direct losses (US$ million) @ 1US$= PKR 86	Lost lives	Affected villages	Flooded area Sq-km
1	1950	488	2,190	10,000	17,920
2	1955	378	679	6,945	20,480
3	1956	318	160	11,609	74,406
4	1957	301	83	4,498	16,003
5	1959	234	88	3,902	10,424
6	1973	5134	474	9,719	41,472
7	1975	684	126	8,628	34,931
8	1976	3485	425	18,390	81,920
9	1977	338	848	2,185	4,657
10	1978	2227	393	9,199	30,597
11	1981	299	82	2,071	4,191
12	1983	135	39	643	1,882
13	1984	75	42	251	1,093
14	1988	858	508	100	6,144
15	1992	3010	1,008	13,208	38,758
16	1994	843	431	1,622	5,568
17	1995	376	591	6,852	16,686
18	2010	10,000 @ 1US$= PKR 86	1,985	17,553	160,000
19	2011	3730* @ 1US$= PKR 94	516	38,700	27,581
20	2012	2640**@ 1US$= PKR 95	571	14,159	4,746
21	2013	2,000^ @ 1US$= PKR 98	333	8,297	4,483
22	2014	500^^@ 1US$= PKR		4,065	9,779
Total		38,055	11,939	11,939	11,939

(Source: Economic Survey of Pakistan 2011-12, NDMA, Daily Times article "Economic losses due to recent floods in Pakistan" published on January 24, 2015)

Table 2.3:- Federal investment on flood protection works.

S No.	Flood Plans/ Programs	Location	No of schemes	Expenditure (Rs Million)
1.	**NFPP-I (1978-88)**	Countrywide	311	1,729.75
	Normal Annual Development Programme			
2.	**NFPP-II (1988-98)**			
i.	Normal/Emergent Flood Programme	Countrywide	170	805.33
ii.	First Flood Protection Sector Project (FPSP-I)	Four Provinces	256	4,735.29
iii.	Prime Minister's River Management Programme (1994-96)	Punjab, KPK & Baluchistan	10	613.386
3.	**NFPP-III (1998-2008)**			
i.	Normal/Emergent Flood Programme	Countrywide	362	4,192.35
ii.	Second Flood Protection Sector Project FPSP-II (1998-2007)	Four Provinces	101	4,165.00
iii.	Special Grant through President/ Chief Executive Directive (2000-2002)	Gilgit-Baltistan	21	92.035
iv.	Lai Nallah Flood Forecasting & Warning System *through Japanese Grant*	Rawalpindi & Islamabad	1	348.00
v.	Normal/Emergent Flood Programme (2008-14)	All over the country	174	2498.00
	Sub Total-I (NFPP-I,II &III)		**1,406**	**19,179.00**
4.	**Flood Damage Restoration Projects**			
i.	1988-Flood Damage Restoration Project	Four Provinces	2,028	1,874.00
ii.	1992-Flood Damage Restoration Project	Countrywide	1,980	6,888.36
	Sub Total-II		**4,008**	**8,762.36**
	Grand Total		**5,414**	**27,941.72**

(Source: Federal Flood Commission)

Table 2.4: - Damages due to flood year 2014.

Province/ Region	Persons Died	Persons Affected	Persons Injured	Houses Damaged	Villages Affected	Cropped Area Affected (Acres)	Cattle Heads Perished
Punjab	286	2,474,727	512	100,000	3,484	2,413,797	1,733
Sindh	-	65,583	-	-	267	-	-
KPK	12	-	15	42	-	-	-
GB	13	13,266	35	1,292	127	1,513	5,369
AJ & K	56	46,979	111	5,768	187	-	2,620
Total	***367***	***2,600,555***	***673***	***107,102***	***4,065***	***2,415,310***	***9,722***

(Source: NDMA)

Table 2.5:- Damage due to flood event 2015.

PUNJAB RIVERINE FLOODS - DAMGES / LOSSES								
Death	**Injured**	**Relief Camps**	**Persons in Camp**	**Evacuees**	**Villages Affected**	**Pop Affected**	**Crop Area Damaged (Acres)**	**Houses Damage**
3	4	105	1,877	54,461	366	194,137	205,366	422

BALOCHISTAN FLASH FLOOD				
District	**Deaths**	**Injured**	**Houses Damaged**	**Livestock Perished**
Zhob	-	2	6	4
Dera Bugti	-	-	100 (approx.)	-
Kohlu	3	6	-	-
Khuzdar	4	-	-	-
TOTAL	7	8	106	4

GILGIT BALTISTAN FLASH FLOOD / GLOF				
Districts	**Deaths**	**Injuries**	**Houses Damaged**	**Crop Area Affected**
Diamer	-	-	80	Medium Damage
Astore	-	-	-	Medium Damage
Gilgit	-	-	29	Medium Damage
Hunza-Nagar	-	-	12	Medium Damage
Ghizer	-	-	5	Low Damage
Skardu	-	-	40 (70 endangered)	High Damage
Ghanche	2	1	53	High Damage

(Source: NDMA 2015)

2.7. Types of floods in Pakistan

Flood is any abnormal rise of water level, which overflow the levees and inundate the adjoining areas (Rahman, 2010). There are several types of floods depending upon the physiography, tectonics, climatic condition and sources of water. Some of the major types of floods include riverine floods, pluvial/urban floods, flash floods, coastal floods and barrier lake floods (Kazi, 2014). These floods are caused by a variety of factors that range from physical to human intensifying factors. Heavy and prolonged rainfall remained the major contributor in the inland flood occurrence. Pakistan is exposed to frequent riverine floods, flash floods and coastal floods. Historical records shows that Pakistan has experienced almost all types of floods but in terms of frequency and magnitude river and flash floods dominates over all other kind of floods.

2.7.1. River floods

In Pakistan, river flooding is a type of inundations, which occur in Indus, Jhelum, Chenab, Ravi, Sutlej and Kabul River systems (Khan, 2003). However, the hilly terrain has a flash flood characteristic, whereas the coastal area has a risk of tsunami. Largely, it is catered by existing flood forecasting and early warning system, established under the flood forecasting division (FFD), Lahore. The Indus plain has a long history of river flooding. Floods in the Indus River and its tributaries is evident to be the most devastating (Tariq and Van-De-Giesen, 2012), because downstream Chashma Barrage, the might Indus enters into the gentle sloping floodplain and meandering throughout the course till it falls into the Arabian Sea. In addition to this, high population density, poverty, farmland, infrastructure and concentration of economic activities are the major risk factors. According to FFC in the past 35 years more than US$ 210 million has been spent on flood mitigation under different programmes. In response to flood damages, no significant decrease in the farmland inundation has been registered (Tariq and VanDe- Giesen, 2012).

2.7.2. Flash floods

Flash flooding is an extreme natural event throughout the mountainous region of Pakistan. It is a frequently occurring phenomenon. Flash flood is more disastrous and occurs within 6 hours of heavy/prolonged rainfall. The Himalaya-Karakorum-Hindu Kush (HKH) region is more susceptible to flash floods. However, flash floods are also reported from the Waziristan

hills, Sulaiman, Kirthar and Makran ranges. In mountain system, it is the physiographic and climatic conditions, which leads to hydro-meteorological disasters. Particularly in the HKH region, the torrential rainfall is some-time supported by cloud bursting, thunder storms, heavy melting of snow/ice and glaciers. Eventually, it increases the intensity and magnitude of flash floods. Forecasting of flash flood is difficult and provides short time for preparedness such as early warning and response. In Pakistan, no flash flood warning system exists except for Nallah Lai, which was established in 2001, after massive flash flood that hit Rawalpindi and adjoining areas. The north-western of Pakistan is more susceptible to flash floods and almost every year heavy casualties have been registered. Such sudden flashy water pick up the silt, sand and in effect cause damages to human lives, standing crops, infrastructure and other property.

2.7.3. Causes of floods

In Pakistan, flooding in the Indus River system is one of the major frequently occurring hazards. It normally occurs in summer season (July–October). Summer monsoon rain has been the major cause of floods together with the heavy melting of snow, ice and glaciers in the catchment areas. Monsoon currents originate from the Bay of Bengal and proceed towards the Himalayan foothills depression and cause heavy rainfall. Such heavy rainfall led to flash floods in the hilly areas and river floods in the lower reaches. The cause of floods in river Indus varies at upper reach and lower reach.

The floods in the upper Indus generally result from heavy precipitation in the hilly catchment area in Himalayas and Hindukush which have limited valley storage. There is significant snow melt contribution. Occasionally, floods have been caused by formation and collapse of temporary natural dams either by glacial movement like the GLOF of Shyok river in 1841 or by the landslides like the one in 1929 that blocked the Indus near Roykot (FFC, 2012). The upper reaches of all these rivers passes through mountainous territory, with a concentration of population in the valleys. Heavy rainfall in these areas usually generates massive flash floods in the headwater regions. The lower Indus basin receives combined flows of the upper Indus and tributaries Jhelum, Chenab, Ravi and Sutlej. The floods in this reach occur in August, but could also occur from July to October and the river can be in high flood for a period exceeding one month (Sheikh, 2004). In the lower Indus basin, the river system twisting and sloping gently causing overflow of water that adversely affects the population and agriculture land lying in the active floodplains.

2.8. Flood management and institutional setup

2.8.1. National Calamity Act 1958

The National Calamities Act of Pakistan 1958 was the only legal document to regulate the relief, rehabilitation and reconstruction. This was only the reactive 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 or post-disaster phase. Under the Calamity Act, in each province there were relief commissioners, who supervised and coordinate 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 elaborated the government line departments and their primary and secondary responsibilities in the disaster phase. The Provincial Board of Revenue has been made responsible of collecting damages data and record of compensation.

2.8.2. UNISDR and HFA (2005–2015)

The United Nations General Assembly has created UNISDR (International Strategy for Disaster Reduction) in 1999. The secretariat of UNISDR is the focal point in the UN system for the coordination of disaster risk reduction (DRR) and implementation of the international DRR– the "Hyogo Framework for Action (HFA) 2005– 2015: Building the resilience of nations and communities to disasters". 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 DRR is applied to 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. The HFA (2005–2015) signed by 168 countries including Pakistan.

2.8.3. Sendai framework for disaster risk reduction 2015 – 2030

The Sendai Framework for DRR 2015–2030 was adopted at the third United Nations World Conference on DRR, held 14-18 March 2015 in Sendai, Miyagi, Japan. Pakistan is also a signatory of this framework. It represented a unique opportunity for countries:

- To adopt a concise, focused, forward-looking and action-oriented post 2015 framework for DRR;
- To complete the assessment and review of the implementation of the HFA 2005–2015: Building the Resilience of Nations and Communities to Disasters;
- To consider the experience gained through the regional and national strategies/ institutions and plans for DRR and their recommendations, as well as relevant regional agreements for the implementation of the HFA;
- To identify modalities of cooperation based on commitments to implement a post 2015 framework for DRR;
- To determine modalities for the periodic review of the implementation of a post 2015 framework for DRR.

The framework Goal is "to Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience". The Framework Priorities for Action are understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in DRR for priority understanding disaster risk resilience and last is enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.(Source: NDMA 2015)

2.8.4. National Disaster Management Ordinance 2006

After 2005 Kashmir earthquake and HFA, the Government of Pakistan was stimulated towards institutionalization for DRR. There was high time for capacity building of the disaster related agencies at national, provincial, district, local and community level. As after the earthquake, numerous challenges emerged and encounter the situation. Keeping in view this alarming state the president of Pakistan promulgated the National Disaster Management

Ordinance (NDMO) in 2006 (GOP, 2011). Under this ordinance, National Disaster Management System was introduced in the country. Similarly, the National Disaster Management Commission (NDMC) was established at the national level. The NDMC was assigned the task of preparing guidelines, policies and plan for DRR. Eventually, the National Disaster Management Authority (NDMA) was established in 2007.

2.8.5. National Disaster Risk Management Framework 2007-2012

The 2005 earthquake led to promulgation of the National Disaster Management Ordinance 2006 (NDMO), which was the first step towards integrated (proactive) disaster management in the country. In 2007, National Disaster Risk Management Framework (NDRMF) was formulated by involving different ministries, UN agencies, national agencies and authorities all stakeholders are expected to undertake following actions to promote disaster risk management system in the country.

I. Integrate risk assessment in the planning and design stages of all new infrastructure/projects.
II. Assess vulnerability of people, infrastructure, assets and services related to their sector.
III. Develop disaster risk management plans.
IV. Integrate vulnerability reduction measures in their programmes.
V. Develop technical capacities of their departments/sectors to implement disaster risk management strategies.
VI. Allocate funds for disaster risk management in annual development budgets.
VII. Conduct post disaster damage and loss assessments.
VIII. Organize emergency response, recovery and rehabilitation as per the mandate of the different departments.

In Pakistan, the NDMC 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, KPK 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. The framework provides guidelines to coordinate activities of numerous stakeholders, sets out priorities for mobilization of resources from donors and development partners of Pakistan to implement strategic activities during the next five years.

2.8.6. National Disaster Management Act 2010

The Pakistan National Disaster Management Ordinance was approved by the parliament in December 2010 and became the Act called as Pakistan National Disaster Management (NDM) Act 2010. The NDM Act has established three levels for the disaster risk management in the country i.e. national, provincial and district levels. National disaster management authority is working at federal level, provincial /state disaster management authority at provincial/state level and district disaster management authority/unit at the district level. The Act provides the establishment of national disaster management system in Pakistan. The NDM Act provides the comprehensive guidelines and legislative backup for entire disaster risk management system in the country. Chapter 2 of the DM act highlight the power and function of national disaster management commission and establishment of national disaster management authority, whereas Chapter 3 focuses on the power and function of provincial disaster management commission and establishment of provincial disaster management authority (PDMA). However, Chapter 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.

The Act consists of eleven chapters and forty eight sections and provides the establishment of NDMS in Pakistan. Section 1 provides the title, extent, and commencement of the Act and Section 2 defines various terms. Sections 3–36 deal with issues that can be broadly divided into three categories, i.e., establishment of institutions and development of plans (Sections 3–28), finances, Accounts including audit in (Sections 29–32), offences and penalties (Sections 33–36). The establishment of institutions and development of plans (Section 3–28) provide a three-tier hierarchical framework. At the top of the hierarchy, a unified national commission,

known as the National Disaster Management Commission (NDMC), headed by the Prime Minister and its members include all provincial chief ministers, Prime Minister AJ&K the key federal cabinet ministers and some other members (Section 3). The NDMC have the responsibility for making the Policies, Plans and guidelines in the country for disaster management (Section 6). For implementation of the PPs at the national level, NDMA headed by a Director General is constituted to act as the executive arm (Section 8), which is to serve as a focal point for the coordination and implementation of disaster management policies in the country (Section 9). The Act requires drawing a national plan for DM, suggesting measures for the prevention of disasters, integration of the measures in development plans, and defining roles and responsibilities of relevant federal government ministries and departments (Section 10). At the second tier, PDMC (Section 13) and at the third tier, PDMA (Section 15) and DDMA (Section 18) are suggested. The PDMAs draw provincial plans (Section 17) and DDMAs draw district plans (Section 21) for disaster management at in Sections provincial and district levels, respectively. In addition, the Act provides establishment of a NIDM for training, research and development (Section 26), and a National Disaster Response Force (NDRF) (Section 27). In addition, the Act suggests establishment of a NDM fund for meeting any threatening disaster situation or disaster (Section 29). Similarly, provinces are asked to establish PDM fund for dealing with disaster issues (Section 30). Moreover, miscellaneous items are covered 37–48 of the Act.

2.8.7. National Disaster Management Plan (2012–2022)

The Pakistan faces wide ranges of hazards and risks, which requires the 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 setup of DRM in the country and project document on formulation of National Disaster Management Plan for Pakistan. NDMP was prepared with the technical support of JICA in 2012. NDMP is a comprehensive plan, having a total investment cost of USD 1040.9 million (PKR 92.02 Bn with 1 USD = PKR 88.4), with a long span of ten years (2012-2022). The Plan aimed at enhancing the capacity of the country response by proactive approach to disasters by defining the measures to be considered necessary for disaster management and risk reduction in line with the provision of the National Disaster Management Act 2010. The Plan consisting of the "Main Plan" document along with three supporting volumes in addition to an Executive Summary, which identifies

macro level hazards and risk assessment, development of the multi hazard early warning system to reduce the vulnerability to disasters by enhancing and strengthening the early warning capacity, identification of the roles and responsibilities of the stakeholders. The National Disaster Management Plan explains the role and responsibilities of these stakeholders in three stages:

(i) pre-disaster including mitigation and preparedness measures,

(ii) during disaster including emergency rescue, response and relief measures, and

(iii) post-disaster including recovery, rehabilitation and reconstruction measures.

The Community Based Disaster Risk Management (CBDRM) approach, in view of its universal reorganization and importance in DRM planning, has been given due place in the Plan. Based on pilot activities tested in different hazard contexts and social settings, best practices and guidelines have been documented in the Plan to serve as models for future CBDRM activities in Pakistan. The Plan also provides strategic direction for systematic human resource development in the field of disaster management and the operational plan for the National Institute of Disaster Management (NIDM).

2.8.8. National Disaster Risk Reduction Policy 2013

Pakistan is a disaster-prone country due to geo-physical conditions, climatic extremes, and high degrees of exposure and vulnerability. The hazards including floods, earthquakes, avalanches, cyclones and storms, droughts, glacial lake outburst floods (GLOF), landslides, tsunamis and epidemic pose risks to Pakistani society. Floods and landslides are the hazards that occur predominantly seasonal and on an annual basis, whereas other such as earthquakes and tsunamis are rare events but potentially highly destructive. In addition, to natural hazards a variety of human-induced hazards threaten Pakistani society, economy and environment. Disaster risk reduction interventions were being carried out in the country in isolation at national, province and district levels. It was a necessary to give them directions with the true spirit of National Disaster Management Act, 2010 to counter the threats of disasters faced by the country. NDMA has taken step for the formulation of a comprehensive National Disaster Risk Reduction Policy through consultations with all stakeholders. The National Disaster Management Commission approved the policy on February 21, 2013 .The Policy covers both natural and man-made hazards. The building blocks of the Policy reflect the priority actions of the HFA and are within the NDM Act 2010 that decentralized responsibilities for the

implementation of DRR to the provincial and district level. One of the objectives of the National Disaster Risk Reduction Policy of Pakistan is "to Strengthening the structural and non-structural resilience of key infrastructure and lifelines in Pakistan". The intervention 3.2 (Prevention and Mitigation) emphasis on resilience key-infrastructure and life-lines. Key infrastructure and lifelines include those facilities, structures and services whose disruption or destruction would seriously affect peoples' lives and livelihoods including those whose functioning is crucial in a post disaster situation i.e. educational and health Facilities, key government buildings, water supply and sanitation, irrigation and flood protection.

This policy document introduces a proactive and anticipatory approach by laying special emphasis on risk assessment, prevention, mitigation and preparedness, with the aim of creating a resilient nation. The document is divided into four chapters:

Chapter 1. Assesses risk awareness and preparedness in Pakistan, finding that Pakistan's current disaster risk reduction (DRR) capacity is insufficient.

Chapter 2. Outlines the National Disaster Management Authority's (NDMA) vision for capacity development in Pakistan, with a focus on vulnerable populations.

Chapter 3. Explains NDMA's plan for policy interventions, particularly for development in the areas of risk knowledge, mitigation, and preparedness.

Chapter 4. Explains NDMA's implementation framework to mainstream DRR in Pakistan, including plans for financing, monitoring, and educating students on disaster preparedness.

The main objectives of the Disaster Management Policies of Pakistan are:

- Creating an integrated national capacity to identify and monitor vulnerability and hazard trends including potential climate change impact.
- Creating Multi-Hazard Early Warning capacity while building upon existing systems and emphasizing the information and warning needs of vulnerable end-users.
- Strengthening an integrated disaster preparedness and response capacity from the local to the national level.
- Promoting development planning that considers and addresses disaster risks alongside environmental and climate change concerns.
- Strengthening the structural and non-structural resilience of key infrastructure and lifelines in Pakistan.

- Strengthening capacity at national and provincial levels to facilitate and provide support to the implementation of DRR policies, plans and programs across sectors and in high-risk areas.
- Strengthening Local Level Risk Reduction capacity focusing upon communities, and supportive linkages with Union Councils, tehsils and districts. Ensuring DRR is systematically integrated into recovery and reconstruction programming, "building better, safer and stronger" and informing DRR mainstreaming in general.

2.9. Institutional setup for flood management

2.9.1. National Disaster Management Authority (NDMA)

The National Disaster Management Authority (NDMA) was established in 2007. The NDMA was held responsible for coordinating, implementing and monitoring body for DRR in the country level. Under the Ordinance (now Act), the National Disaster Risk Management Framework (NDRMF) was prepared by the NDMA in March 2007 (GOP, 2012), which serves an overall guideline for disaster risk management at national, provincial and district levels. This necessitates NDMA to directly interact/ communicate with all stakeholders, including Ministries, Divisions, and Departments. 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 had been in the process of strengthening the DRM system in the country. As per National Disaster Management Authority Act-2010, the main functions of NDMA are as under:

a) Act as implementing, coordinating and monitoring body for disaster management;
b) Prepare the National Plan to be approved by the National Disaster Management Commission;
c) Implement, coordinate and monitor the implementation of the national policy;
d) Lay down guidelines for preparing Disaster Management Plans by different ministries or departments and the provincial authorities;

e) Provide necessary technical assistance to provincial government and provincial authorities for preparing their Disaster Management Plans in accordance with the guidelines laid down by the NDMC;

f) Coordinate response in the event of any threatening disaster situation or disaster;

g) Lay down guidelines for or give directions to the concerned ministries or provincial governments and provincial authorities regarding measures to be taken by them to response to any threatening disaster situation or disaster;

h) For any specific purpose or for general assistance requisition the services of any person and such person shall be co-opted as member and exercise such power as conferred upon him by the authority in writing;

i) Promote general education and awareness in relation to disaster management;

j) Perform such other functions as the National Disaster Management Commission may require performing.

2.9.2. Provincial Disaster Management Authority and relief organizations

The National Disaster Management Act insisted for the establishment of a Provincial Disaster Management Commission (PDMC) as well as Provincial Disaster Management Authority (PDMA) to cope with the challenges of Disaster Management in a professional and efficient manner. Both the organizations have been mandated to effectively set up a system to look after disasters and calamities whether natural or man induced and coordinate with the key players. Previously, the Provincial Relief Commissionerate had been responsible for the relief, compensation and rehabilitation of people affected by natural disasters. With the establishment of PDMA, the functions of the Relief Commissionerate have been incorporated into the new organization.

Provincial Relief Organizations (now Provincial Disaster Management Authorities) are responsible for disaster preparedness, preparation of emergency response plan, rescue and relief measures and rehabilitation plan and its approval from Provincial Government before implementation; examine the vulnerability of various parts of the province to different disasters and specify prevention or mitigation measures; lay down guidelines for preparation of disaster management plans by the Provincial Department and District Authorities; evaluate preparedness at governmental levels to respond to disaster and enhance preparedness; coordinate response in the event of disaster; give directions to

DDMAs regarding actions to be taken in response to disaster; and promote general education, awareness and community training etc. pertaining to all disasters including floods. Relief functions at the District and Tehsil/Union Council level are now performed through the District Disaster Management Authorities, who coordinate with the concerned departments to carry out the disaster management functions at the district level.

2.9.3. District Disaster Management Authority/Unit

In order to involve local organization in DRR planning and implementation, district disaster management authority (DDMA) has been in the process of establishing at district level. In KPK there is district disaster management unit instead of authority. As per plan, the head of the local council at the district level shall be the chairperson, Deputy Commissioner /District Coordination Officer as secretary, whereas District Police Officer and Executive District Health Officer are the ex-officio members. The power and function of District Authority include preparation of district disaster management plan, coordinate and monitor the implementation of the National Policy, Provincial Policy, National Plan, Provincial Plan and District Plan. In addition to this, DDMA shall ensure that the vulnerable areas in the district are identified and measures have been taken for their prevention and mitigation at district level (GOP, 2012).

2.9.4. Federal Flood Commission

Prior to 1977, flood mitigation was the concern of respective provincial Governments. However, the heavy floods of 1973 followed by flood-1976 has prompted the provincial Governments to raise the issue at federal level that planning and execution of flood mitigation is beyond their carrying capacity (Rahman, 2010). As a consequence, in 1977 the Federal Flood Commission (FFC) was established to tackle the flood issue at federal level. The key responsibility of FFC includes:

- Preparation of National Flood Protection Plans;
- Approval of flood control schemes prepared by Provincial Governments and concerned Federal Agencies;
- Review of flood damages to flood protection infrastructure and review of plans for restoration and reconstruction works;
- Measures for improvements in flood forecasting and warning system;

- Standardization of designs and specifications for flood protection works;
- Evaluation and monitoring relating to progress of implementation of the National Flood Protection Plans;
- Preparation of a research program for flood control and protection;
- Recommendations regarding principles of regulation of reservoirs for flood control (GOP, 2011).

2.9.5. Achievements of FFC

Since its establishment in 1977, FFC has so far executed three 10-Years National Flood Protection Plans covering periods from 1978-1988 (NFPP-I), 1988-1998 (NFPP-II) and 1998-2008 (NFPP-III). Brief details of projects executed under the three 10-Years Plans are given as under:

National Flood Protection Plan-I (1978-88):

Flood protection activities executed under **National Flood Protection Plan-I (NFPP-I)** through various programme/projects are given as; Emphasis was mainly given on the implementation of structural measures (construction of flood protection structures). Pakistan Meteorological Department (PMD) and WAPDA carried out only maintenance works related to Flood Forecasting and Warning System equipment.

National Flood Protection Plan-II (NFPP-II) (1988-98):

Under NFPP-II, the following activities were undertaken for improvement of Country's existing Flood Forecasting and Warning System through Flood Sector Protection Project (FPSP-I):

- Procurement and installation of Meteor-burst Telecommunication System (Phase-I) including one Master Station and 24 remote sensing stations.
- Installation of 10-CM Quantitative Precipitation Measurement (QPM) Weather Radar at Flood Forecasting Division (FFD) Lahore.
- Pre-feasibilities studies for four Barrages i.e. Sulemanki, Baloki, Trimmu and Panjnad for increasing their design discharge capacity to carry increased flood flows in view of 1992 floods.
- Preparation of Flood Plain Maps of Indus River (5-Reaches i.e. Chashma-Taunsa, Taunsa-Guddu, Guddu-Sukkur, Sukkur-Kotri and Kotri-Seas Reach).

National Flood Protection Plan-III (NFPP-III) (1998-2008):

The major activities undertaken for improvement of country's existing Flood Forecasting & Warning System include;

- Procurement and installation of 24 No. HF-Radio Sets.
- Procurement and installation of 20 additional remote sensing stations under existing Meteor-burst Telecommunication System (Phase-II);
- Upgradation of 10 CM Quantitative Precipitation Measurement Weather Radar procured under FPSP-I in the premises of FFD, Lahore;
- Upgradation of 5.36 CM Sialkot Weather Radar into 10 CM Quantitative Precipitation Measurement Weather Radar;
- Procurement and installation of a 10 CM Quantitative Precipitation Measurement Weather Radar at Mangla;
- Development of initial/1st version of Computer Based Flood Early Warning System (FEWS) through NESPAK, PMD and Delft Hydraulics;
- Expansion of Flood Plain Mapping activity covering major tributaries of River Indus i.e. Rivers Jhelum, Chenab, Ravi and Sutlej;
- Bathymetric Survey and flow measurements of Indus River and its major tributaries (Sutlej, Ravi, Chenab and Jhelum) for improvements in discharge rating curves and to collect data for FEWS Model and Flood Plain Mapping activities.

Establishment of Flood Forecasting and Warning System for Lai Nullah Basin (Islamabad & Rawalpindi):

Facilities provided includes:

- Two No. Telemetry rainfall gauging stations at Golra, Islamabad and Bokra, Islamabad;
- Two No. water level gauging stations at Kattarian Bridge, Rawalpindi and Gawalmandi Bridge, Rawalpindi;
- Master control station in PMD, Islamabad;
- Two monitoring stations at FFC and TMA/Rescue-1122-Rawalpindi respectively;
- Executive Warning Control room in Rawalpindi Fire Brigade , and
- Nine No. warning posts at various locations.

National Flood Protection Plan –IV:

After experiencing 2010 floods in country, the need for investment in flood sector has gained importance. Federal Flood Commission initiated working on formulation of National Flood Protection Plan-IV on fast track basis and consultants were engaged in May 2013 through World Bank funded Water Sector Capacity Building Project for preparation of NFPP-IV. The draft plan is under consideration by the various stakeholders organizations. Actual implementation has been planned to be carried out during the next ten years subject to the approval of plan by the Government of Pakistan and provision of adequate funds for construction of various interventions to be proposed in the NFPP-IV during the next ten years.

Presently, the urgent nature flood protection works are being undertaken through GOP funded Normal/Emergent Flood Programme under Public Sector Development Programme on yearly basis, which are planned and executed by the Provinces and Federal Administered Areas.

2.9.6. Pakistan Meteorology Department and Flood Forecasting Division

The Pakistan meteorological department (PMD) provides services of flood forecasting and early warning together with the generation of weather data and its dissemination to the relevant agencies. The PMD has so far installed 97 weather stations all over the country to record rainfall and other weather elements. One of the core areas of PMD is the Flood Forecasting division.

FFD, Lahore, the specialized unit of PMD, which plays a pivotal role in the Flood Forecasting & Warning process obtains the hydro-meteorological data from the various National and International sources, which is then analyzed to produce weather & flood forecasts, warnings and disseminated to various Federal/Provincial organizations and electronic/print media through various means and also uploaded on PMD Website. This division is fully equipped with Doppler radar to remotely sense and measure the quantitative precipitation over the catchment area of major river systems. Such 10-cm Radar facilities are available at Lahore and Mangla, whereas 5-cm radar at Sialkot, Islamabad, Dera Ghazi Khan, Rahim Yar Khan and Karachi, which cover almost all the catchment area of major river systems in Pakistan. The Flood Forecasting Division is also applying mathematical model on

Indus river system for computing the stream hydraulics and to identify vulnerable areas for issuance of early flood warning. The overall disaster/flood management is shown in Fig 2.1.

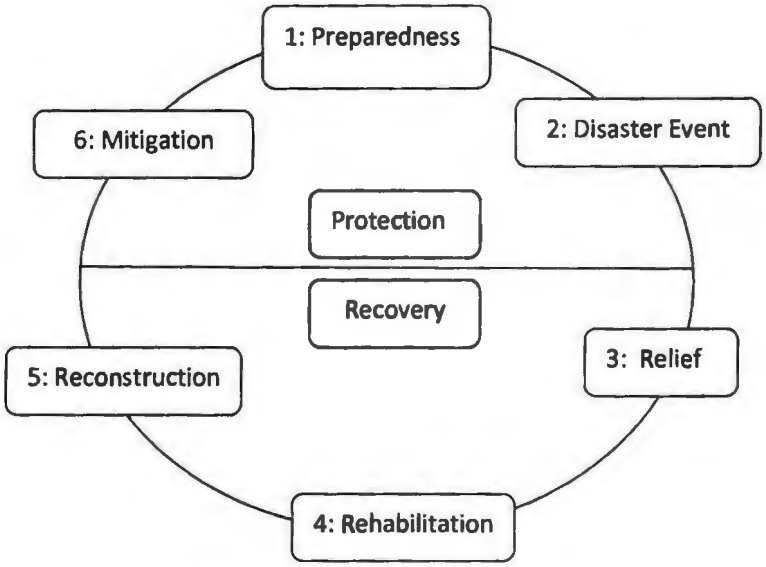


Fig. 2.1 The disaster management cycle

2.9.7. Provincial Irrigation Departments

The Provincial Irrigation Departments (PIDs) play a front line role in flood management, fighting and mitigation. Major flood related functions include:

a) Operation and maintenance of Barrages and measurement of discharges at specific sites (Barrages/Headworks) on rivers, Irrigation and Drains Networks, besides, flood management facilities;
b) Planning, design, construction and maintenance of Irrigation, Drainage and Flood Protection & River Training Works;
c) Collection and transmission of Rivers flows data to FFD, Lahore, FFC and other concerned organizations for flood management activities;
d) Establishment and Operation of Flood Warning Centre during the monsoon season each year for sharing flood flows data and other information, besides, timely dissemination of the flood forecasts/warnings to concerned quarters;
e) Preparation and implementation of the Flood Fighting Plans during monsoon season every year.

2.9.8. WAPDA

WAPDA is actively involved in the flood forecasting process as it provides water levels of major reservoirs (Tarbela, Chashma and Mangla), river flows and rainfall data collected through Flood Telemetric System/Gauged sites in the catchment areas of major rivers. The system is supplemented by Meteor-burst communication system. WAPDA supports another hydrometric data measurement and transmission system through its Surface Water Hydrology Project.

WAPDA's Flood Telemetric Network is directly linked with FFD, Lahore. WAPDA provides hydrometric flood data and water levels, inflows/ outflows of Tarbela, Chashma and Mangla reservoirs to FFD, Lahore, FFC and other concerned organizations. Coordination between FFD Lahore and WAPDA has considerably improved after the 1992-flood disaster. Regular meetings in the office of General Manager (Planning & Design) are held during flood season and necessary instructions are issued to Tarbela and Mangla Dam Flood Management Committees.

2.9.9. Pakistan Army

Pak Army's Force of Engineers under the command and control of Engineer-in-Chief provide necessary help to the civil authorities to carry out the rescue and relief operations during and after the floods. Provincial Governments provide necessary logistic support/equipment (boats, life jackets, vehicles and tents etc.) to Pakistan Army for such operations.

Pakistan Army's flood related functions encompass all the three phases of flood operations from the pre-flood to post flood phases including the important flood phase. Pre-flood phase is the flood preparatory phase during which the adequacy and service ability of the flood fighting equipment is ensured. Pre-flood meeting are also held at the Corps Head Quarters and Engineer Directorate, GHQ in order to review the arrangements of PIDs, PDMAs and Federal Line Agencies for handling flood situation.

Pre-flood inspections of the flood protection structures are carried out by the respective Commander Corps of Engineers along with concerned officers of Provincial Irrigation Departments for their respective areas to ensure that the flood protection structures (Bunds, Barrages, and Spurs etc.) are in satisfactory state of maintenance. Deficiencies, if any, are brought to the notice of PIDs. Availability of sufficient stock of explosives is ensured at pre-

determined breaching sections to activate the pre-determined breaching sections, whenever required.

An officer of the 4 Corps Engineers 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 Commander Corps Engineers 4 Corps in time, which are transmitted to the D.G. Engineers and all other Commander Corps of the Engineers. In the event of floods, units of the Pak Army move out to their respective areas of responsibility and carry out the relief and rescue operations in coordination with the respective civil administration. A post flood meeting is held under the Chairmanship of Engineer-in-Chief/ D.G. Engineers to discuss the performance of all the flood management related agencies with the view to bring about the necessary improvement in future.

2.9.10. Pakistan Commissioner for Indus Waters (PCIW)

Pakistan has a unique flood-forecasting problem in the sense that major part of the flood generating in upper catchments of Rivers Sutlej, Ravi, Jhelum and Chenab lie across the border in India/ held Kashmir. A number of water storage reservoirs have been constructed over Eastern Rivers (Ravi and Sutlej) across the border. As a result, the free flood flow conditions are disrupted making the operation of the rainfall/runoff model extremely difficult. The situation underlines the need for the acquisition of rivers flow data from across the border in respect of important sites over the rivers in Indian occupied Kashmir. Consequently, an agreement had been signed between the two countries in 1989 through their respective Commissioners for Indus Waters, which includes provision/ sharing rivers flows data with India such rivers flow and rain data as is considered important for flood forecasting in Pakistan. A number of river flow stations are specified for this purpose.

The Pakistan Commissioner for Indus Waters receives the Chenab River and Eastern Rivers (Ravi & Sutlej) data normally once in a day. The data is then passed on to the FFD, Lahore for preparation and issuance of Flood forecast to concerned organizations. Frequency of data reception is increased to six hourly and even to hourly in case of severe flood situation. Pakistan Commissioner for Indus Waters is thus responsible to provide to FFD, Lahore, the much-needed data obtained from India for use in the flood forecasting models to ensure accurate forecasts for Rivers Sutlej, Ravi, and Jhelum and Chenab. Pakistan Commissioner for Indus Waters is the only forum through which any clarification or further information can

be obtained from India with regard to flood flows data of Chenab & Eastern River (Ravi & Sutlej).

2.9.11. Emergency Relief Cell (ERC), cabinet division

Emergency Relief Cell exists under the Cabinet Division and is controlled by the Cabinet Division. The cell is headed by the Director General. The main functions of the Emergency Relief Cell include:

a) Planning and assessment of relief requirements for major disasters;
b) Stock piling of basic need items during emergency such as dry ration, tents, blankets etc.;
c) Establishing emergency fund upon declaration of any part of the country as calamity affected; and
d) Maintaining contact with NDMA, UNO and its related organizations, besides other international aid giving agencies.

2.10. Establishment of Flood Communication Cell during flood season

During flood season, each year, flood communication cell of FFC remains in operation on round-the-clock basis for the entire flood season (1st July to 15th October). The Daily Flood Situation Report (containing rainfall, river flows, reservoirs water levels and weather situation for the country) is issued to all concerned organizations.

The main job of the Flood Communication Cell is to obtain weather and rivers flow data/information from the Flood Forecasting Division (FFD), Lahore, WAPDA, PID's and other Flood Warning Centers set up in the Provincial Headquarters, besides, flood flows data of Eastern Rivers through PCIW. The duty staff along with one officer remains available round the clock during all working days as well as Sundays and National Holidays for collection of rainfall and rivers flow data and weather reports for compilation and dissemination to all concerned organizations.

FFC also sends reports to the President Secretariat and Prime Minister Office as and when the situation demands. The Daily Flood Situation Report on Weather & River Discharges as received from FFD, Lahore, WAPDA and PIDs is prepared and issued to the concerned

Government officials during the Monsoon Season every year containing the following data/information:

a) Actual rivers flood flows position of major rivers at stations and other important control points in a tabular form;
b) Prevailing weather situation and future outlook;
c) Concise forecast relating to the movement of various weather systems and river flow condition for the next 24 hours including likely inundation /flooding of nullahs etc. as received from PMD/FFD, Lahore;
d) Damage details in the event of flood emergency in the flood affected areas. In case of exceptionally High Flood Stage/emergency situation, special advisory on Weather and Rivers flood flows position is issued on six hourly bases.

2.11. Flood Warning Dissemination System

Monsoon Season normally starts in 1st week of July (sometimes, it starts little early) and ends in last week of September (sometimes prolongs up to mid-October). However, the Flood Warning Centers of all flood management related agencies start functioning from 15th June every year for collecting weather and flood flows data and keep continue up to 15th October. During this period effective interaction and communication between various floods related provincial as well as federal agencies is maintained on round-the-clock basis in order to counter any eventuality due to monsoon rains/floods.

2.12. Pre-flood preparedness meetings

A number of pre-flood meetings are organized annually by the concerned flood management organizations, i.e. Pakistan Army, NDMA, and Ministry of Water and Power/FFC to review the status of preparedness and flood fighting Plans/arrangements of concerned organizations. The following pre-flood meetings were held during 2014;

a) Pakistan Army Pre-Flood Coordination Conference was held on May 14, 2014 at Engineers Directorate, GHQ Rawalpindi, which was attended by the Commanders of Pak. Army formations, FFC, NDMA, PMD and WAPDA etc. The Flood Preparedness Plans were reviewed;
b) The 49th Annual Meeting of Federal Flood Commission was organized on July 23, 2014 in Ministry of Water and Power, Islamabad, under the Chairmanship of Federal

Minister for Water and Power, to review the status of preparedness of concerned Federal and Provincial Government organizations and arrangements made for safe passage of Flood Season-2014.

c) A meeting for review the arrangements of flood management related organizations and also to evaluate progress on decisions taken in 49th Annual Meeting of FFC was arranged on August 05, 2014 under the Chairmanship of Additional Secretary Ministry of Water & Power, in committee room of office of the Chief Engineering Advisor/ Chairman Federal Flood Commission, Islamabad.

d) The Post Flood meeting of Federal Flood Commission was held on November 10, 2014 in the committee room, Chief Engineering Advisor/Chairman Federal Flood Commission, Islamabad under the Chairmanship of Chief Engineering Advisor/ Chairman FFC, Islamabad.

e) Pakistan Army Post-Flood Coordination Conference was also held on November 11, 2014 at Engineers Directorate, GHQ Rawalpindi, wherein the Commanders of Pak. Army formations, representatives from FFC, NDMA, PMD, and WAPDA etc. participated in order to share their experience of 2014 floods and lessons learnt for better flood management in future.

2.13. Environmental problem

Environmental problems from the Flood Risk Reduction (FRR) strategies were identified through discussion with experts and literature review.

SEA Topic	Relevant environmental problems and key issues	Consideration in FRR Plans & Policies/strategies
Population and human health	Flooding has the potential to impact on risk to life, human health a number of ways: • Flooding has impacts in particular within populated urban areas as it has the potential to affect high numbers of individuals. • Impacts of flooding may be greater for some vulnerable or deprived groups Impacts on health can include risk to life, the impact of exposure to aquatic, immediate and longer term mental health impacts. In addition to reducing flood risk, measures/actions to manage flood risk can have other impacts on people, both positive and negative, for example, measures may impact convenience, access to recreation, and green space.	The FRR strategies should contribute to reducing risk to life, to protecting human health from the impacts of flood risk. Measures/actions should be targeted to areas where there is greatest risk and benefit, to bring about significant benefits to populations most at risk. Attention should be given to impacts on convenience, access to recreation and access to green space, when selecting measures/actions, aiming to deliver benefits where possible.

Biodiversity, fauna and flora	The biodiversity, flora and fauna is at risk from: • Threats to ecosystems and biodiversity • Deteriorating habitats and protected species • Highland biodiversity losses • Burden on wetlands • Nutrient enrichment affecting river and coastal water quality Flooding can impacts on habitats and species, both positively and negatively; Some advantage from regular flooding, whereas others may be damaged by sediment or pollutants in flood water. Measures /actions to manage flood risk can have positive and negative impacts on species and habitats. Habitat creation or enhancement (for example as part of natural flood reduction or by Sustainable Urban Drainage Systems can benefit biodiversity, fauna and flora. Other measures/actions (for example some engineering works) could negatively impact on habitats and species, although sensitively designed schemes can lessen impacts (through mitigation).	The FRR strategies should consider the contribution that can be made to preventing habitat loss and ecosystem decline and, where suitable, enhancing biodiversity and ecological linkages by: • facilitating to protect designated sites from significant flood risk; • considering the best use of natural features in flood risk reduction measures/actions; • Encouraging approaches which integrate environmental considerations.

Soil	Soil is at risk from a number of measures/ actions including changing flora, erosion, acidification, and by development. Flooding and flood prevention measures /actions could impact on soil, with associated impacts from erosion, disturbance and landslips.	Consideration should be given to the contribution that measures/actions could make to improving or preventing decline of soil quality by: • Considering the best use of natural features in FRR measures/actions ; • Guaranteeing measures/actions are suitable for soil conditions on which they are planned.
Water	Flooding is a natural process but strategies of flooding can be rehabilitated and intensified by human influence for example, alterations to land use or hydro morphology such as modification of river channel. A key pressure on the aquatic environment is diffuse pollution, as flooding can release pollutants. Measures/actions to reduce flood risk particularly natural flood reduction measures/actions can deliver benefits. The FRR measures/actions can also have negative impacts, for example, some types of land use change or changes to river or coastal morphology	Proposed measures/actions should, where relevant, seek to reduce the risk of flooding related to pollution of the aquatic environment. Proposed measures/actions should seek to restore or enhance the rural & urban landscapes natural ability to slow and store flood water.

Climatic factors	Pakistan has two major rainy seasons' winter and summer. In winter, under the impact of westerly winds northern half of the country receives significant rainfall in plains and snow in the mountains. Monsoon rain in summer adds about 60 % of the annual total rainfall from July to September. Pre-monsoon months of May and June are very hot and dry while autumn is also the dry season without summer or winter rains. The country's total annual precipitation is between 500 and 800 mm. The northern part receives higher amounts from both winter and summer precipitation compared to southern half, which receives hardly 50 % of the northern one because neither monsoon establishes well nor winter precipitation approaches with generous monsoons. Precipitation in the northern half accumulated over the mountains in winter in association with the glaciers feed the Indus and its tributaries in pre-monsoon period (Rasul *et al.*, 2012). Sea level rises and storm surges are also likely to lead to an increase in flood risk. The risk of flooding can be exacerbated by coastal squeeze. FRR measures/actions can impact on greenhouse gas emissions (GHGs). For example • changes in land use associated with FRR measures/actions can	When selecting measures, consideration should be given to: • future changes in flood probability due to climate change; • future proofing measures (whether the measure can be adapted in the future); • Enhancing, restoring, or creating habitats that help to slow and store water. Consideration should also be given to mitigating climate change by: • contributing to green networks and soil protection; • Minimizing use of energy.

	impact on climatic factors by protecting green linkages and soil resources which act as carbon sinks • Construction of new flood protection measures could use significant energy and material resource. • Measures/actions can also help to adapt to changes in climate e.g. Natural flood management measures that can help to create space for water	
Material assets	Flooding can cause significant damage to properties, services, transport, and community infrastructure. In rural areas, the intervention can be particularly severe where alternative infrastructure may be rare or absent. The process of construction may use significant material resources, and also generate waste including soil.	Measures should seek to protect infrastructure from significant flood risk. Consideration should be given to minimizing the use of material resources and production of waste.
Cultural heritage	Cultural and well-known environment assets and their settings are under pressure from a variety of influences. Some assets may be at significant flood risk. Measures/actions to manage flood risk could impact on cultural heritage, for example, through destruction from civil works. Changes to hydrological patterns can also impact both +itively and – tively wetland archaeology.	Proposed measures should seek to protect cultural heritage from significant flood risk and from any negative impacts of management measures.

Landscape	Landscapes are self-motivated places, shaped by natural process and human activity. Burdens on landscape include erosion, climate change, and landslips, land use and development. FRR measures/actions could impact both +itively and -atively on landscape like impacts could arise from flood protection schemes, or the cumulative impacts of changes to land use or land management.	Proposed measures/actions should ensure that benefits and adverse impacts to landscape are given suitable consideration during selection of measures/actions.

2.9.4. Potential impacts of floods

	Social or human effects	**Physical effects**	**Economic effects**
Primary effects	• Fatalities • Injuries • loss of income or employment opportunities • homelessness	• ground deformation and loss of ground quality • collapse of and structural damage to buildings and infrastructure • non-structural damage loss and ground quality to buildings and infrastructure	• interruption of business due to damage to buildings and infrastructure • loss of productive workforce through fatalities, injuries and relief efforts • capital costs of response and infrastructure and relief
Secondary effects	• disease or permanent disability • psychological impact of injury, bereavement, shock • loss of social cohesion due to disruption of community • political unrest where government response is perceived as inadequate	• progressive deterioration of damaged buildings and in- infrastructure which are not repaired	• losses borne by insurance industry weakening the insurance market and increasing premiums • loss of markets and trade opportunities through short-term business interruption • loss of confidence by investors, withdrawal of investment • capital costs of repair

Chapter 3

METHODOLOGY

3.1. Methodology

One of the problems of conducting SEA is knowing how best to carry out SEA in practice, as methodologies are still evolving and best-practice examples are still rare. However, there is now useful guidance aimed specifically at practitioners (e.g. English Nature *et al.*, 2004; ODPM *et al.*, 2004; Good Practice Guidelines developed by OECD (2006), and Scottish (2005), Practical Guide to the SEA Directive 2001/42/EC etc.). The Scottish practical guide to the SEA directive divide SEA process into four main steps shown in Table 3.1 below

Table 3.1:- Steps involved in SEA process.

SEA steps and tasks	Purpose
Step A: Setting the context and objectives, establishing the baseline and deciding on the scope	
Identifying other relevant plans, programmes, and environmental protection objectives	To establish how the plan or programme(PPs) is affected by outside factors, to suggest ideas for how any constraints can be addressed and to help to identify SEA objectives
Collecting baseline information	To provide an evidence base for environmental problems, prediction of effects and monitoring; to help in the development of SEA objectives.
Identifying environmental problems	To help focus the SEA and rationalize the subsequent stages, including baseline information analysis, setting of the SEA objectives, prediction of effects and monitoring
Developing SEA objectives	To provide a means by which the environmental performance of plan or programme and alternatives can be assessed.

Consulting on the scope of SEA	To ensure that the SEA covers the likely significant environmental effects of the plan or programme
Step B: Developing and refining alternatives and assessing effects	
Testing the plan or programme objectives against the SEA	To identify potential synergies or inconsistencies between the objectives of the plan or programme and the SEA objectives and help in developing alternatives
Developing strategic alternatives	To develop and refine strategic alternatives
Predicting the effects of the plan or programme alternatives	To predict the significant environmental effects of the plan or programme and alternatives.
Evaluating the effects of the plan or programme, including alternatives	To evaluate the predicted effects of the plan or programme, including alternatives and assist in the refinement of the plan or programme.
Mitigating adverse effects	To ensure that adverse effects are identified and potential mitigation measures are considered.
Proposing measures to monitor the environmental effects of plan or programme implementation	To detail the means by which the environmental performance of plan or programme can be assessed.
Step C: Preparing the Environmental Report	
Preparing the Environmental Report	To present the predicted environmental effects of the plan or programme, including alternatives, in a form suitable for public consultation and use by decision-makers.
Step D: Consulting on the draft plan or programme and the Environmental Report	
Consulting the public and the Consultation Bodies on the draft and the Environmental Report	To give the public and the Consultation Bodies an opportunity to express their opinions on the findings of the Environmental Report and to use it as a reference point in commenting on the plan or programme. To gather more information through the opinions and concerns of the public
Assessing significant changes	To ensure that the environmental implications of any significant changes to the draft plan or programme at this stage are assessed and taken into account

Making decisions and providing Information	To provide information on how the Environmental Report and consultees' opinions were taken into account in deciding the final form of the plan or programme to be adopted
Stage E: Monitoring the significant effects of implementing the plan or programme on the environment	
Developing aims and methods monitoring	To track the environmental effects of the plan or programme to show whether they are as predicted; to help identify adverse effects
Responding to adverse effects	To prepare for appropriate responses where adverse effects are identified

Source: Scottish (2005)

The present study does not cover all the steps of SEA due to time constrain and unavailability of national indicators /parameters required for this study, so study and assessment framework of the study will be establishment and shown in Fig 3.1 and Fig 3.2 respectively. The study was done by adopting a holistic /variety of different methods to conduct SEA which included:

- desk review and analysis, meetings with experts to discuss Strategic Environmental Assessment experience, awareness, opportunities and constraints;
- semi-structured interviews with key personalities;
- round table meetings to discuss issues, with different stakeholders and players during workshops and conferences;
- participants include representatives from different government departments and agencies, business and industrial communities, non-governmental organizations, academics, disaster effected representative and other potential stakeholders consist of experts who have been involved in Environmental Impact Assessment/Strategic Environmental Assessment, those who have (or might have) formal responsibilities for Environmental Impact Assessment / Strategic Environmental Assessment and others with concern or potential interest in Strategic Environmental Assessment . In this research a blend of such methodologies are used. Such interviews and round table meetings in workshops /international conferences and events are useful to

3.3. Assessment Framework

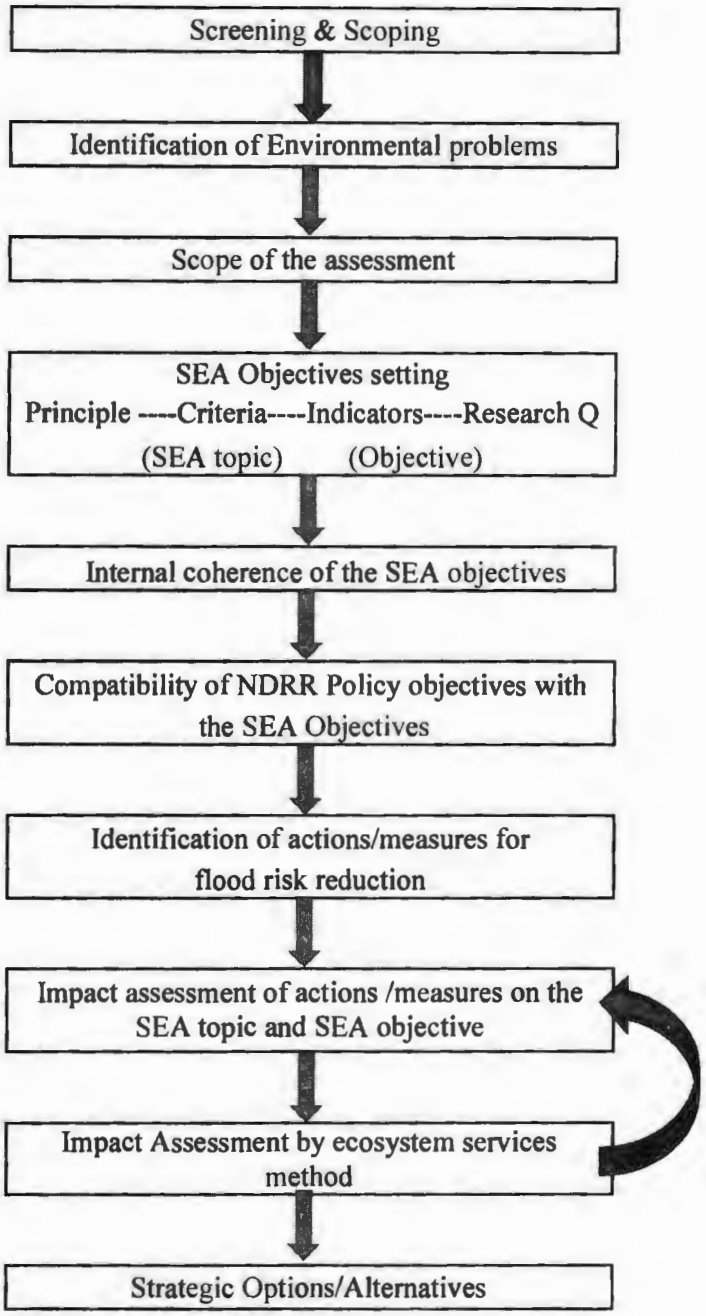


Fig 3.2. Assessment framework for the study.

To assess the eco-friendly sustainability the following phases will be adopted:

- **Coherence analysis**
- **Impact assessment**

3.3.1. Coherence analysis

Fundamental objective of SEA is to check whether the proposed policy or plan is environmentally sustainable (McCluskey and Joao, 2011), through the advancement of a consistency/coherence examination that expects to confirm the policy general objectives are successfully fit with the natural objectives. This approach proposes a twofold passage network for the assessment of this trademark, in which in the columns will be recorded general objectives of the NRRR Policy, and in the segments the objectives of national policies, *superordinate* plans or programs will be set. Thus, components of the policy that are not mixed with their superordinate plans or programs can be effectively decided.

Table 3.2:- Coherence analysis.

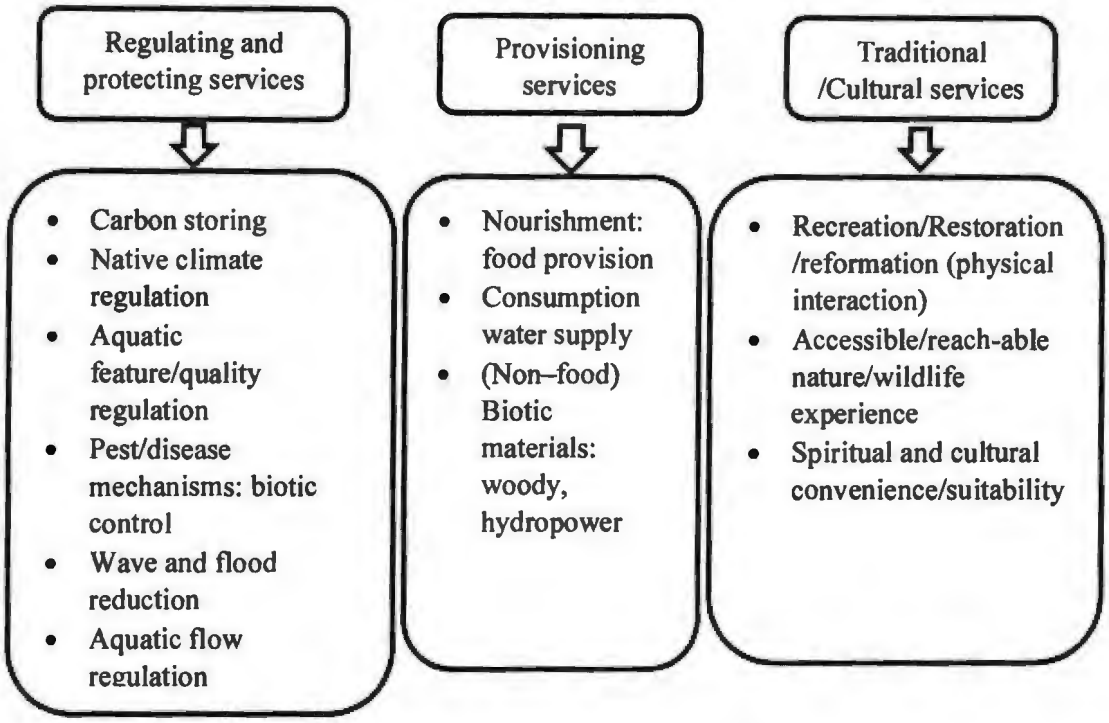
DRR policy objectives / ***National Policies objectives superordinate PP***	Columns					
Segment						
	0	✓	X			

(0 Neutral/not linked , ✓ coherent , X distortion)

3.3.2. Impact Assessment

Assessment method:

The assessment is supported by an ecosystem services method. The ecosystem method is established on the opinion that healthy, functioning ecosystems provide a sustainable movement of services. These ecosystem services support our economy, our health and well-being and are important to our continued existence:



3.4. Alternatives

Once the key risks and opportunities are identified, next step involves the identification and description of the alternatives for the proposed PPP. Alternatives are choices, options or courses of actions to achieve particular objective like in this case "to reduce the flood risk reduction". Currently, there is no well-defined or single methodology used for the identification of alternatives (Desmond, 2007). However, a range of methods and approaches used for the identification and evaluation alternatives include using literature review, and consulting experts (Therivel, 2004). Desmond (2007), SEA alternatives should be publically acceptable, authorized, realistic, technically possible, financial viable, eco-friendly and sustainable.

To conduct the Strategic environmental assessment for the identification of "alternatives" in this case, it is pre-requisite to assess what has been done, what and where is gap and what is required. For this purpose, assessment of existing flood management system and its components (e.g. institutional capacities, flood types, objectives of the strategy, and measures) is essential to proceed. Further, identification of the triggering factors influencing the flooding trends and undermining the existing flood management system e.g. climate change influences flood risk which in turn varies in impacts (both negative and positive) on

different risk categories (e.g. human life, agriculture and environment etc.) exposed to flood hazard in particular areas.

Once the gaps are identified within the existing flood management system and the range of the triggering factors together with the findings of scoping stage, discussions, consultation and public participation will bring the much clear picture on the work. Furthermore, meeting sessions with experts, flood managers and affectees will help to identify a range of issues, gaps, and desired actions. All these steps will direct SEA-team to decide for the identification of alternatives. Regarding criteria, there are different choices depending upon the purpose or aim of the assessment, e.g. in this case the purpose of assessment is to identify a range of appropriate alternatives to get a best compromise of environment and socio-economic benefits. For this purpose, SEA objectives are set as criteria addressing almost all three components of choice to achieve the indicators. The steps involved in the identification of appropriate strategic alternatives are shown in the Fig 3.2.The study will not carry all steps for the identification of alternatives due to time and financial constrain and non-availability of time series data. The main focus is given to the expert views and consultations.

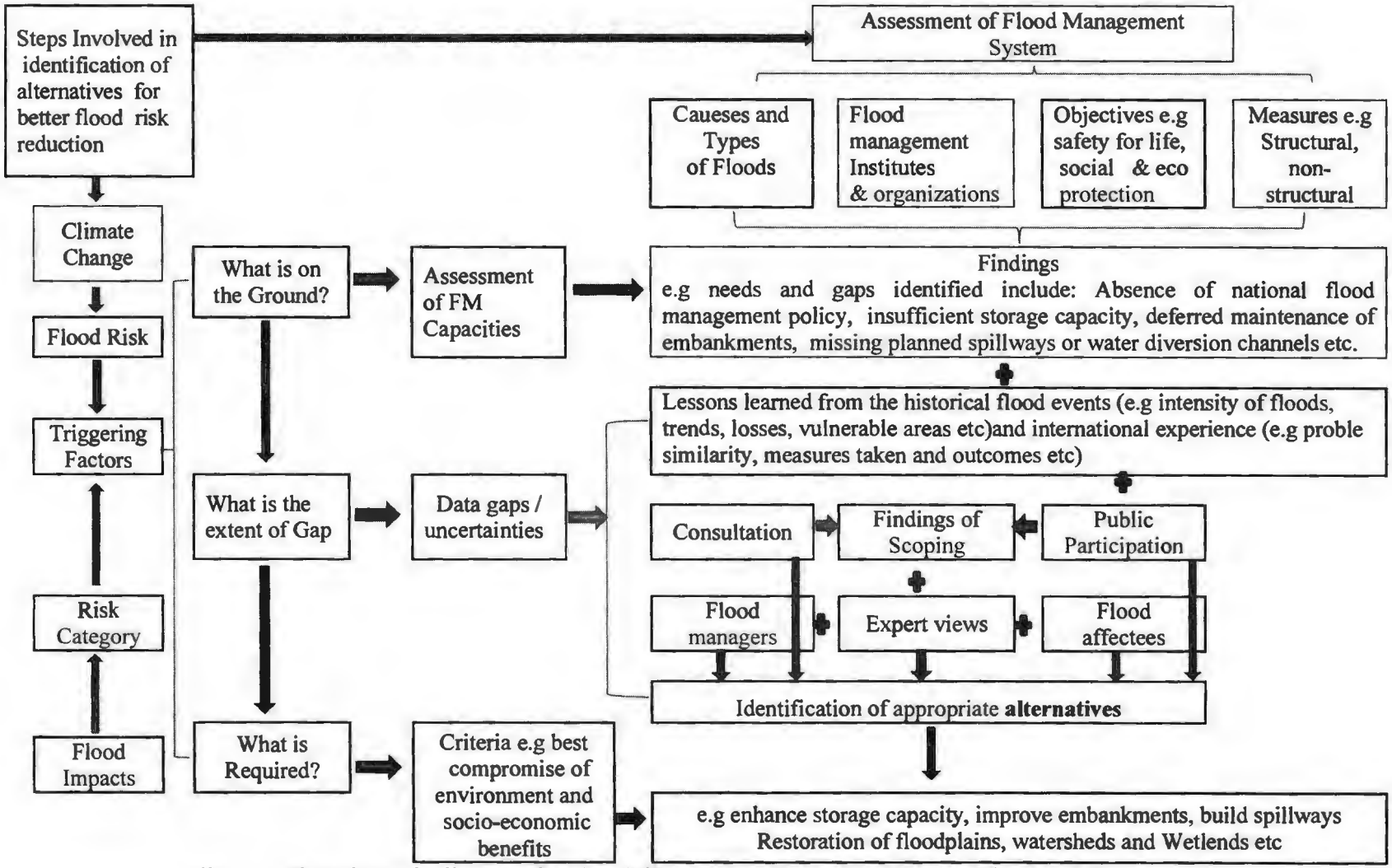


Fig. 3.3. The schematic diagram showing different steps involved in the identification of alternative.

3.5. Consultation with professionals

The researcher did internship in the Pak- EPA from April 2015 to Nov 2015. The following national experts and government officials were consulted in this study to know their views and concerns regarding NDM system and its selected documents

- Mr. Zia Ul Islam / Dir (Environmental Impact Assessment/Mentoring.) Pakistan Environmental Protection Agency.
- Mr. Ahmed Kamal Member (DRR) & Project Director NDMA.
- Dr. Aurangzeb Khan Director (EIA/Mont.) AJK –EPA.
- Dr. Abdul Majeed Project Lead, Pakistan Center for Advanced Studies in Energy Project, IUCN Pakistan Islamabad Office.
- Dr. Qazi Tallat Mahmood Siddique Deputy Engineering Advisor (civil) Federal Flood Commission Islamabad.
- Mr. Zia-ud- Din Khattak, Director (Labs/NEQS) Pak-EPA.

3.6. Training course on "Environmental Concerns in Development"

Training course on **"Environmental Concerns in Development"** Organized by National Center for Rural Development (NCRD), Establishment Division Government of Pakistan, Islamabad from 06 to 10 April 2015

3.7. Training Workshop on Drinking Water Quality

One day **"Training Workshop on Drinking Water Quality"** held at COMSATS Institute of Information Technology, Islamabad on 5th May, 2015, in Collaboration with Institute of Water Sanitation and hygiene (IWASH), and Pakistan Council of Research in Water Resources (PCRWR).

3.8. Consultation workshop on Disaster Management

The researcher attended the consultation workshop organized **by Human Rights Commission of Pakistan in Islamabad Hotel on Disaster Management (29 August 2015).** The following experts presented their point of view regarding gaps and deficiencies of national disaster management system in Pakistan.

- Mr. I. A. Rehman, Secretary General HRCP.
- Director DRR NDMA Islamabad presented Disaster Management Framework
- Dr. Ali Imran Syed, Deputy Director Operation PDMA Punjab "Early warning Provincial Action Plan"
- Mr. Naseebullah, Director Planning PDMA Baluchistan "Early Warning Provincial Action Plan"
- Mr. Noor ul Amin, Assistant Director, FATADMA. "Early Warning Provincial Action Plan"
- Rescue and rehabilitation priorities -1122 Rescue Representative.
- Civil society members, students, NGO's etc.

3.9. International GOLF conference on "Learning a way forward"

The researcher attended two days (14-15 Oct 2015) **International GOLF conference "Learning a way forward"** at Marriot Hotel, Islamabad, hosted by ministry of climate change, Pakistan GLOF project, adaptation fund and UNDP. The researcher learns a lot of from the presentations, groups and individual discussion with the national, international experts and flood affectees community representatives.

3.10. Workshop on Climate Change and its Consequences

The researcher attended one day workshop which is organized by Member of the National Assembly of Pakistan Asiya Nasir in Collaboration with Konrad –Adenauer-Stiftung (KAS) On Tuesday ,October 27 ,2015 in Pakistan Institution of Parliamentarian services

- Prof. Dr. Muhammad Irfan Khan, Chairman Environmental Science Department, International Islamic University Islamabad "Climate Change and Water Resource Management"
- Dr. Bilal Anwar, Senior Management Officer center for Climate Research and Development ,COMSAT "Climate Change Adaptation and Risk Management"
- Dr. Shoaib Ahmed, Chairman Socio Anchor, Legal Foundation "Climate Change Adaptation and Mitigation".

- Dr. Feriyal Amal Aslam, Disaster Management Studies, PIDE University "Determining the Impacts of Climate Change".
- Mr. Ahmad Kamal, Member National Disaster Management Authority, Prime Minister Office Islamabad "Risk Preparedness and Management in Context of NDMA".
- Ms. Shahida Akthar, Member National Assembly, "Climate Change and Food Security".

Chapter 4

RESULTS AND DISCUSSION

4.1. Screening

Screening is a process which determines that environmental assessment is essential for certain categories of PPs. For instance, The European Directive 2001/42/EC1 marks the strategic environmental assessment condition compulsory for certain types of PPs where they are likely to cause significant environmental effects (e.g. water management) and to promote sustainable development (SEA-Directive). Thus the NDRRP 2013 in the context of flood management qualifies to go through SEA.

Flooding has become the seasonal disaster with catastrophic effects in Pakistan. This calls the urgency for innovative, practical and reliable solutions for sustainable flood and water resource management. The planning needs to consider the available water resources, increasing water demand without new water development opportunities, monsoon shift, future flooding scenarios integrating climate change climax, and measures required to manage and mitigate all these issues. The literature shows that Pakistan is facing two major issues related with water resource management i.e. water scarcity and flooding, overwhelmed by very low water storage capacity of the country. In this context consideration of basin or reservoir construction is the prime focus to mitigate flooding as well as for enhancing water storage capacity of the country.

Practically, flood management options consider a mix or combination of measures i.e. non-structural and structural measures. The DRR Policy 2013 of Pakistan is dedicated "to the establishment of the non- structural and structural resilient key structure in Pakistan for flood protection. Structural measures have comparatively significant environmental consequences than non-structural measures. As currently, the construction of flood storage basin or reservoir is required, this option can have significant environmental issues including socio-economic constraints and opportunities. Further, the location of structure in environmental sensitive area can aggravate the situation. Similarly, many other measures e.g. embankments, diversion channels, retention basins or developing refuge centers would have direct and cumulative effects on selected or important receptors. Therefore, it is suggested that the PPPs

and strategies considered for flood or water resource management should be screened and undergo SEA process at the planning stage.

4.2. Scoping

Once the screening is done, the next step in SEA process is scoping. According to SEA Directive (article 6) the competent authority formulating the PP is mandatory to consult with specific "environmental authorities" (e.g. EPAs) on the scope and level of detail of the information to be included in the Environmental Report. The scoping is the first stage in SEA Process where SEA plays its strategic role. Scoping develops boundaries and context for the SEA (OECD, 2006). This stage of SEA plays crucial role in deciding what is likely to be significant impact associated with particular Policy, Plan or Program and what options/alternatives should be considered (Wood, 2003). Therefore, scoping is considered as a "central factor" for the quality of environmental assessment. The techniques involved in scoping might include literature surveys, checklists, public consultation and expert judgement (Therivel and Partidário, 1996). During the collection and review of information relevant to SEA topics, scoping stage will also help in identifying data gaps and uncertainties which can affect the quality of assessment. Further, discussion and consultation process with stakeholders and general public will help in better assessment of flood management options by integrating their concerns, identifying opportunities for improving baseline conditions and directing towards more environment friendly and strategic options/alternatives. The scoping process allows the range of issues to be scoped in or scoped out depending on significance and relevance of issue. Further, scoping in SEA has advantage as compared to EIA where cumulative impacts are not properly addressed. While in the case of SEA scoping considers the relevance or conflicts of other PPPs with the proposed one to identify cumulative, synergistic or conflicting impacts.

Table 4.1:- Scope of the Assessment.

SEA Topic	Possible impacts of FRR Strategies	Scope
Population & human life health protection	Flood risk has consequences for physical & mental health. The FRR strategies will address risk to human health from flooding & will therefore contribute to improving human health and welfare.	IN

Biodiversity, flora and fauna	The FRR strategies may have +tive and -tive impacts on biodiversity, habitats and species through changes to flood hazard, and through execution of measures.	IN
Soil	The FRR strategies may have an impact on soil through land use changes, and through proposed construction activities.	IN
Water	The FRR strategies are expected to have a significant effects on the aquatic environment mainly through reducing flood risk. Actions could also impact on hydrological processes, & ecology	IN
Air	The FRR strategies will not have significant impact on air quality, noise or odour	OUT
Climatic factors	The FRR strategies aim to improve resilience to climate change. Actions could impact on net GHGs emission through construction and repairs of actions and land use change.	IN
Material Assets	The FRR strategies will add the safeguard of material assets; including the built environment, conveyance linkage and community facilities.	IN
Cultural Heritage	The FRR strategies will seek to protect cultural heritage at significant flood risk. The FRM strategies should also give due regard to protecting cultural heritage from any adverse effects of applying actions.	IN
Landscape	The actions contained in the FRM strategies may impact on landscape the aim will be to ensure a best fit with the local landscape character.	IN

4.3. Setting SEA Objectives

Following the scoping stage and identification of environmental problem, next step was to develop SEA objectives and research questions through discussion with experts.

The SEA objectives and research questions were developed based on the identified environmental problems (Chapter 2 Literature Review 2.13) relevant to the Flood Risk Reduction Strategies. Main focus was on the National Climate Change Policy 2012, National Power Policy 2013, National Water Policy 2012 (draft), Forest Policy 2009, National Rangeland Policy 2010 (draft), Environmental Policy 2005, National Housing Policy 2001, Agriculture and Food Security Policy (draft) 2013, Wetlands Policy (draft) 2009, National Sustainable Development Strategy (draft) 2012, Pakistan Vision 2025 and selected DRR documents like DRRR Policy 2013, NDMP 2012-2022, NDRMF 2007-2012 and NDM act 2010. Further, SEA Objectives can be improved by reviewing baseline and scoping and considering concerns of general public, flood affectees and expert views.

Table 4.2:-SEA Objectives.

Principle/SEA topic	Criteria/ SEA objectives	Indicators	Research questions
Population and human life / health Protection	Protect human health, reduce health inequalities and promote healthy lifestyles	• Number of people suffering from water borne diseases in locality of flood affected areas • Rate of death due to flood • Emissions and their impact on human health • Yearly budget of damage linked to flood occasions	**Do the FRR strategies?** • Improve the health and living environment of people and communities? • Reduce flood risk? • Improve opportunities for healthy lifestyles • Protect drinking water areas
Biodiversity,	Conserve & where appropriate enhance species, habitats biodiversity, and habitat connectivity	• Biodiversity, sensitive areas, special forests • Status, percentage and coverage of protected areas, • Status and number of species • Status of the forest cover	• Avoid adverse effects on, & improve protected species and habitats? • Avoid adverse effects on & improve wider biodiversity? • Support healthier ecosystems? • Help promote habitat connectivity?

Soil	Protect & where appropriate improve the function and quality of the soil source,	• Agricultural land areas, contaminated sites, pollutants in soils • Urban development with satisfactory mitigation for any increased run -off • Number of landfills/waste sites protected	• Safeguard soil quality & function, including valuable soil resources such as agricultural land and carbon rich soils? • Reduce erosion? • Protect agricultural land? • Contribute to reducing land contamination in plain area?
Water	To prevent deterioration, protect & where suitable enhance the aquatic environment	• Quality of rivers, canals , freshwater, groundwater, marine waters, Use availability and proportions recycled	• Protect and enhance the overall aquatic environment? • Avoid adverse effects on sensitive coastal areas, status of water bodies and the marine environment? • Avoid water bodies from alterations?
Climate Factors	Contribution to mitigation of and adaptation to climate change	• GHGs emissions • Integration of GHG sequestering services in policies • Quantity of development in floodplain	• Improve adaptability to the effects of climate change? • Contribute to reducing GHGs emissions? • Contribute in energy efficiency?
Material Assets	Contribute to protecting property & infrastructure, minimize waste / energy consumption, promote most efficient use of resources & Infrastructure for water management	• Number of archaeological sites, protected buildings, properties, roads and rail infrastructure at risk of flooding • Adaptation to water pressures by water managing infrastructure	• Protect material assets e.g. infrastructure, properties? • Promote resource efficiency, including energy, waste, and water management infrastructure? • Safeguard current infrastructure e.g. flood defences?

Cultural heritage	Protect & where appropriate develop the character, diversity & special qualities of cultural heritage & the historic Environment	• Archaeological sites, protected buildings • Number of buildings & structures affected by floods	• Protect the historic environment and its setting? • Enhance or restore historic features and their settings? • Improve the quality of the environment?
Landscape	Protect & where appropriate develop character, diversity &special qualities of landscapes. Identify Pressures on landscape like climate change, erosion and landslips, land use and development	• Increasing forest cover will have a significant impact on many parts of country. • Valuable areas, aesthetical factors, protected areas • Amount and range of landscape areas affected by floods	• Protect, enhance or restore landscape quality of national designated landscape areas if any? • Avoid adverse effects on protected landscapes?

4.3.1. Internal coherence / inter-relationships between the SEA objective/SEA topics

The internal coherence or inter-relationship of the SEA objectives /SEA topic has been scrutinized to identify consistency/ inter-relationships & clash in connection to each objective and SEA topic. All SEA objectives & SEA topic are coherent with one another, like the SEA objective to improve habitat diversity and connectivity, leading to better opportunities for recreation, experiencing wildlife and nature, these are likely to contribute positively to the SEA objective to promote healthy lifestyles and protect human health, cultural services.

Table 4.3:- Internal coherence / inter-relationships between the SEA objectives.

To protect human health, promote healthy lifestyles	✓							
To conserve habitats, biodiversity, habitat connectivity& creation	✓	✓						
To protect the function & quality of the soil /reduce erosion	✓	✓	✓					
To prevent deterioration, protect a enhance the aquatic	✓	✓	✓	✓				
Mitigation & adaptation to climate change	✓	✓	✓	✓	✓			
Protect property, infrastructure, & promote efficient use	✓	✓	✓	✓	✓	✓		
Protect cultural heritage & the historic environment	✓	✓	✓	✓	✓	✓	✓	
To protect diversity of landscapes	✓	✓	✓	✓	✓	✓	✓	✓
SEA Objectives	To protect human health, promote healthy lifestyles	To conserve habitats, biodiversity, habitat connectivity& creation	To protect the function & quality of the soil /reduce erosion	aquatic environment	Mitigation & adaptation to climate change	Protect property, infrastructure, & promote efficient use of resources	To protect cultural heritage & the historic environment	To protect diversity of landscapes

(X= Neutral/not linked, ✓=coherent)

Table 4.4:-Internal coherence / inter-relationships between the SEA topics.

Population & Human Life /Health Protection	✓							
Biodiversity, Flora & Fauna	✓	✓						
Soil	✓	✓	✓					
Water	✓	✓	✓	✓				
Climatic Factors	✓	✓	✓	✓	✓			
Material Assets	✓	✓	✓	✓	✓	✓		
Cultural Heritage	✓	✓	✓	✓	✓	✓	✓	
Landscapes.	✓	✓	✓	✓	✓	✓	✓	✓
SEA Topic	Population & Human Life /Health Protection	Biodiversity, Flora & Fauna	Soil	Water	Climatic Factors	Material Assets	Cultural Heritage	Landscapes.

(X= Neutral/not linked, ✓=coherent)

4.4. List of stakeholders identified for DRR /FRR

- **Federal Ministries** like ministry of communication, climate change, economic & statistics, finance & revenue, planning & development, food Security & research, foreign affairs, housing & work, human right, industries, information & broadcasting,

information & technology, interior, law, justice & parliamentary affair, petroleum & natural resources, port & shipping, railway, health regulations & services, water & power etc.

- **Federal Departments and Authorities** are CDA, civil aviation, housing authority, WAPDA, highway authority, Indus river system authority, civil defence, FFC, firefighting services, geological survey of Pakistan, national crisis management cell, national emergency relief cell, national logistics cell, Pakistan Armed forces, PMD, Pakistan commissioner for Indus waters, PWD, Pakistan railways, SUPARCO, survey of Pakistan, Police and Pakistan Navy etc.
- **Federal Public Companies and Stakeholders** are airline companies, banks, ambulance services, hospitals, insurance sector, telecommunications companies (NTC, PTLC) and media, mobile telecommunication companies, Pakistan humanitarian forum, Pakistan red crescent society, Sui northern gas pipeline limited, southern gas pipeline limited. Other Stakeholders include Community organizations, universities and research institutes, international agencies, volunteers, insurance sector, district, provincial and national governments CBOs, NGOs, and individuals.

4.5. Coherence and distortion of the NDRR Policy 2013 to the National Environmental Policy 2005

The environmental objectives are carefully chosen from the national environmental policy 2005 and are tested against the NDRRP 2013 objectives to get a wider point of view of the coherence and distortion between NDRR policy 2013's objectives and the national environmental objectives. Most of the objectives of NDRRP 2013 are coherent with the national environmental objectives just one is distorted that related to the structural measure for flood risk reduction can negatively impact the environment while other objectives of the NDRR Policy 2013 focused on the strengthening non-structural measure to reduce disaster/flood risk hence coherent to the national environmental objectives.

Table 4.5:-Coherence and distortion of the NDRRP 2013 objective with the national environmental objectives.

NDRR Policy 2013 Objective / *Environmental Objective*	To create an integrated national capacity to identify & monitor vulnerability and hazard trends including potential climate change impact	To create MHE Warning capacity and emphasizing the information and warning needs of vulnerable end-users	Strengthening an integrated disaster preparedness & response capacity from the local to the national level	Promoting development planning that considers & addresses DR alongside environmental & climate change concerns	Strengthening the structural and non-structural resilience of key infrastructure and lifelines in Pakistan	Strengthening capacity at national and provincial levels to facilitate and provide support to the implementation of DRR PPPs across sectors and in high-risk areas	Strengthening Local Level RR capacity focusing upon communities, and supportive linkages with Union Councils, tehsils and districts	Ensuring DRR is systematically integrated into recovery and reconstruction programming, "building better, safer and stronger "and informing DRR mainstreaming in general
Conservation, restoration & efficient environmental resources management	✓	✓	✓	✓	✓X	✓	✓	✓
To Integrate environment in policy making and planning process	✓	✓	✓	✓	✓	✓	✓	✓
To manage and conserve the water resources	✓	✓	✓	✓	✓X	✓	✓	✓
To prevent & reduce air pollution	✓	✓	✓	✓	✓X	✓	✓	✓
To prevent & reduce pollution by waste management	✓	✓	✓	✓	✓	✓	✓	✓

To increase sustainable economic growth &food security	✓	✓	✓	✓	✓	✓	✓	✓
Conservation of biodiversity & effectively management the protected areas	✓	✓	✓	✓	✓X	✓	✓	✓
To protect the ozone layer promote energy efficiency &renewable sources of energy	✓	✓	✓	✓	✓	✓	✓	✓
To introduce land use planning & zoning	✓	✓	✓	✓	✓X	✓	✓	✓
To ensure the protection and preservation of agriculture land	✓	✓	✓	✓	✓X	✓	✓	✓
To attain environmental sustainability through poverty reduction and economic growth	✓	✓	✓	✓	✓	✓	✓	✓
To ensure the empowerment of women.	✓	✓	✓	✓	✓	✓	✓	✓
To increase the public awareness of unchecked population growth and natural resource	✓	✓	✓	✓	✓	✓	0	0
To prevent, reduce and mitigate the health impacts	✓	✓	✓	✓	✓	✓	✓	✓
To ensure DRR and preparedness for natural disasters	✓	✓	✓	✓	✓	✓	✓	✓
To build a public- private –civil society partnership for environmental management	✓	✓	✓	✓	✓	✓	✓	✓

(0 Neutral/not linked, ✓ coherent, X distortion)

4.6. Internal coherence and distortion among National Disaster Management system

After 2005 Kashmir earthquake the Government of Pakistan was stimulated towards institutionalization for DRR. The government has formulated the NDMO in 2006, now NDM Act 2010. Under this ordinance, NDM System was introduced in the state. The NDMC was established at the federal level and PDMC at provincial level. The NDMC was assigned the task of preparing and approving guidelines, policies and plans for DRR. Finally NDMA was established to follow-up the directives of the commission. The 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 NDRMF (2007 2012) was prepared by the NDMA, which serves a general guide for DRM at all levels. In March 2010, the NDMA formulated the NDR Plan for identifying specific roles and responsibilities of the main pertinent stakeholders in emergency response including SOPs. In 2012, with technical assistance of JICA, NDMP was prepared. The government approved the project which span on long 10 years (2012– 2022) with an estimated cost of 1.040 Billion US Dollars. Finally, in 2013 NDRR Policy was developed. The coherence among the NDMO 2006 /MDM act 2010, NDRMF 2007-2012, NDMP 2012-2022 and NDRR policy 2013 is a basic component for an effective and efficient DRR system and any distortion in these documents may result in the failure of the disaster management system of the country. So, it is essential to assess whether these documents are coherent or is there any distortion exist.

Table 4.6:-Coherence and Distortion between NDRR Policy (2013) & NDMP 2012-22.

NDRR Policy 2013 Objectives / *NDM Plan 2012-22 Objectives*	To create an integrated national capacity to identify/monitor vulnerability and hazard trends including potential climate change impact	Creating MHE Warning capacity while building upon existing systems and emphasizing the information and warning needs of vulnerable end users	Strengthening capacity at national and provincial levels to facilitate and provide support to the implementation of DRR PPPs in high-risk areas	Ensuring DRR is systematically integrated into recovery and reconstruction programming, "building better, safer and stronger" and informing DRR mainstreaming in general	Strengthening an integrated disaster preparedness and response capacity from the local to the national level	Promoting development planning that considers and addresses disaster risks alongside environmental and climate change concerns	Strengthening the structural and non-structural resilience of key infrastructure	Strengthening Local Level Risk Reduction capacity focusing upon communities, and supportive linkages with Union Councils, tehsils and districts
To develop resilience in society against disasters that Pakistan has experienced in the past	✓	✓	✓	✓	✓	✓	✓X	✓
To mitigate damages from recurring disasters such as floods& urban flooding etc	✓	✓	✓	✓	✓	✓	✓X	✓
To reduce disaster risks and vulnerabilities, particularly for poor and marginalized groups of people	✓	✓	✓	✓	✓	✓	✓X	✓

NDRR 2013 Interventions & Strategies / *NDMP 2012-22 Interventions & Strategies*	**Risk Knowledge** • Risk or vulnerability atlas & index at national level. • Local/ district level risk assessment • Damage & loss data-base & climate change-focused research	**Prevention & Mitigation** • Creating more resilient communities ,promoting "risk conscious" and resilient development • Integrate DRR into development planning strategies; mega-projects) • Resilient key-infrastructure and life-lines • Promoting risk awareness and knowledge through DRR education	**Preparedness** • Multi-hazard EWS ,Integrated disaster preparedness and response capacity • Disaster preparedness and response plans • Disaster response forces / volunteers, civil-military relation, financial protection and disaster risk financing mechanisms, Insurance system
Establish the institutional and legal system for disaster Management	✓	✓	✓
Prepare Disaster Management Plans at Various Levels	✓	✓	✓
Establish National Hazard and Vulnerability Assessment	✓	✓	✓
Establish Multi-Hazard Early Warning and Evacuation Systems	✓	✓	✓

Training, education and awareness promotion in relation to DM	✓	✓	✓
Strengthen awareness program on DRR at local level	✓	✓	✓
Infrastructure development for DRR	✓	✓	✓
DRR mainstreaming into Development	✓	✓	✓
National emergency response system establishment	✓	✓	✓
Post-disaster recovery capacity development	✓	✓	✓
NDRR Policy / ***Vision***			
"A Pakistan that build up its resilience to shocks from natural and manmade hazards	"To achieve sustainable social, economic and environmental development in Pakistan through reducing disaster risks and vulnerabilities, particularly those of the poor and marginalized groups of people in the country;		

with a sense of urgency, creating a solid base to address disaster risk reduction in vulnerable areas, while involving an increasingly wider range of stakeholders from government, civil society and private sector"	and to enhance country's ability to manage all disasters (floods, earthquakes, tsunamis, droughts, landslides, sediment disasters, avalanches, GLOF, cyclones with storm surges, etc.) using a comprehensive national approach"
	X
The Policy emphasis on Disaster Risk	The Plan emphasis on Disaster Management X
Approval dated	The National Disaster Management Plan was finalized in June 2012 X
Approval of the policy by the NDM	X

(✓ Coherent, X Distortion)

4.6.1. Coherence and Distortion between NDRR Policy (2013) & NDMP 2012-2022

The Policy and Plan is almost coherent with respect to objectives and intervention but distortion is exists in the vision statement, and the date of approval of both the Policy and Plan. The vision statement of NDMP is considering the triple bottom line concept (environmental, economic and social) of sustainable development but NDRR Policy is lacking triple bottom line concept of sustainable development. It is recommended to integrate the word "*sustainable*" before the word "*resilience*" in the vision of NDRR Policy 2013. Literature review reveal that NDRR Policy was approved after the approval of NDMP. Member NDMA Ahmad Kamal told me during a discussion that his team first prepared NDMP and then NDRR Policy. The NDMP has been organized into Pre-disaster including mitigation and preparedness measures, during disaster including emergency rescue, response and relief measures, post-disaster including recovery, rehabilitation and reconstruction measures. Whereas NDRR Policy although give guideline about the prevention, mitigation and preparedness measures for disasters but lacking post disaster measures.

The NDRR Policy 2013 emphasis on DRR but NDMP is about the management of the disaster. During discussion with the experts in conferences and workshops it is recommended that we cannot manage the disaster, we can reduce the risk of disaster, so emphasis need to be given to risk assessment of the disaster, not on management because risk assessment is the initial stage through which we can reduce losses, unfortunately current system in the country is about disaster management not disaster risk reduction

In NDRR Policy it is stated that transparency and accountability in all DRR interventions will be established, and resources for DRR need to be assigned on a translucent basis based upon verifiable assessments. Information on resource allocation should be in the public domain and be subjected to third party scrutiny. DRR programs and activities are ultimately accountable towards those who are vulnerable to or affected by disasters. Their input and feedback needs to be sought proactively through the establishment of communication channels, monitoring and beneficiary feedback mechanisms, there is no such type of mechanism is explained in NDMP, NDRMF.

Although NDRRP & NDMP emphasis on the strengthening community participation in DM and establishment of community based Disaster Risk Reduction but need to make a proper mechanism for the involvement of community in the disaster management. The DRR Policy

2013 and NDMP 2012-22 suggests the establishment of DM funds at both provincial and national levels. However, there is lack of direction for the establishment of such funds at the district level and to the amount of funds that would be reserved in the annual budget for National and Provincial governments to the disaster management activities at district.

Table 4.7: - Coherence and Distortion between NDRMF 2007-12 & NDMP 2012-2022.

NDMP 2012-22 Interventions / *NDRMF 2007-12 Interventions*	Establish the institutional and legal system for DM	Establish national hazard and vulnerability assessment	Promotion of training, education and awareness in relation to DM	Strengthen the awareness program on disaster risk reduction at the local level.	Establish a multi-hazard early warning system	Mainstreaming DRR into Development	Prepare DM plans at various levels Prepare disaster management plans at various levels.	Establish a national emergency response system	Capacity Development for Post Disaster Recovery	Infrastructure development for DRR
Institutional and Legal Arrangements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
National Hazard and Vulnerability Assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Training, Education and Awareness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community and Local Level Risk Reduction Programming	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Multi-hazard Early Warning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mainstreaming DRR into Development	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Establishment of Emergency Response System	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Capacity Development for Post Disaster Recovery	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Promoting DRM Planning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

NDMP Vision / *NDRMF Vision*	To achieve sustainable social, economic and environmental development in Pakistan through reducing disaster risks and vulnerabilities, particularly those of the poor and marginalized groups of people in the country; and to enhance country's ability to manage all disasters (floods, earthquakes, tsunamis, droughts, landslides, sediment disasters, avalanches, GLOF, cyclones with storm surges, etc.) using a comprehensive national approach.
To achieve sustainable social, economic and environmental development in Pakistan through reducing risks and vulnerabilities, particularly those of the poor and marginalized groups, and by effectively responding to and recovering from all types of disaster events.	✓
NDMP Mission / *NDRMF Mission*	To manage the complete spectrum of disasters by development of disaster risk reduction policies, strategies, measures and actions of all stakeholders, especially at the national level; and to enhance institutional capacities, and human and material resources for mitigation, prevention and preparedness, response and recovery in disasters.
To manage complete spectrum of disasters by adopting a disaster DRR perspective in development planning at all levels, and through enhancing institutional capacities for disaster preparedness, response and recovery.	✓

(✓ coherent, X distortion)

4.6.2. Coherence and Distortion between NDRMF 2007-12 & NDMP 2012-22

The NDRMF 2007 -2012 and NDMP 2012-2022 are completely coherent, it mean that NDMP is prepared in the direction of NDRMF, not according to NDRR Policy 2013 because few distortion is identified between NDRR Policy and NDMP (see Table No 4.6)

Table 4.8:- Coherence and Distortion between NDRR Policy 2013& NDRMF 2007-2012.

NDRRP 2013 Interventions / ***NDRF 2007-12 Intervention***	**Risk Knowledge** • Risk or vulnerability atlas and index • Local/ district level risk assessment • Damage and loss data-base and climate change-focused research	**Prevention and Mitigation** • Creating more resilient communities • Promoting "risk conscious" and resilience • Integrate DRR into development planning • promotion of DRR through land-use plans and building codes ,resilient key-infrastructure and life-lines, promoting risk awareness and knowledge through DRR education, promoting DRR through public awareness campaigns	**Preparedness** • Multi-hazard EWS, Integrated disaster preparedness and response capacity • Defining levels and geography of disaster situations. disaster response forces / volunteers, • Civil-military relations, financial protection and disaster risk financing mechanisms, insurance • Hazard- and sector-specific plans	• Establishing and managing National and Provincial DM Fund separately
Institutional and Legal Arrangements	✓	✓	✓	✓
National Hazard and Vulnerability Assessment	✓	✓	✓	✓

Training, Education and Awareness	✓	✓	✓	✓
Promoting DRM Planning	✓	✓	✓	✓
Community and Local Level Risk Reduction Programming	✓	✓	✓	✓
Multi-hazard Early Warning System	✓	✓	✓	✓
Mainstreaming DRR into Development	✓	✓	✓	✓
Emergency Response System	✓	✓	✓	X
Capacity Development for Post Disaster Recovery	✓	✓	✓	✓
NDRRP Vision / ***NDRMF Vision***	To achieve sustainable social, economic and environmental development in Pakistan through reducing risks and vulnerabilities, particularly those of the poor and marginalized groups, and by effectively responding to and recovering from all types of disaster events.			
"A Pakistan that build up its resilience to shocks from natural and manmade hazards with a sense of urgency, creating a solid base to address DRR in vulnerable areas, while involving an increasingly wider range of stakeholders from government, civil society and private sector."	X			

(✓ Coherent, X Distortion)

4.6.3. Coherence and Distortion between NDRR Policy 2013 & NDRMF 2007- 2012

Almost all interventions of the NDRR Policy and NDRMF are coherent except vision statement and one of the Intervention "Emergency and Response System" of the NDRMF i.e. Emergency and Response System. The vision statement of NDRR Policy is lacking triple bottom line concept of sustainable development but NDRMF's Vision considered the sustainable development. So it is recommended to integrate the sustainable development concept in the vision statement of NDRR Policy.

The Intervention Emergency Response System of NDRMF is committed that a NDM Fund would be recognized in order to empower the federal Government to consolidate emergency response efficiently, but the National DRR Policy recommends that a separate and dedicated budget line for DRR be created at federal, provincial and district tiers. For the sustainability of prevention, mitigation and preparedness efforts and to ensure a timely response to any disaster situation, the NDM Act 2010 calls for establishing and managing National and Provincial Disaster Management Funds separately i.e. NDM fund and PDM fund. Both NDRMF and NDM act are failed to make any direction about the establishment/allocation of DM fund at district level. So a distortion exists among NDRR Policy 2013, NDM act 2010 and NDRM framework 2007-2012.

Table 4.9:- Coherence and Distortion between NDRR Policy 2013 and NDM Act 2010.

NDRR Policy 2013 / *NDM ACT 2010*	*Interventions* **Risk Knowledge** • Risk or vulnerability atlas and index at national level local/ district level risk assessments • Damage and loss data-base and climate change-focused research **Prevention and Mitigation** • Integrate DRR into development planning • Resilient key-infrastructure and life-lines • Promoting risk awareness and knowledge through DRR education **Preparedness** • Multi-hazard EWS • Integrated disaster preparedness and response capacity • Financial protection and disaster risk financing mechanisms **Policy Objectives** 2.4.3 Strengthening an integrated disaster preparedness and response capacity from the local to the national level 2.4.8 Ensuring DRR is systematically integrated into recovery and Reconstruction programming, "building better, safer and stronger" and informing DRR mainstreaming in general
Section 2 Define various terms and one of them is the "disaster management" mean managing the complete disaster spectrum, including preparedness, response, recovery, rehabilitation and reconstruction	✓
Section 3& 6 Establishment, power and function of NDM Commission	X
Section 8&9 Establishment, power and function of NDMA	X
Section 11 Guidelines for minimum standard of relief	X

Section 10(2) &17 (2) The National Plan shall be prepared by National Authority & PDM Plan shall be prepared by PDMA	A NDMP will be developed outlining measures for disaster prevention, mitigation and preparedness as well as defining roles and responsibilities of different ministries or divisions of the Federal Government to be performed at different stages of DRM. Similarly, F/G/S/PDMAs will develop provincial DRR/DRM plans, which will be approved by the PDMC
	F/G/S/PDMAs will develop provincial DRR/DRM plans, which will be approved by the PDMC
	✓
Section 23 Federal Government to take measure; (2a) co-ordination of actions of Ministries and divisions of the Federal Government, Provincial Governments, National Authority, Provincial Authority, Governmental and NGO in relation to disaster management	X
Section 26 NIDM for Planning and promoting training research and for developing core competencies in the area of DM, documentation, and development of national level information base related to DM	NIDM will document lessons of past disasters recovery and reconstruction to guide the future course of mainstreaming DRR into post-disaster phases. NIDM will also document DRM case studies and best practices to be disseminated to all stakeholders for the promotion of DRM in Pakistan.
	✓
Section 27 Establishment of NDR Force; There shall be established a national disaster response force for the purpose of specialist response to a threatening disaster situation or disaster	There is a need to create disaster response forces / volunteer's forces at provincial and district levels while building upon everyday emergency services (medical services, fires-service etc.) and civil defense with its volunteer structure. In the national capital more specialized search and rescue units and teams that can also be deployed to local areas need to be created.
	✓
Section 29 (1): National Fund for the DM. The Federal Government may, by notification in Official Gazette, constitute a fund to be called the NDM Fund for meeting any threatening disaster situation or disaster	The National DRR Policy recommends that for the sustainability of prevention, mitigation and preparedness efforts and to ensure a timely response to any disaster situation, establishing and managing NDM fund and PDM fund.
	✓

Section 29(4): The NDM fund shell kept in one or more accounts maintained by the National Authority, in local or foreign currency, in any scheduled bank in Pakistan and shall be operated in accordance with the directions of the National Authority	X
Section 30(1)(3): Establishment of the Fund by the Provincial Government; (1) The Provincial Government shall, immediately after notification issued for constituting the Provincial Authority & the district authorities, establish for the purposes of this act fund to be called the PDM fund	✓
3) The PDM fund shell kept in one or more accounts maintained by the Provincial Authority, in local or foreign currency, in any scheduled bank in Pakistan and shall be operated in accordance with the directions of the Provincial Authority	X
Section 31: Allocation of fund by the Federal and Provincial Government; The Federal Government and Provincial Government shall, in their annual budgets, make provisions for the fund for the purposes of carrying out the activities and programmes set out in its DM plan	The National DRR Policy recommends that a separate and dedicated budget line for DRR be created at federal, provincial and district tiers
	✓

4.6.4. Coherence and distortion between NDRR Policy 2013 and NDM Act 2010

The national disaster management act 2010 gave the direction for establishing of a NDM system for Pakistan. The Act also explain about the formation of NDMC (section 3), power and function of NDMC (section 6), establishment of NDMA (section 8), power and functions of NDMA (section 9), guidelines for minimum standard of relief (section 11), establishment of PDMC (section 13), powers and functions of PDM commission (section

14), establishment of provincial disaster management authority (section 15), powers and functions of provincial authority (section 16), constitution of DDM authority (section 18), power and function of district authority (section 20). The DRRP 2013 does not give any direction about NDM system for the country. The establishment of authorities and commissions with power and function at different tiers is not directed in the NDRR Policy.

The section 2 of the act define various terms and one of them is the "disaster management" mean managing the complete disaster spectrum of disaster management. The complete spectrum of the disaster is also explained in different section of the NDRRP like the interventions risk knowledge, prevention and mitigation, preparedness, one of the Principle of NDRRP (2.3.4 pp 7) strengthening the resilience of vulnerable groups consider the needs and damage as well as vulnerability and risk assessments, and DRR programs (such as CBDRM, recovery and reconstruction or sector-specific mitigation initiatives) need to demonstrate gender-sensitivity. The policy objective (2.4.8, pp 9) also considered the recovery and reconstruction as ensuring DRR is systematically integrated into recovery and reconstruction programming, "building better, safer and stronger" and informing DRR mainstreaming in general. So the compete spectrum of the disaster management according to NDM act 2010 is focused in the NDRR Policy, and it is a coherent area between NDM act 2010 and NDRRP 2013.

Section 10 of the act is about national plan which include measures for the prevention of the disaster or the mitigation of their effects, integration of the of mitigation measures in the development plans, preparedness and capacity building to effectively response to any threatening situations or disaster, and role and responsibilities of different ministries or divisions of the Federal Government in respect of the measures. The Implementation framework of national disaster risk reduction policy (chapter 4 sub section 4.2.2 DRR / Management plans pp24) considered that NDMP will be established outlining measures for disaster prevention, mitigation and preparedness as well as defining roles and responsibilities of different ministries or divisions of the Federal Government to be performed at different stages of disaster risk management. So the section 10 of the act and subsection 4.2.2 DRR /management plan Chapter 4 of the NDRR Policy is coherent.

Section 17 of the act is about Provincial DMP which shall include the vulnerability of different parts of the Province to different forms of disasters, the measures to be adopted for prevention and mitigation of disasters, the manner in which the mitigation measures shall be

integrated with the development plans and projects, the capacity building and preparedness measures to be taken, the role and responsibilities of each department of the government of the province in relation to the measures specified, the role and responsibilities of different departments of the provincial government in responding to any threatening disaster situation or disaster, and Provincial Plan shall be reviewed and updated annually. Implementation framework of national disaster risk reduction policy (subsection 4.2.2 Disaster risk reduction / management plans pp24) considered that F/G/S/PDMAs will develop provincial DRR/DRM plans. There is a lacking of direction in DRR Policy with respect to the measures and responsibilities for Provincial Disaster Management Plan as considered in the NDM Act 2010 (section 17).

Section 23 of the Act explain that the Federal Government take measure for the co-ordination of actions of ministries and divisions of the Federal Government, Provincial Governments, National Authority, Provincial Authority, governmental and non-governmental organizations in relation to disaster management, co-ordination with the united nation's agencies, international organizations and government of foreign countries. No such type of measures are taken/directed in NDRR Policy hence a distortion is present with respect to the sub section (2d) and (2e) of the section 23 of NDM Act 2010.

The section 26 of Act is about National Institute of Disaster Management (NIDM) for planning and promoting training research for developing core competencies in the area of disaster management, documentation and development of national level information base related to disaster management policies, prevention mechanism and mitigation. The section 26 also deal with:

a) Develop training modules, undertake research and documentation in disaster management and organize training programmes.
b) Formulate and implement a comprehensive human resource development plan covering all aspect of the disaster management.
c) Provide assistance in national policy formation.
d) Provide require assistance to the training and research programmes for stakeholders including government's functionaries etc.

The establishment of the NIDM with roles and responsibilities as discussed in the section 26 of the act are also considered in the NDRR Policy.

There shall be established a national disaster response force for the purpose of specialist response to a threatening disaster situation or disaster (section 27). The NDRR Policy directed that communities are the first to respond to disasters and the importance of training the community in preparedness and life-saving measures is well recognized. Their immediate response needs to be backed up by more specialized and better-resourced response forces. There is a need to create such forces at provincial and district levels while building upon everyday emergency services and civil defense with its volunteer structure. At provincial level and in major cities including the national capital more specialized search and rescue units and hazmat teams that can also be deployed to local areas need to be created. Both NDM act and NDRR Policy recommended the establishment of national disaster response force while NDRR Policy in addition to the establishment of national disaster response force also consider the creation of disaster response forces at the provincial and district level. Hence a distortion is present between NDM Act and NDRR Policy with respect to the creation of disaster response force at provincial and district level.

Under section 29 of the act a NDM fund shall be established. Some of the areas under this section are coherent i.e. subsection 1, 2 and 3 and others like subsection 4 is distorted to the NDRRP. The coherent areas are, the act states that the Federal Government may by notification in official gazette constitute a fund to be called the NDM fund for meeting any threatening disaster situation or disaster. The NDM fund shall be financed from grant made by the Federal Government; loans, aids, donations from the nation or international agencies and donation received from any other source.

The subsection 4 of the section 29 is not considered in NDRRP is known as distortion between NDRR Policy & NDM act i.e. The NDM fund shell kept in one or more accounts maintained by the National Authority, in local or foreign currency, in any scheduled bank in Pakistan and shall be operated in accordance with the directions of the National Authority. The NDM fund shall be administered by the National Authority toward meeting the expenses for emergency preparedness, response mitigation, relief and reconstruction.

Similarly, the section 30 (1) (2) is about the "establishment of fund by Provincial Government" are coherent to NDRR Policy. While the subsection (3) of section 30 is about the account of provincial disaster management fund is not consider in NDRRP. Hence subsection (3) of section 30 of act is identified as distortion area to the NDRR Policy. Allocation of fund by the Federal and Provincial Government (section 31) is coherent to the

NDRR policy. The Section 31 of the act stated that the Federal Government and Provincial Government shall in their annual budgets, make provisions of the fund for the purposes of carrying out the activities and programmes set out in its DM Plan. The NDRR Policy also explain that the Federal and Provincial Governments shall make provisions for funds in their annual budgets for carrying out activities and programs set out in DM plans as required by N/F/G/S/P/DMAs.

Table 4.10:- Coherence and Distortion between NDM Act 2010 and NDMP 2012-2022.

NDMP 2012-2022	The executive summary of the NDMP is begin with a brief introduction of NDM system in Pakistan. The Chapter 3 is about institutional systems for DM in Pakistan. It explains the evolution of DM systems in Pakistan, the roles, powers and functions of the disaster management organizations like NDMC, NDMA, PDMC, PDMA, DDMA, National Plan, Provincial Plan, District Plan are considered as instructured by the NDM Act 2010.
Section 3, 4, 6, 8, 9, 10, 13, 14, 15, 16, 17, 18, 20 and 21: An Act to provide the establishment of NDM system in Pakistan. Establishment of NDMC, meetings of the National Commission, power and function of National Commission. Establishment of NDMA, power and functions of NDMA, National Plan. Establishing of PDMC, powers and functions of PDMC. Establishment of PDMA, powers and functions of Provincial Authority, Provincial Plan. Establishment of DDM Authority, power and function of and function of District Authority, District Plan.	✓
Section 11: Guidelines for minimum standards of relief;	Guidelines for minimum standards of relief are not well considered in NDMP 2012-2022

Subject to the direction of National Commission, the National Authority shall lay down guidelines for the minimum standards of relief to be provided to persons affected by disaster which shall include: a) The minimum requirements to be provided in the relief camps in relation to shelter, food, drinking water, medical cover and sanitation; b) On the special provision to be made for vulnerable groups.	X
	The Plan has been organized in three stages (i) pre-disaster including mitigation and preparedness measures, (ii) during disaster including emergency response and relief measures, and (iii) after-disaster including rehabilitation and reconstruction measures
Section 2: Defines various terms and one of them is the "disaster management" mean managing the complete disaster spectrum, including preparedness, response, recovery and rehabilitation, reconstruction	✓
Section 23: Federal Government to take measure; co-ordination of actions of ministries and divisions of the Federal Government, Provincial Governments, National Authority, Provincial Authority, Governmental and Non-Governmental	Section 23 is distorted because no clear cut co-ordination of actions of ministries and divisions of the Federal Government is considered in NDMP
	X
Section 26: NIDM for planning and promoting training research and for developing core competencies in the area of disaster management, documentation, and development of national level information base related to disaster management policies, prevention mechanism and mitigation	Intervention 5: Promotion of training, education and awareness in relation to disaster management strategies : 1) Develop NIDM to promote human resource development in the field of DM 2) Enhance the capacity of government agencies in charge of DM 3) Promote mainstreaming DRR through capacity enhancement of

	governmental officers. 4) Develop the capacity of communities to cope with disasters. 5) Raise people's awareness of disaster management
	✓
Section 30: Establishment of the Fund by the Provincial Government 1) The Provincial Government shall, immediately after notification issued for constituting the Provincial Authority and the district authorities, establish for the purposes of this act fund to be called the PDM Fund	Establishment of Funds by Provincial/State Governments 1) The Provincial/State Governments shall, immediately after notifications issued for constituting the Provincial/State Authority and the District Authorities, establish the fund to be called the P/State DM Fund.
	X ✓

(✓ Coherent, X Distortion)

4.6.5. Coherence and Distortion between NDM Act 2010 and NDMP 2012-2022

Almost all the sections of the NDM act 2010 and NDMP 2012-2022 are coherent except section 11 (guidelines for minimum standards of relief), section 23 (Federal Government to take measure for co-ordination of actions of ministries etc.), and section 30 (consider only establishment of the fund by the Provincial Government while NDMP consider the establishment of Funds by Provincial/State Governments) It is recommended to consider the section 11, and 23 of NDM act in the NDMP and should incorporate the provision of fund for the state government in NDM act.

4.7. Structure of DRM and local government system in Pakistan

The DRR or DRM is a cross-cutting planning area and needs well-timed preparedness and response. In this regard government of Pakistan established NDMA under NDMO 2006 at national level in 2007. The NDMA serve a focal coordinating body and assist the implementation of mitigation, preparedness and recovery plans and programs. It is NDMA which directly link with the stakeholders. NDMA needs to attain the capacity to act as the main facilitator of DRR in the country and provide overall support and technical direction to

line agencies, FATA/GB/State/PDMAs and DDMAs. In Pakistan, the NDM act 2010 insists on the devolution of DRR approaches and pursue involvement of key stakeholders at district, tehsil, union council and community level in decision making and implementation of disaster planning activities (Fig. 4.1). The effective involvement of local government is not reported due to lack of financial, technical and human capacity in understanding disasters coping mechanism. Whenever a disaster hits an area, communities were the quick and effective respondents in reducing the impacts of disasters. It is therefore recommended that local community need to be involved in local policy making, mitigation, preparedness and recovery process. However, at local level the productive operationalization of DRR planning needs to incorporate with due weightage to community decisions in DRR process at the local level.

In the local bodies system, power is decentralized to the district managements, which is the 3rd tier of government system after provincial & federal set-up. Each district administration is headed by Zella Nazem/ District Nazem and executive head of district administration with a key duty of executing government policies, plans, strategies and developing productive initiatives. Until 2010 each district administration was commanded by a district coordination officer. Tehsil/town council is the 4th tier and tehsil/town Nazem is the executive head. Similarly, union council is the smallest unit and 5th tier of local government system and headed by union council Nazem/Chairman (Fig.4.1). Nazim/ Chairmen of all the union councils in a district form the district assemble.

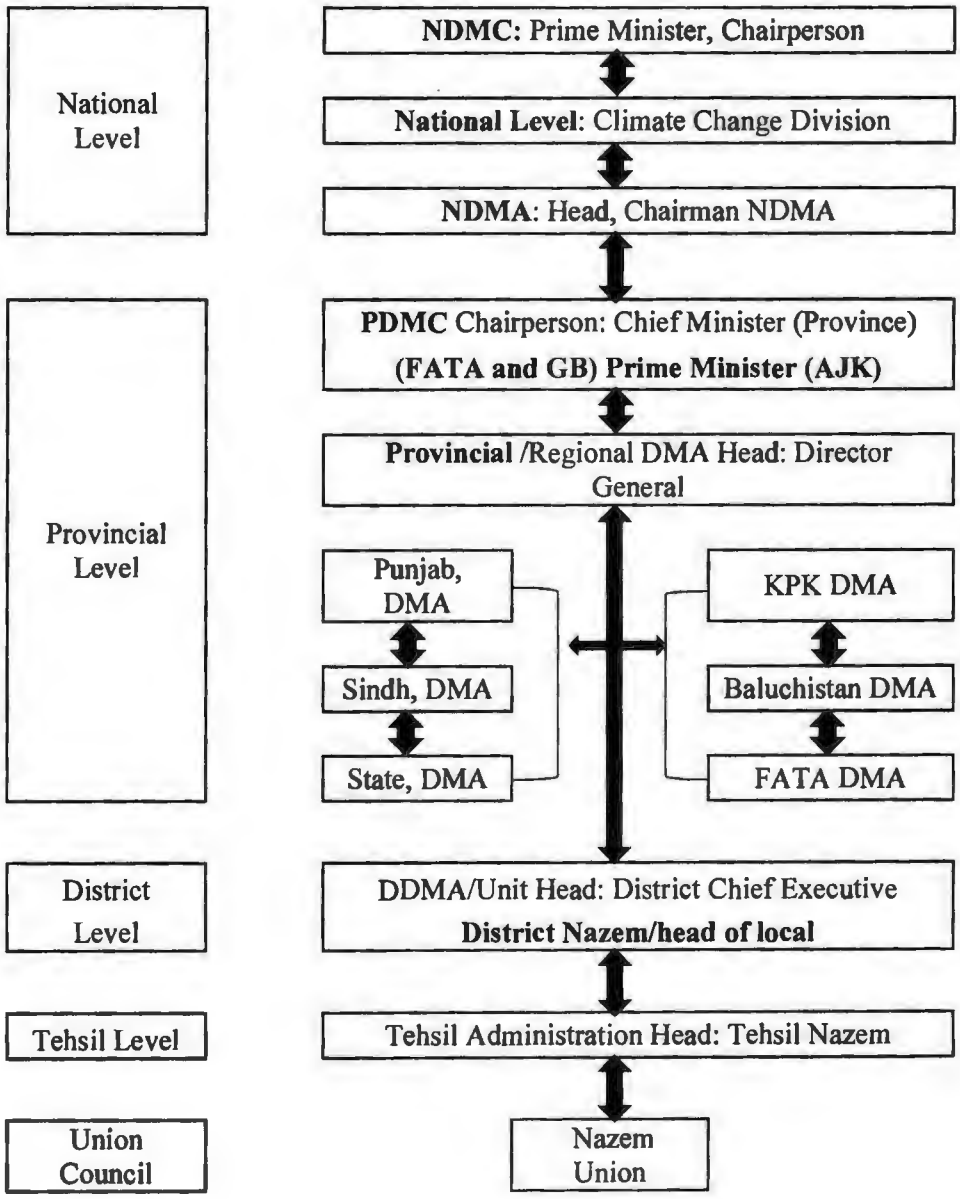


Fig. 4.1. Structure of DRM system in Pakistan.

4.7.1. Gaps and deficiencies in disaster management system and Recommendation to remove the identified gaps and deficiencies

- **Need to make resilient DM organizations at all level of governance:**

The government of Pakistan has established NDMA, Regional DMAs (F/G/S/PDMAs) and DDMAs at national, provincial/regional and district levels, respectively. However, the DM institutions at the national level has not been established with clear roles and responsibilities

with the federal ministries in terms of financial and technical coordination. Moreover linkages between NDMA and F/G/S/PDMAs are quite weak and there is no clear coordination mechanism between NDMA, PDMAs and DDMAs. DDMAs have lack of dedicated staff to cope with any disaster. In most of the provinces the DDMAs are not established. The NDRMF 2007-2012 was prepared in 2007, Pakistan has received heavy damages from flood 2010, 2011, 2012, 2013 and 2015. The coordination mechanism of DM among local, provincial and national levels, needs to be strengthened mainly in terms of policy integrations, technical and financial resource mobilization. There is also need of building and strengthening disaster management (DM) institutions and clear cut policy for planning, finances and capacity building at national, regional and local level.

- **Improve disaster management system in the pre, during and post-disaster periods:**

Since the beginning of Pakistan, emergency response has remained a major activity of DM system. Because of widespread skilled personal, throughout the role of Pakistan army has remained of enormous significance in DM, especially in emergency response and early recovery phases. Though in pre disaster phase priority attentions need to be given to building disaster resilience related to human resources via hazard prevention, mitigation and preparedness in the project formulation period, which is lacking in the country DM system. Similarly, during post-disaster phase there are no proper institutional systems or funding sources for disaster restoration, early recovery and reconstruction. Therefore, the district, Provincial and Federal Governments need to prepare DRR plans covering actions and measures to be taken in all stages of pre, during and post-disaster situations.

- **Mechanism for assessment and monitoring of disaster risks:**

Assessment and monitoring of risk and hazard is essential for DRR and building resilience. In the country, there is lack of methodological understanding and information about hazard identification, assessment of risk and it reduction and management, relation between occupations and disaster preparedness. Risk and vulnerability assessments of hazards are prepared by different agencies like FFC, PMD, NDMA and few disaster related provincial department, but they are in segments and representing only few areas. Similarly, there is lack of effective harmonization and sometime overlapping powers and responsibilities like earthquake reconstruction and rehabilitation authority is still involved in the rehabilitation and reconstruction of earthquake 2005 in the presence of NDMA, PDMAs and DDMAs. There is an urgent need of multi-hazard risk assessment, early warning, effective emergency

response and recovery system to save human lives, property and sources of livelihoods earnings.

- **Mechanism for mainstreaming DRR into development planning:**

The DRM, DRR, development planning and eco-friendly management function in separation and integrated planning methodology between these sections is almost missing in most of the National Policies, like the National Environmental Policy 2005 objective is the efficient management of environmental resources but about disaster risk management it just stated that the government may develop and implement a natural NDM strategy, establish DM institutions at the Federal and Provincial levels. The National Development Plan should include a DRR method as a part of the nation's sustainable development policies. There is lack of durable, broad / coherent planning systems to address disaster issues with a national goal. NDMA determined ten ministries and started assessment of development projects with reference to the DRR concept. However, there is a lack of a central consultant/authority to integrate DM into development planning. A dedicated technical staff and financial resources for DRM is also lacking at the federal and provincial/regional level for overall development design/organization.

- **The DRR through building resilience at local, districts, provincial and national levels:**

In Pakistan DRR through building resilience at community, district, provincial and federal levels remained all time key issue in DRR process. There is dearth of awareness and expertise of bureaucrats in pertinent government organizations and civil society in DRR. Structural mitigation measures has given importance than non-structural measures at all levels of the governance as result weakens the significance of non-structural measures such as early warning system, first aid, training, search and rescue, awareness and recovery. Disaster related sectors and establishments remained under-resourced and unexperienced and are not given essential training and learning, which is necessary for capacity building and increasing disaster resilience. Likewise, community is the heart of DRR cycle also needs special attention in building disaster resilience. Enhancing the knowledge and building resilience capacities of individuals, community, and technical staff would definitely help in risk reduction at all levels.

- **Urban risk reduction:**

In Pakistan almost all the cities have been facing the impacts of floods and other disasters in one way or the other. Some cities have been threatened extremely while others are at the margin. The big 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 centers. In addition to this, heavy rainstorm, drought, storm flows, urban flooding are some of climate change consequence. Municipalities 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 an organized approach. It is projected 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. 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 inhabitants. Construction of high rise buildings and ignoring the building bye-laws may further increase the vulnerability and can exploit 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.

- **Establishment of early warning system at flood prone areas:**

The timely delivery of information about the hazards, enable citizen/community/ authority to take measures to cope and effectively minimize the impacts of disaster like flood. 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 systems throughout the country and develop an efficient and effective relationship with the national and regional forecasting agencies in sharing forecasting information and timely provision of accurate data to the multi-hazard warning center 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 centered is of supreme importance.

The early warning dissemination 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 proper training and capacity building of community to respond effectively to forthcoming hazard. In Pakistan, Flood forecasting and Warning Center, Tropical Cyclone Warning Centre, National Seismic & Tsunami Early Warning Centre, National Drought Monitoring Center etc. are some of the early warning systems established but need further strengthening.

- **Need to establish and strengthen an emergency response system:**

The establishment of emergency response system at community, districts, provincial and national level can help in minimizing the impacts of disasters/floods. The NDM Act 2010 has specifically highlighted the significance of emergency response system. The NDMA should develop disaster response plan at all levels to effectively respond to emergency situation. In NDM Act 2010 has also stressed on the formation of rapid response force at all levels. Insufficient response capacity and unawareness of disaster to related implementing agencies have brought into notice the dire need of a specialized response system. Such a mechanism is particularly meaningful for carrying out search and 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 centers, rapid response force, a civil defence, and search and rescue teams at district and community level instead of National level.

- **Other challenges in disaster/flood risk reduction:**

In the past two decades, Pakistan has faced numerous disasters, which cost billions of US dollars. This has put marvelous pressure on the country economy and almost paralyzed the economic growth rate. It is because of these frequent incidences of emergency situation of different disasters like frequent floods the MDGs were hardly achieved. The country has DRR policies, programmes and plans but lack of coherence and financial ability are major problems in effective implementation. The frequent occurrences of disasters/floods 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 unexpected events like floods and earthquake etc. These institutions are new and mostly face lack of coherence and capacity of handling emergency situation. In case of provincial and local level authorities i.e. at district and union council level absence of technical staffs is one of the major deficiencies found in planning and implementing DRR policies and development plans in right spirit. Disaster and climate change education is lacking at all levels of the governance. 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 DRR planning is a major challenge in the country for integrated disaster management system. In the country, universities, research organizations and scientific community are consistently working on various aspects of DR assessment and management but there is lack of coordination between the disaster management institutions/ authorities and academia which may result in overlapping research, wastages of time and resources. There should be strong linkages, sharing technical advanced knowledge and best practices in the public interest.

The present NDM system faces duplication, poor harmonization and communication. The NDRM framework does not form formal relations with related ministries, and departments etc. The legitimate planning fails to recognize and explain association between main disasters related organizations. The repetition of jobs is another fundamental issue which the law should addressed strongly e.g. prior to the formation of national disaster management authority, Federal Emergency Relief Cell was the principal body of DM, yet it is still working with no different role, same is with ERRA. A list of organizations responding to disaster is identified in NDRRP, NDMP, NDRMF agencies. But the current NDM act fails to establish links for a coordinated reaction strategy. There is no adequate knowledge of risk factors and risk reduction strategy at all level. Ability to conduct vulnerability scrutiny is very low due to dispersed data at all level. The concept and approached toward DRR's integration into development is at its initial stage. The lack of awareness, research on climatic changes, communication and political will and week early warning system has exposed the country to a number of disasters like floods, drought and earthquake etc.

4.8. External coherence and distortion of NDRR Policy 2013 objectives/ actions with relevant national policies and national vision

According to the Strategic Environmental Assessment directive the environmental statement must deliver information on the PPPs link with further related PPs .The National Policies objectives were tested in contrast to the NDRRP 2013 objectives to get a comprehensive viewpoint of the consistency and incompatibility between the national Policies & NDRR Policy i.e. external coherence and distortion of NDRR Policy 2013.

Table 4.11:- External Coherence and Distortion of NDRR Policy 2013 Objectives/ actions with relevant national policies' objectives.

NDRRP 2013 Objectives / ***Relevant National Policies Objectives/ actions***	Creating an integrated national capacity to identify & monitor vulnerability & hazard trends including climate change	Creating MHE Warning capacity, emphasizing the information & warning needs of vulnerable end-users	Strengthening an integrated disaster preparedness & response capacity from the local to the national level	Promoting development planning that considers and addresses DR alongside environmental and climate change concerns	Strengthening the structural & non-structural resilience of key infrastructure and lifelines in Pakistan	Strengthening capacity at national/provincial levels to facilitate & provide support to the implementation of DRR PPPs across sectors	Strengthening local level RR capacity focusing upon communities and supportive linkages with union councils, tehsils and districts	Ensuring DRR is systematically integrated into recovery and reconstruction programming
1. National Climate Change Policy 2013: To minimize the risks arising from the expected extreme weather events such as floods & droughts etc.	✓	✓	✓	✓	✓	✓	✓	✓
To promote mitigation in a cost-effective means	✓	0	✓	✓	✓	✓	✓	✓

To strengthen inter-ministerial decision making and coordination mechanisms on climate change	✓	0	✓	✓	✓	✓	✓	✓
To promote conservation of the natural resources	✓	0	✓	✓	✓	✓	✓	✓
To ensure water security of state in the challenges of climate change	✓	✓	✓	✓	✓	✓	✓	✓
2. National Power Policy 2013 To generate inexpensive and affordable electricity from coal	0	0	X	X	X	0	0	0
Create a culture of energy conservation	✓	0	✓	✓	✓	✓	✓	✓
3. National Education Policy 2009 To promote coherence through sensible use of educational procedure	✓	✓	✓	✓	✓	✓	✓	✓
To assist nation to accomplish its obligations to achieve Goal MDGs	✓	✓	✓	✓	✓	✓	✓	✓
Policy Actions: Awareness shall be raised amongst the students concerning emergency conditions & disasters	✓	✓	✓	✓	✓	✓	✓	✓
Curriculum shall include emergencies, natural disasters established on modern global best practices	✓	✓	✓	✓	✓	✓	✓	✓

NDMA shall deliver guiding principle and code of conduct to construct schools allowing to the intercontinental standards	✓	0	✓	✓	✓	✓	✓	✓
Environmental teaching shall be a central part of education	✓	✓	✓	✓	✓	✓	✓	✓
4. National Water Policy draft 2012 Restoring and maintaining the health of the environment	✓	✓	✓	✓	✓	✓	✓	✓
To mitigate floods and minimize flood damages	✓	✓	✓	✓	✓	✓	✓	✓
To Improve availability, reliability & quality of fresh water resources to meet environmental needs	✓	✓	✓	✓	✓	✓	✓	✓
To Promote integrated water resources management	✓	✓	✓	✓	✓	✓	✓	✓
5. National Forest Policy 2009 To encourage sustainable natural resource based incomes	✓	✓	✓	✓	✓	✓	✓	✓
Enlargement of alternative renewable energy resources	✓	0	✓	✓	✓	✓	✓	✓
To enhance carbon sequestration ability	✓	0	✓	✓	✓	✓	✓	✓

To involve local people in sustainable NRM and generating awareness	✓	0	✓	✓	✓	✓	✓	✓
To regulate mining and quarrying from environmental point of view	✓	0	✓	✓	✓	✓	✓	✓
To boost growth ratio of native species to encourage resilience to pollution and climate change affects.	0	0	✓	✓	0	✓	✓	✓
6. National Rangeland Policy 2010 (draft) To maintain ecological functions & mitigate the climate change impacts	✓	0	✓	✓	✓	✓	✓	✓
To enhance the environmental functions/ services of the rangeland	✓	0	✓	✓	✓	✓	✓	✓
To avoid land use change except ecologically suitable	✓	✓	✓	✓	✓X	✓	✓	✓
7. National Wetlands Policy 2009 (draft): To promote wetland conservation sustainable use of wetland resources	✓	✓	✓	✓	✓X	✓	✓	✓
To address threats like unplanned land use change, climate change & natural disasters induced degradation of wetlands	✓	✓	✓	✓	✓X	✓	✓	✓

To promote harmonization and teamwork between agencies and sectors on wetland issues	✓	✓	✓	✓	✓	✓	✓	✓
8. National Environmental Policy 2005: To restore, conserve and protect the environment	✓	0	✓	✓	✓	✓	✓	✓
Environmental integration in policy making and planning processes	✓	✓	✓	✓	✓	✓	✓	✓
To increase forest cover for financial growth and foodstuff security	✓	✓	✓	✓	✓	✓	✓	✓
To indorse the use of ozone friendly technologies	✓	✓	✓	✓	✓	✓	✓	✓
To ensure DRR & adequate preparedness for natural disasters	✓	✓	✓	✓	✓	✓	✓	✓
9. National Housing Policy 2001: To create affordability through reduction in property tax, registration, simplification of procedure	0	0	0	0	0	0	0	0
To increase the housing situations of the low-income residents, through reduced housing standards	X	X	X	X	X	X	X	X
To accomplish goals like employ, fiscal growth, elevation of market oriented economy	✓	✓	✓	✓	✓	✓	✓	✓

Policy Measures: To ensure planning and design of infrastructure in harmony with the "National Building Code of Pakistan."	✓	✓	✓	✓	✓	✓	✓	✓
To provide direction and guidance for cost effective, resilient and environment friendly construction	✓	✓	✓	✓	✓X	✓	✓	✓
To ensure that any certification are only given after environmental assessment sufficiency of the planned infrastructure	✓	✓	✓	✓	✓	✓	✓	✓
10. Agriculture and Food Security Policy 2013(Draft) To ensuring sustainability by conserving/manage natural resources base and adopting environmentally friendly activities	✓	✓	✓	✓	✓	✓	✓	✓
To build resilience of the agriculture sector for climate change projections	✓	✓	✓	✓	✓	✓	✓	✓
Adapt to climate change and be resilient enough to quickly recover from shocks & emergency	✓	✓	✓	✓	✓	✓	✓	✓
To focusing agriculture subsidies to socio-economic groups	0	0	X	X	0	0	0	0

11. National Sustainable Development Strategy 2012 (draft): To ensure mainstreaming of climate change into national decision making	✓	✓	✓	✓	✓	✓	✓	✓
To promote the integration of three dimensions (fiscal, societal and environmental)of sustainable development in decision making	✓	✓	✓	✓	✓	✓	✓	✓
To improve environmental governance at all levels, encouraged SEA & cost-benefit analysis of all development projects	✓	0	✓	✓	✓	✓	✓	✓
To promote economic growth without overexploitation of natural resources	✓		✓	✓	✓	✓	✓	✓
12. Pakistan Vision 2025: To promote sustainability, conservation and protection of natural resources and addressing climate change	✓	✓	✓	✓	✓	✓	✓	✓
To build/strengthen climate change adaptation capacity amongst vulnerable populations	✓	✓	✓	✓	✓	✓	✓	✓

To categorical recognition of the relevant risks execution of well-defined mitigation & adaptation approaches	✓	✓	✓	✓	✓	✓	✓	✓
To approve developmental projects in terms of environment efficient technology	✓	0	✓	✓	✓	✓	✓	✓
To operationalize the enormous potential of Thar coal with 6600 MW capacity	X	X	X	X	X	X	X	X

(0 *Neutral/not linked*, ✓ *Coherent* and X *Distortion*)

4.8.1. Climate change Policy 2012

The National Climate Change Policy sanctioned by the cabinet in Sep 2012, delivers an outline for handling the threats of climate change. It aims to promote climate resilient approach to development and ensure that the actions to contest climate change are integrated in the economic and social development plans. The coping measures recommended cover wide ranging sectors from water, agriculture, livestock and forestry to human health, disaster preparedness, transport and energy. Envisaged funding choices for projects in the climate change policy comprise obtaining from the international green climate fund that has a target to raise $100 billion by 2020 and a proposed National Climate Change Fund.

Pakistan is vulnerable to wide range of hazards rooting from weather, hydrological, geophysical and human induced disasters. In the near past, there has been an increase in the rate of recurrence and concentration of hydro-meteorological disasters including floods, life-threatening temperatures, torrential and prolonged rainfall, drought and storms. In this regard, 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. Hyogo Framework for Action 2005–2015, emphasizes the role of knowledge and education, stress on formal and non-formal education and awareness-raising as a key component of DRR policy. Keeping in view this changing scenario, the Government of

Pakistan has developed the national climate change policy 2012, which clearly pinpointed the need for disaster and climate change education and development of curricula with particular emphasis on disaster and climate change, and its introduction in the country education system. The policy also highlighted to guarantee addition of climate change learning and training as an essential subject in the forest related departments. In order to increase the social capacity in the field of disaster and climate change education, both NDRR Policy and NCC Policy are coherent in respect to the measure i.e. for referring young researchers and scholars to reputed institutes out of the country for advanced studies. In addition to this, it is pertinent to encourage and strengthen the existing disaster and climate change science, in the related institutions and universities through technical and financial support. The NDMP 2012–2022 and NDRR Policy 2013 also highlighted that research need to be carried out on the challenges of disasters and climate change issues. These measures if taken care of in other development policy, plans and programs will definitely lead to mitigate and minimize the extent of damages in anticipation to the changing climate scenario.

The climate change policy focus on the climate change adaptation and mitigation through energy conservation, improve energy efficiency, and promotion of renewable energy production etc. to support international efforts for GHGs emissions reduction but NRRR Policy lack measures/actions to reduce GHGs emissions. There is a dire need to integrate the measures /actions related to climate change mitigation & adaptation into NDRR Policy because the country faces frequent disaster like flood and climate change scenarios.

4.8.2. National Education Policy 2009

The policy focuses on various aspects including strengthening education curricula, training, infrastructure safety and preventive strategies. The policy further states that an emergency related material including manual, guiding principle, least standard, and investigation related to any disaster shall be sustained at all stages. The HFA highlight the role of knowledge, education and highlights the formal and non-formal education and awareness-raising as an important component of DRR strategy should be integrated in national education policy.

4.8.3. National Power Policy 2013

The Government has developed a national power policy to support the present and forthcoming energy requirements of the state. The Policy vision is "to develop the most efficient and consumer centric power generation, transmission and distribution system that

meets the needs of its population and boosts its economy in a sustainable and affordable manner". The Policy is committed to using coal (Thar coal) and hydel, that is, the construction of medium and long-term hydel capability for energy production. Six projects to be accomplished by Feb 2015. The smaller hydropower schemes are estimated to be finalized by Dec 2017 and will add 247MW. An extra 969MW is expected from the Neelum-Jhelum HPP project by Nov 2016. A number of hydel projects are projected to come working in 2017 which have the potential to add 1,910 MW. The government also claims to reveal a coal corridor with an ability to generate 6000 – 7000 MW in the near future.

The power generation and irrigation requirements aim to fill the reservoir to its full capacity by the end of the monsoon in August each year. In terms of releases, optimum power generation requires maintaining the high water level during the entire period of operation, while irrigation supplies require maximum level in August and minimum water level in June next year, thereby enabling full utilization of the stored water for agricultural purposes. If some degree of priority is given to flood, space would need to be reserved at a certain level below the full capacity. Another option would be to permit flexibility in operational regulations relying upon instant information that is possible from the more efficient communication system; by storing flood peaks in the event when the reservoirs are full at the end of August and a flood is experienced (say) in early September. Under the current regulations no flood mitigation is considered. This aspect needs to be given serious consideration in NDRR policy, national power policy, National Climate Change policy, agriculture and food security policy and national water policy.

4.8.4. National Water Policy draft 2012

Draft National Water Policy 2012 reports all water related problems in the state, including the disaster like floods. It deals a background whereby flood controlling in the country can be enhanced through necessary institutional and legal reforms. The Water Policy draft is a milestone manuscript and can go a long way in refining flood management in Pakistan. The Policy recognizes gaps in the current policy structure and mentions streamlining various pieces of legislation to lessen overlap. It put forward to generate a federal water commission integrating FFC, part of design section of water and power development authority and office of the chief engineering advisor. It also mentions replacement of numerous water associated provincial acts with a humble cohesive law that assists clearer understanding and later application of the law. The Policy based on up-to-date lines and highlights all the compulsory

non-structural and structural measures for flood risk reduction. The policy stresses on participation of stakeholders in the flood management process and promoting flood risk reduction awareness in the community. The Policy also emphasis on strengthening of information management and research in the area of flood management.

The Water Policy draft imitating a clear and coherent institutional agenda of policy, gives due consideration to climate change should be implemented at the initial stage. The resulting policy may combine manifold elements as well as technical improvements and social and environmental concerns to water management. Draft National Water Policy provides the following flood management strategy.

Issues	Policy	Strategy
➢ Increase in flood peaks due to sedimentation of reservoirs. ➢ Problem of inundation and land erosion. ➢ Dearth of appropriate repairs of flood protection works. ➢ Inadequate management of floods and flood forecasting and warning system. ➢ Flood Plain encroachments.	➢ Greater emphasis on proper maintenance of the existing infrastructure. ➢ To reduce flood peaks, additional multi-purpose storages (including flood control) be constructed. ➢ Promote flood retardation structures. ➢ Review the design and maintenance standards of existing flood protection structures, and make upgrade where essential to carry them to the level of functional capability and reliability. ➢ Encourage flood adaptability in riverine belts. ➢ Improve flood forecasting and warning system. ➢ Towards better flood management, review and update flood manual and national flood protection plan, flood routing study be undertaken. ➢ Improvement of design and standards of flood protection interventions ➢ Establish and promote flood zoning and enforce proper land use by shunning growth of vulnerable enlargements in flood-prone areas. ➢ Develop River Laws to protect waterways and flood plains from encroachment, misuse etc. ➢ Enhance reservoir functioning rules to ensure efficient and sensible decisions to control floods, specific when reservoirs are near to maximum conservation level.	➢ Continue with the construction of additional flood protection facilities. ➢ Creation of public awareness education on flood related intervention. ➢ Support a special study to explore various methodologies such as flushing and/or removal of accumulated sediment from river beds, particularly in the lower reaches of Indus, to check the river levels from rising further. ➢ Encourage and provision research for better consideration of the monsoon systems. ➢ Strengthen PMD through modern weather forecasting equipment.

4.8.5. National Forest Policy 2009 (draft)

The Policy have a structure for the sustainable management of forests and related natural capitals. It aims at development, conservation, restoration and sustainable management of woodlands and associated natural assets to ensure sustainability of ecosystem functions, services for present and forthcoming generations of the country. Succeeding measures and actions are considered in National Forest Policy which directly and indirectly not only reduce the flood risk but also help to protect human health, and promote healthy lifestyles, protect and increase the role and value of the soil reserve, conserve and enhance species, habitats and biodiversity, and habitat connectivity, prevent deterioration, protect and enhance the aquatic environment, donation to climate change in the field of adaptation and mitigation, defend and increase the character, variety and abilities of cultural heritage land scape and the historic environment through:

- Critical conservation and development of watersheds in highlands, and control of encroachments.
- Sustainable Management in reserved, protected, and private forests tree planting, soil stabilization and watershed management.
- Afforestation campaigns under corporate social responsibility to sequester GHGs emission from the industrial processes.
- To promote controlled grazing, stand feeding and breed enhancement.
- To deal with the new tasks like climate change, deforestation and forest degradation.
- The maintenance and restoration of the:
    - highland forests, protected areas, mangrove forests for maintenance of their environmental and biodiversity functions;
    - conservation and sustainable management of Juniper forests;
    - conservation and restoration of sub-alpine and high-altitude rangelands and meadows;
    - restoration and management of semi / arid rangelands;
    - sustainable land management to combat land degradation and desertification.
- To cheered incentives for farmers to growing trees on farm plots.
- To promote linear plantations along canals, roads and railway tracks.

- At least 10 % of command area of new canals shall be allocated for raising plantations. Road side plantations shall become an integral component of all the projects of new highways and motorways.
- District administrations will gave due focus on urban forestry by their development programmes.
- Native tree species will be encouraged, and governments will ensure that alien invasive species are not introduced and propagated.

Almost all objectives of the NDRR Policy and national forest policy are coherent and play an significant role in flood risk reduction except the objective of NDRR Policy related to the structural measure for flood risk reduction can negatively affect the objective of national forest policy, because construction can cause habitat fragmentation, degradation of aquatic environment and increase soil erosion etc. So it is recommended that proper mitigation measure and alternative should be considered in case of any construction like dram or embankment or flood controlling structure.

4.8.6. National Rangeland Policy 2010 (draft)

Rangelands include; natural grass lands, savannas, deserts, tundra, alpine plants communities, costal marshes and wet meadows etc. Over 52.2 million hectares land is classified as rangelands. Out of this 18.5 million ha is considered to be productive and can be used for grazing. The Vision statement of National Rangeland Policy is that "Rangelands of Pakistan are managed to potential productivity level, contributing significantly to improve living conditions of the dependent communities towards enhancement of livestock share in national economy besides maintaining ecological functions and mitigating impacts of climate change and loss of biodiversity". The overall goal of the national rangelands policy is to rehabilitate the degraded rangelands and pastures close to their potential for increased productivity enhance their environmental and regulatory functions and services, increase and conserve rangeland biodiversity besides mitigating the negative impacts of global climate change through collaborative and holistic rangeland resources to contribute to the livelihood improvement of the rangelands dependent communities as well as to the national economy . The Policy is committed to eliminate the non-palatable and toxic and poisonous plants before they are ready to shed the seed, to increase infiltration for sustainable water flow and reduce soil erosion, wildlife conservation and management and the local communities in case of disaster will be helped in their coping mechanism and survival strategy.

Almost all objectives of the NDRR Policy and national rangeland policy are coherent and play an important role in flood risk reduction except the objective of NDRR Policy related to the structural measure for flood risk reduction can negatively affect the national rangeland policy. So proper mitigation measure and alternative should be considered in case of any construction like dram or embankment.

4.8.7. National Wetlands Policy 2009 (draft)

The Policy recognizes that 10 % of the land area of Pakistan is covered by wetlands which run valued ecosystem services. The policy focused on restoration, rehabilitation, sustainable management and use of wetlands. The policy's vision is "Pakistan manages its wetlands for effective performance of ecological functions and services; and for realizing opportunities for sustainable livelihoods, recreation and culture, research and education." The DRR /FRR is not consider in the policy, although the restoration of the wetland will result in the flood risk reduction so need to considered DRR/FRR in the policy objective and vision statement because Pakistan is committed to integrate the DRR in developmental policies after the signatory of HFA (2005–2015) and Sendai Framework for DRR (2015-2030).

4.8.8. National Environmental Policy 2005

The main objective of the policy is conservation, restoration and efficient management of environmental resources. The policy consists of six sectors and proposes 107 guidelines for sectoral environmental issues and 35 for cross sectoral issues. The policy also proposes six instruments for achieving the objectives and 29 guidelines related to the instruments. The sectoral environmental issues are pollution of fresh water bodies, coastal, air and noise, absence of appropriate solid waste management, damage of biodiversity, deforestation, desertification, natural disaster and climate change are highlighted in the policy. So National Environmental Policy 2005 is coherent to NDRRP 2013 by addressing natural disaster, deforestation, and desertification and issues related to climate change because these issues are directly and indirectly linked to the flooding in Pakistan.

4.8.9. National Housing Policy 2001

Housing is a basic and essential human need, millions are in the struggle to have a roof in the country. The Policy was sanctioned by the President and Chief Executive on 2001 during a demonstration prepared by the ministry of housing and works. The main stress of the policy

is on resource deployment, land availability, incentives for homeownership, encouragements to developers and constructors. One the objective is to increase the housing situations of the low-income inhabitants, through reduced housing standards while NDRR Policy which emphasis to develop resilience in society and infrastructure against disasters and lessen damages from periodic disasters such as floods through implementation of building codes etc. In the existence of cheap housing standard resilience against disasters and sustainable development never be attain, reduced standard will cause environmental and economic loss. The National Housing Policy is completely lacking the consideration of DRR and climate change adaptation and mitigation as the country is exposed to wide range of hazards including earthquakes, landslides, floods, extreme weather phenomenon, Glacier Lake Outburst Floods (GLOF), snow avalanches etc. The country is a member of HFA 2005-15 and Sendai Framework for DRR 2015-2030. There is a dire need to integrate DRR in the National Housing Policy in order to handle frequent disasters like floods and earthquake because lack of implementation of building codes and land use planning and regulations has seriously affected urban housing and infrastructure in Pakistan. The rapidly increasing urban poverty has further aggravated and deteriorated the already unsafe construction practices in the country. People of the hilly areas dearth entree to hazard-resistant building technologies and construction ingredients. Vulnerabilities of hilly areas can be further intensified in post-disaster situation due to blockage of roads and harsh climatic conditions. It is recommended to considered measures related to the pre-disaster, during disaster and post-disaster in the National Housing Policy for the safe and disaster resilience infrastructure development.

4.8.10. National Agriculture and Food Security Policy 2013 (Draft)

Policy is committed to use the resource in a well-organized and sustainable means, focusing agriculture subsidies to socio-economic groups. If the subsidies are given in term of free water extraction and cheap fertilizer usage than it may cause environmental degradation in form of the sub-surface water table loss and soil pollution respectively. The DRR Policy and NDMP is committed for the construction of dams to protect flood which can enhance the agriculture while subsidy for water extraction and fertilizer in agriculture and food security policy may boost the agriculture with environmental problem. Unrestrained and free pumping of subsurface water is resulting in quick loss of the sub-surface water table. Agriculture and Food Security Policy is completely lacking the integration of Disaster Risk Reduction Strategy. Literature review reveal that under changing climate scenarios, agriculture is a

sector which is at high risk. As Pakistan is an agro-based country and helping hand of the national economy is agriculture. The agriculture sector contributes approximately 24 % to Gross Domestic Product (GDP) and employs almost 47 % of the country labour force. The recent disasters of drought (1997– 2003), the frequent cyclone and storm surges, the flash floods of 2001, 2005, 2008 and the super-floods of 2010, 2011, 2012, 2013, 2014 and 2015 and the heat waves of 2010 and 2015 are some of the indications of serious implications of climate change on Pakistani territory. During massive 2010-flood, besides other damages, agriculture sector also received tremendous losses to standing crops (2.3 million ha). Agriculture is a life line of the country economy but at the same time it is highly vulnerable to climate change phenomena.

Due to shift of climate patterns and changes in precipitation, agriculture is at serious risks. Hence, it is a key sector that demand the integration of DRR and effective adaptation approaches to deal with frequent disasters/floods and climate change. Mitigation wise also there is a substantial "win-win" opportunity in this sector in terms of conservation of valuable inputs such as water and agrochemicals, which can promote cost savings as well as reduce GHG.

4.8.11. National Sustainable Development Strategy 2012 (draft)

National Sustainable Development Strategy envisions to develop harmonious society in the country through advancement of exciting and justifiable fiscal growth without overexploitation of natural resources with rational dissemination of development to all; in specific to the marginalized, deprived and vulnerable people and to next generations. The focus has been on integrating not only through three general dimensions of sustainable development but also integrating the goals with the existing development paradigm with the aim of shifting it on to a more sustainable pathway. The NSDS places an adaptive system and approach that can reply to evolving challenges like climate prompted natural disasters and DRR. The NSDS described the three dimensional sustainable development challenges, that is, environmental, social and economic of Pakistan. Environmental sustainability is explained in the NSDS by different strategies to improve/mitigate/reduce air, water quality and pollution, waste management, land and forest degradation and biodiversity security etc. All the above mention strategies related to environmental sustainability in NSDS directly and indirectly reduce the flood risk hence coherent to NDRR Policy 2013.

4.8.12. Pakistan Vision 2025

The Pakistan 2025 vision is "to make Pakistan the next Asian Tiger". To become the next Asian Tiger seven priority areas are identified that are:

1. developing human and social capital;
2. attaining sustained, indigenous and general development;
3. elected governance, official reform and modernization of the public sector;
4. water, energy and food security;
5. private sector and private enterprise led growth;
6. developing a competitive knowledge economy through value addition;
7. modernizing transportation infrastructure and greater regional connectivity.

The ultimate destination of Pakistan vision 2025 is to see country amongst the ten major economies of the world by 2047. Climate change and disasters are also explained in Vision 2025 as global warming and the climate change, resulting in significant and lasting change in weather patterns is having a severe impact on Pakistan including increased frequency and severity of natural disasters. This has a direct and major impact on water, energy and food security of the country.

The vision 2025 is committed to optimize energy generation mix between oil, gas, hydro, coal, nuclear, solar, wind and biomass with reference to risk assessment and environmental impact. Functioning the huge potential of Thar coal with 6600 MW capacity is also considered in the vision. The energy production from coal can increase GHGs emission, which can cause climate change, more disasters and flooding in the country hence distorted to the NDRR Policy 2013's objectives which are committed to create resilience in the country against flood and /Disaster risk reduction. DRR is not consider in Pakistan vision 2025 there is a essential to incorporate DRR, because Pakistan is a signatory of HFA 2005–2015 i.e. to integrate DRR in the development . The institutional reform and modernization of the public sector is highlighted in Pakistan vision 2025 for Economic growth, social development, peace and security of the country should considered DRR strategies and measures for environmental protection. Institutions involve in Pakistan vision2025 for reform does not considered DDR. All stakeholders involve in NDMP should be incorporated in the Pakistan vision for reform with special reference to disaster risk reduction.

4.9. Compatibility of NDRR policy objectives with the SEA objectives

For the development of the alternatives which are a part of the Strategic Environmental Assessment, the assessment of NDRR Policy objectives with the SEA objectives should be carried out in order to ensure whether they are compatible or not.

Table 4.12: - Compatibility of NDRR policy objectives with SEA objectives.

DRR Policy 2013 / *SEA objectives*	To create an integrated national capacity to identify & monitor vulnerability & hazard trends & potential climate change impact	To create MHE Warning capacity & emphasizing the information & warning needs of vulnerable end-users	Strengthening an integrated disaster preparedness & response capacity from the local to the national level	Promoting development planning that considers & addresses DR alongside environmental & climate change concerns	Strengthening the structural & non-structural resilience of key infrastructure and lifelines in Pakistan	Strengthening capacity at national /provincial levels to facilitate & provide support implementation of DRR PPPs across sectors and in high-risk areas	Strengthening Local Level RR capacity focusing upon communities & supportive linkages with union councils, tehsils & districts	Strengthening Local Level RR capacity focusing upon communities & supportive linkages with union councils, tehsils & districts
Protect human health, reduce health inequalities & promote healthy lifestyles	+	+	+	+	+/-	+	+	+
Conserve and where appropriate enhance species, habitats & biodiversity, and habitat connectivity	+	N/A	+	+	+/-	+	+/-	+
Protect & where appropriate improve the function and quality of the soil source	+	+	+	+	+/-	+	+	+

To prevent decline, protect and where appropriate enhance the aquatic environment	+	+	+	+	+/-	+	+	+
Contribution to mitigation of & adaptation to climate change	+	+	+	+	+/-	+	+	+
Contribute to protecting property & infrastructure, minimize waste/energy consumption, promote most efficient use of resources & infrastructure	+	+	+	+	+/-	+	+	+
Protect and where appropriate develop the character, diversity and special qualities of cultural heritage and the historic environment	+	+	+	+	+/-	+	+	+
Protect & where appropriate develop the character, diversity and special qualities of landscapes. Identify Burdens on landscape like climate change, erosion and landslips, land use & development	+	N/A	+	+	+/-	+	+	+

(+ = *possibly compatible, +/- = possibly compatible/incompatible more details is required to determine, N/A= not applicable*)

Table 4.13:- Types of Flood Risk Reduction Strategies in Pakistan.

Non-Structural Measures	**Structural Measures**
• Flood Forecasting and Early Warning • Flood Emergency Response System • Flood Abatement, Flood Insurance, Real-Time Flood Preparedness, Land use Planning, Building Regulation, Flood Risk Mapping and Zoning	• Flood Water Reservoir • Channel Modification • Link Canal/Flood Relief Channels/Diversion Channels • Embankment and Spur/Dyke

4.9.1. Proposed Actions and measures in NDRR Policy 2013, NDMP 2012-22 & other national documents for flood risk reduction

A list of actions and measures are identified related to flood risk reduction for impact assessment. Some of these actions and measures are scope in while others are scope out. Only those actions will be considered for impact assessment which are scope in while the others will be ignored. Finally, the Impact assessment of actions /measures of FRR on the SEA topic and SEA objective will be done for the establishment of Strategic Options/alternatives. The actions and measures are:

- Fixing of meteor-burst cable system.
- Setting up of 10-CM quantitative precipitation measurement weather radar.
- Flood warning schemes and flood plain mapping and zoning **(scope in).**
- Evacuation plan, community based flood management.
- Relocation of properties/infrastructure away from flood risk areas **(scope in).**
- Property level protection **(scope in).**
- Retrofitting of existing flood protection works, dams and barrages.
- Retrofitting protection of important public facilities, enhancing resilience.
- To develop knowledge of flood hazards and impacts **(scope in).**
- Preparation of surface water management plans and local/ district level risk assessments.
- Establishment of multi-hazard early (MHE) warning and insurance system etc.
- Manufacture of coastal dikes along major public facilities against flood.
- Construction and rehabilitation of flood control/mitigation structures.
- Construction of DRM centers in flood prone /vulnerable areas.
- Constructing of new flood protection works, dams and barrages to increase flood mitigation/protection capacity.
- Construction of direct flood defences, embankments, walls, adaptable walls, temporary defence **(scope in).**
- Sustainable urban drainage systems **(scope in),** drainage system of major cities rehabilitation. Restoration of ponds and wetlands **(scope in),** groundwater management

planning, coastal defences, coastline recharge, restoration of sand dunes and coastal vegetated soil.

- Run off control/reduction, forest planting (afforestation) **(scope in).**
- Land management **(scope in),** cross slope forests **(scope in),** highland drain blocking **(scope in),** creation and restoration of wetland and ponds **(scope in).**
- Modification of conveyance/passage **(scope in),** channel alteration **(scope in),** remove or adjust culvert or hydraulic constriction **(scope in),** modify bridges, storage, conveyance/passage and control **(scope in),** operational and disconnected storage **(scope in).**
- River or floodplain restoration **(scope in),** floodplain re-joining/reconnection **(scope in),** floodplain forests **(scope in)** spread restoration **(scope in).**

Table 4.14:- Impact assessment of actions /measures of FRR on the SEA topic and SEA objectives.

Actions /Measures

- **Non- structural actions:** Flood Plan Mapping. Awareness rising regarding flood hazards and impacts, relocation of properties / infrastructure away from flood risk, flood warning schemes, creating MHE warning capacity, vulnerability and risk assessments & flood forecasting.
- **Run off Reduction:** Land management. Cross slope forests, upland drain blocking, creation and restoration of wetland /ponds and forest planting.
- **River and Floodplain Restoration:** Floodplain rejoining, forest conservation and restoration. Flood early warning system. Restoration of native species, creation and restoration of wetlands. Running channel uncertainties, sediment traps, bank restoration.
- **Storage, Conveyance and Control:** Construction of storage, modification of conveyance channel, modification of relief channel, removes or modify culvert.
- **River Defenses:** Construction of direct flood defenses, river defenses, embankments, walls, adjustable walls etc.
- **Sustainable Urban Drainage Systems.**

SEA Topic	SEA objectives	Symbol with description/Action , measures	Impacts	Mitigations
Population & human health	Protect human health and promote healthy lifestyles	++ (Non- structural actions) Contribute FRR, protecting human health ++ (Run off Reduction) Contribute FRR, protecting human health ++ (Run off Reduction) Promoting/helping healthy lifestyles through improved chances for recreation and experiencing nature ++ (River and Floodplain Restoration) Contribute FRR, protecting human health +/- (River and Floodplain Restoration) Diverse, that is, positive and negative impact on promoting healthy lifestyles: some recreation may benefit other activities may lose out	No significant adverse impacts	

		+/- (Storage, Conveyance and Control) Diverse that is , positive and negative impact on promoting healthy lifestyles: some recreation may benefit other activities may lose out ++ (River Defenses) Contribute FRR, protecting human health +/- (River Defenses) Diverse i.e. both positive and negative impact on promoting healthy lifestyles: some recreation may benefit, other activities may lose out ++ (Sustainable Urban Drainage Systems) Contribute FRR, protecting human health + (Sustainable Urban Drainage Systems) Improving the living situation of communities through enhanced urban greenspace		
Biodiversity, flora and fauna	Conserve and where appropriate enhance species, habitats and biodiversity and habitat connectivity	0, ? (Non- structural actions) No or insignificant effect effects as impact of relocation are site specific. ++ (Run off Reduction) Benefits to connectivity and health of native woodland/forest and wetland ecosystems. +/-, ? (Run off Reduction) Diverse i.e. positive / negative and uncertain/ mpact on protected sites. ++ (River and Floodplain Restoration) Benefits to connectivity and health of native woodland/forests and wetland ecosystems.	The storage, conveyance and control actions, river defenses and could damage ecosystems such as wetlands and native floodplain woodlands that are already fragmented or degraded.	Potential negative impact can be mitigated through the identification of impact concerned design & timing of works to avoid or minimize the impact on habitats & wildlife along consultation with relevant authorities.

		+/-, ? (River and Floodplain Restoration) Diverse i.e. positive and negative and uncertain/unclear impact on protected site. +/- (Storage, Conveyance and Control) Possibly Significant negative impact due to loss of habitat; though, some actions could lead to improvements. +/-, ? (Storage, Conveyance and Control) Diverse i.e. positive /negative and uncertain impact on protected sites with potentially significant negative effects on protected freshwater species. ××, ? (River Defenses) Possibly significant negative impact on endangered freshwater and estuarine sites; uncertainty due to absence of detail on type and location of actions. + (Sustainable Urban Drainage Systems) The freshwater and estuarine species may subsidy from improved water quality.	All structural actions could have significant negative impact on designated nature conservation sites, for example by altering patterns of river flow or through disturbance.	Potential negative impact on protected sites should be assessed by relevant EPAs and NDMA /PDMAs for the FRR Strategies & mitigation measures applied where required.
Soil	Protect and where appropriate enhance the function and quality of the soil resource	0, ? (Non- structural actions) No or uncertain impact as effects of relocation are site specific. ++ (Run off Reduction) Restoration of carbon rich soils. ++ (Run off Reduction) Protection of soils from erosion. +/- (Run off Reduction) Diverse i.e. both positive and negative impact on productivity of agricultural land. ++ (River and Floodplain Restoration) Restoration of carbon rich soils. ++ (River and Floodplain Restoration) Protection of soils from erosion.	Storage, conveyance and control actions/measures can change natural processes and lead to increased erosion of carbon rich soils or agricultural land.	Establishing of natural processes can help to better forecast and mitigate potential negative impact: this should be addressed during feasibility and comprehensive design stages.

		+/- (River and Floodplain Restoration) Diverse i.e. positive and negative impact on productivity of agricultural land. +/- (Storage, Conveyance and Control) Diverse i.e. both positive and negative and possibly significant impact on protecting soils as erosion potential depends on type and location of action. +/- (Storage, Conveyance and Control) Diverse .i.e. positive and negative impact on productivity of agricultural land. 0 (River Defenses) No or insignificant impact. 0 (Sustainable Urban Drainage Systems) No or insignificant impact.		
Water	To prevent deterioration , protect and where appropriate enhance the aquatic environment	0, ? (Non- structural actions) No or Uncertain Impact as Impact of relocation are site specific ++ (Run off Reduction) Improving water quality and decreasing sedimentation ++, (River and Floodplain Restoration) Improving water quality and decreasing Sedimentation ×× (Storage, Conveyance and Control) Possibly significant negative effects due to degradation of banks of rivers; although, some actions could lead to improvements ×× (River Defenses) Increased erosion and degradation of river 's banks although some chances may exist for improvements ++ (Sustainable Urban Drainage Systems) Improving water quality	The Storage, conveyance and control actions and river defenses, could lead to possible degradation of banks of rivers	The possible negative impacts can be mitigated by minimizing possible habitat loss and including habitat creation in FRR. Negative impacts should be addressed during feasibility & detailed design stages. Actions that can impact the freshwater environment such as river defenses or storage actions are regulated under the controlled regulations (NEQs), which aim to protect the aquatic environment

				Mitigation should be measured as part of the authorization process. Some actions, particularly those deemed a development, should regulated under the land use planning system: environmental impacts should be addressed through project level EIAs.
Climatic factors	Contribute to mitigation of and adaptation to climate change	++ (Non- structural actions) To contribute adaptation to climate change. ++ (Run off Reduction) Carbon storage increased through wetland enhancement and benefits mitigated by any loss of forest/ woodland. ++ (River and Floodplain Restoration) Carbon storage increased through wetland enhancement benefits mitigated by any loss of forest/ woodland. +/- (Storage, Conveyance and Control) Possibly significant negative effects due to loss / degradation of floodplain wetland or forest/woodland .Although some actions could lead to improvements. +/- (River Defenses) Diverse. Negative effects due to loss / degradation of floodplain, wetland or forest /woodland; though some actions could lead to improvements. + (Sustainable Urban Drainage Systems) To contribute adaptation to climate change.	The Storage, conveyance and control actions, and river defenses could lead to possible loss or degradation of habitats e.g. wetlands that help to mitigate and adapt to a changing climate.	The potential negative impacts can be mitigated by minimizing possible habitat loss and including habitat creation in FRR schemes. Negative effects should be addressed during feasibility and detailed design stages.

Material assets	Contribute to protecting property & infrastructure, minimize waste and energy consumption and promote resource efficiency,	++ (Non- structural actions) Contribute FRR, protecting property and infrastructure. ++ (Run off Reduction) Contribute FRR, protecting property and infrastructure. ++ (River and Floodplain Restoration) Contribute FRR, protecting property and infrastructure. ++ (Storage, Conveyance and Control) Contribute FRR, protecting property and infrastructure. ++ (River Defenses) Contribute FRR, protecting property and infrastructure. ++ (Sustainable Urban Drainage Systems) Contribute FRR, protecting property and infrastructure.	No identified negative impact. Impacts on waste, energy and resource efficiency uncertain.	Chances to minimize waste and resource use should be examined during feasibility and detailed design stages.
Cultural heritage	Protect and where appropriate enhance the character, diversity and special qualities of cultural heritage and the historic environment.	0, ? (Non- structural actions) No or uncertain effects (as effects of relocation are site specific) +/-, ? (Run off Reduction) Diverse i.e. positive/negative and uncertain effects on cultural heritage. +/-, ? (River and Floodplain Restoration) Diverse i.e. positive/ negative and uncertain effects on cultural heritage. ++ (Storage, Conveyance and Control) Contribute FRR, protecting property and infrastructure. +/-, ? (Storage, Conveyance and Control) Diverse i.e. positive/negative and uncertain effects on cultural heritage.	No significant negative impact identified although assessment is uncertain as impacts depend strongly on the type of action and its location.	Possible negative impacts can be mitigated through the identification of any heritage assets including archaeology and the early engagement of heritage interests during feasibility and detailed design stages.

		+/-, ? (River Defenses) Diverse i.e. Positive/ negative and uncertain effects on cultural heritage. +/-, ? (Sustainable Urban Drainage Systems) Diverse i.e. positive/negative and uncertain effects on cultural heritage		
Landscape	Protect and where appropriate enhance the character, diversity and special qualities of landscapes.	0, ? (Non- structural actions) No or uncertain impacts as effects of relocation are site specific. + (Run off Reduction) Improving diversity of the landscape. + (River and Floodplain Restoration) Improving diversity of the landscape. × (Storage, Conveyance and Control) Possible landscape degradation. × (River Defenses) Possible landscape degradation. + (Sustainable Urban Drainage Systems) Improving urban landscape	The storage, conveyance and control actions, and river defenses could lead to landscape deprivation/ degradation.	Potential negative impacts should be addressed early during feasibility and detailed design stages. Consultation with National Park Authorities and affected communities is recommended.

Nomenclature of the Assessment: The assessment has been categorized using the codes and explanations.

Codes	Taxonomy and explanation
++	**Significant positive:** Actions are likely to improve an environment that is in less than good condition
+	**Positive:** A clear positive impact of the actions that does not meet the explanation above
0	**Neutral:** Actions has no or insignificant impact
×	**Negative:** A clear negative impact of the actions that does not meet the explanation below
××	**Significant negative:** Actions are likely to cause an adverse impact on an environment that is in less than good condition
+/-	**Diverse:** The effect of actions that is likely to be a combination of positive and negative impacts.
?	**Uncertain:** The impact of the actions is not known, or is too unpredictable to assess.

Assumptions and limitations

The assessment assumes that whether the flood risk reduction actions are designed and implemented in line with best practice. The assessment assumes that all flood risk reduction actions will deliver significant benefits in terms of reducing overall flood risk. Some actions are likely to be located near to the area of flood risk (e.g. river defences) but others (e.g. run off reduction) could be located within or its upstream catchment. For many actions, no additional detail on location is available. The assessment is limited by the availability of information on location, type, scale and timing of the actions. To reflect the assumptions and limitations, assessment describes the possible effects of action.

4.10. Flood control measures and environmental impacts

Floods are known as natural hazards, mainly occurs in metropolitan and suburban areas of the country. In order to mitigate flood costs, numerous categories of measures are adopted in the world. The Pakistan NDRR policy 2013 launch two key types of flood management measures i.e. structural and non-structural. Core structural methods include dams, reservoirs, channel alterations, dikes, floodwalls, high flow diversions, spillways, retention basins and storm water managing services. The Non-structural measures consist of extensive variety of prevention or adjusting measures to reduce flood risk like forecasting and warning systems, food preparedness and emergency plans, land use regulations and flood insurance. Structural measures for flood control can cause significant environmental impacts, due to the modifications of the hydrological regime that affect the biotic and abiotic components of an ecosystem, soil property, habitat disturbance and socio-economic issues etc. The consciousness of these impacts have been progressively rising, calling to the need for conducting tool like SEA at the planning stage of PP related to flood management or flood risk reduction to assessing and minimizing the negative environmental impacts of the measures and providing the strategic alternative options.

4.11. Strategic options/alternatives

Strategic Options: A range of options have been identified distinguished under three groups of "Strategic Options/ Alternatives" following the steps mentioned in Fig 3.2.

Strategic Option-I (Do Nothing)

This option describes no change in the existing strategy of flood management practice in the country. This option is considered as baseline against which all other options are assessed.

Strategic Option-II (Structural Measures)

- **Improving Water Storage Capacity**

This option will not only helped in mitigating flood impacts but also to meet the other needs (e.g. agricultural, industrial, hydropower generation). The option seems do-able and sensible but it has significant effects on socio-economic and environmental factors (e.g. land use, geology, morphology, ecology, landscape and other features of the adjacent areas etc.).

- **Improving Embankments**

This option considers the repairing and maintenance of existing structures as well as construction of new structures to enhance the durability of the embankment network and increase the security of vulnerable communities.

- **Building Spillways/Diversion Channels**

Spillways or diversion structures regulate flood flows and avoid damaging impacts of flooding.

- **Establishing Emergency Refuge Areas/Centers**

Establishing refuge areas/centers in vulnerable areas and persuading people to leave their homes and belonging soon after receiving early warning.

Strategic Option-III (Non-Structural Measures)

- **Watershed, Wetlands and Forest Management**

This option considers the rehabilitation and restoration of forest cover in the natural forest, watershed, areas of Indus river and tributary rivers by reforestation to avoid soil erosion or soil cover loss. To promote management activities in the watershed areas community-based participation is desirable by creating awareness about the potential benefits of plantation and reducing flood impacts.

- **Restoration of Floodplains**

Restoration of floodplains is significant to reduce the flood losses for existing infrastructures and for future planning. The desirable initiatives would include:

- No more development in floodplains.
- Avoid illegal developments in floodplains.

- **Land Use Control and Planning Approach**

This option considers appropriate land use/spatial planning integrating zoning and changes in designs of infrastructures/buildings in vulnerable areas to build flood resistant infrastructures.

- **Improving and Strengthening Flood Early Warning & Forecasting System (FEWS)**

  Improving and strengthening flood early warning and forecasting system to reduce life and property losses in vulnerable areas. Appropriate and effective FEWS strategically distributed throughout the country should become the top priority of the government in the field of DRR.

4.12. Conclusion and recommendations

SEA has developed as an essential tool for incorporating environment into strategic decision making process globally. Flood risk reduction is amongst one of the part where there is a need of integrating environmental concerns for sustainable development through strategic preparation. This sector is identified to have significant contribution in environmental problems and can be highly influenced by policy. In case of Pakistan, this need has increased many folds after 18th amendment in constitution with which disaster management or flood risk reduction sectors has become provincial responsibility.

The present study aimed at reviewing existing NDM system in Pakistan for identifying gaps and deficiencies in the context of sustainability. The study was based primarily on critical review of the National Disaster Risk Reduction Policy 2013. The Study was carried out by gathering data against environmental performance of the policy. Based on the identified environmental problem related to flood risk reduction strategies, consultation with experts and environmental objectives set under selected National Polices and vision like National Housing Policy 2001, Agriculture and Food Security Policy (draft), National Sustainable Development Strategy (draft) 2012, Pakistan vision 2025 etc., and selected DRR documents like NDRR Policy 2013, NDMP 2012-2022, NDRMF 2007-12 and NDM act 2010, the SEA objectives were set and assess with objectives/ actions proposed under NDRRP 2013 and other flood risk reduction documents to identify positive and negative impacts on environment and gap that need to be addressed in future policies.

Results shows that assessment of actions (proposed for flood risk reduction) of non – structural measures like flood early warning system etc. with SEA objectives have expected positive impacts. The negative impacts are likely from the actions related to structural measure e.g. storage, conveyance and control, construction of storage, modification of conveyance channel, modification of relief channel, river defences, construction of direct

flood defences, river defences embankments and walls. So the efficiency of the policy measures and actions related to structural and non-structural is linked with the planning, monitoring and auditing. Capacity building of the current organizations will be a criterion to achieve these objectives.

The study will be concluded under following main headings:

I. **Coherence and distortion of the NDRRP 2013 objectives with the national environmental objectives**

II. **Internal coherence and distortion between NDM system 's documents**
   a) NDRRP (2013) & NDMP 2012-22
   b) NDRMF 2007-12 & NDMP 2012-22
   c) NDRRP 2013& NDRMF 2007-2012
   d) NDRRP 2013 and NDM Act 2010
   e) NDM Act 2010 and NDMP 2012-22

III. **Coherence & distortion in National Disaster Management system**

IV. **External coherence and distortion of NDRRP 2013 with selected National Policies and Vision**

V. **Impact Assessment of the actions /measures of FRR strategies on SEA topic and SEA objective**

Now we will explain the conclusions in detail.

I. Coherence and distortion of the NDRRP 2013 objectives with the national environmental objectives

Majority of the objectives of NDRRP 2013 are coherent with the national environmental objectives just few are not coherent and represent distortion like the objective of the NDRR Policy 2013 related to the structural measure for flood risk reduction without mitigation can effect the environment (Table 4.5) while other objectives of the NDRRP 2013 is on strengthening non-structural measure to reduce disaster/flood risk hence coherent to the national environmental objectives.

II. Internal coherence and distortion between NDM system's documents

The study concluded that most of the objectives and interventions of the NDRR Policy 2013 and NDMP 2012-2022 of the national disaster management system of Pakistan are internally

coherent as indicated in the Table 4.6 with the few exceptions i.e. vision statement of the NDRR Policy and NDMP, date of approval of NDRR Policy and NDMP, consideration of disaster risk reduction approach in NDRR Policy and NDMP . The Triple bottom line concept of sustainable development is missing in NRRP vision statement, NDRRP is approved after the approval of the NDMP. The NDRR Policy focused on the DRR while NDMP emphasis on disaster management instead of DRR. It is recommended to integrate DRR in NDMP because we cannot manage disasters/floods we can reduce the risk of disasters or floods.

Almost all interventions of the NDRR Policy and NDRMF (Table 4.8) are coherent except vision statement and one of the interventions "Emergency and Response System" of the NDRMF. The vision statement of NDRR Policy is deficient in sustainable development concept (environmental, societal and economic). The intervention "Emergency Response System" of NDRMF is committed that only a NDM Fund would be recognized in order to support the Federal Government to establish emergency response effectively, whereas the National DRR Policy recommends that a separate and dedicated budget line for disaster risk reduction be created not only at federal level but also for provincial and district tiers.

The interventions, vision and mission statement of NDRMF 2007-12 and NDMP 2012-22 (Table 4.7) are coherent. Not a single distortion is noted during literature review and discussion with expert. The member NDMA Ahmad Kamal who indicate that NDMP is prepared in the direction of NDRMF not according to NDRR Policy. Moreover, he reported that when their team have completed 80% work in the preparation of NDMP, then they came to know that the country have no DRR Policy. Then they started work on the Policy formation according to NDMP.

The results of Table 4.8 and Table 4.6 are about the coherence and distortion between NDRR Policy and NDRMF and NDRR Policy and NDMP respectively indicate that NDRR Policy and NDRMF are distorted with respect to the vision statements i.e. vision statement of NDRR Policy is completely missing the triple bottom line concept of sustainable development whereas the NDRMF vision statement considered triple bottom line concept of sustainable development likewise the NDRR Policy is distorted from the NDMP with respect to triple bottom line concept of sustainable development which is considered in the vision statement of NDMP and deficient in the vision of NDRR Policy.

Results of Table 4.6 and Table 4.7 indicates that NDMP is prepared in the light of NDRMF and not in the direction of NDRR Policy which is technically wrong because it is necessary to prepare the Policy first because policy is a direction and in that direction Plan and Program are prepared and launched but unfortunately in case of National Disaster Management System the NDRMF is Prepared /approved first from 2007 to 2012 for five years and then NDMP 2012 -2022 is prepared /approved in the direction of NDRMF 2007-2012 but the NDRR Policy is prepared by NDMA and then approved later on 21st of February 2013 by National Disaster Management Commission.

Table 4.9 is about the coherence and distortion between NDM act 2010 and NDRR Policy 2013. Some sections of the act are coherent whereas the others are distorted like section 2 of the act is about the complete spectrum of the disaster management is coherent to the interventions and objectives of the NDRR Policy, the section 10(2) and section17 (2) are about the preparation of National & Provincial Disaster Management Plan by NDMA and PDMA respectively is coherent to NDRR Policy. The section 26 (establishment and function of NIDM) section 27 (establishment of National Disaster Response Force), section 29 (National Fund for the DM), section30 (establishment of the Fund by the Provincial Government) and section 31(allocation of fund by the Federal and Provincial Government) are all directed and considered in the NDRR Policy hence coherent to NDM act 2010. The distorted sections of the act to the NDRR Policy are section 3 and 6 (establishment, power and function of National Disaster Management Commission), section 8 and 9 (establishment, power and function of NDMA), section 11 (guidelines for minimum standard of relief), section 23 (Federal Government to take measure; (2a) co-ordination of actions of ministries and divisions of the Federal Government, Provincial Governments, National Authority, Provincial Authority, Governmental and Non-Governmental organizations in relation to disaster management), section 29(4) and section 30 (3) are about the account of National and Provincial Disaster Management Fund respectively.

The coherence and distortion between NDM Act 2010 and NDMP 2012-22 is well explain in Table 4.10. The section 11 is about the preparation of guidelines for minimum standards of relief and section 23 (2a) is for Federal Government to take measure for co-ordination of actions of ministries and divisions of the Federal Government, Provincial Governments, National Authority, Provincial Authority, Governmental and Non-Governmental organizations in relation to disaster management are not clearly considered in NDMP 2012-2022 and hence distortion exist between the section 11 and section 23(2a) of the NDM act

2010 & NDMP 2012-2022. The other sections of the act like section 2,3,4,6,8 9 ,10 13,14, 15,16, 17,18, 20,21,26,30 , and 31are considered in NDMP and so NDM act and NDMP are coherent to each other in relation to these sections.

III. Coherence & distortion in National Disaster Management system

After 2005 Kashmir earthquake Pakistan is one of the signatories of HFA (2005), the Government of Pakistan was stimulated towards institutionalization for disaster risk reduction. There was high need for capacity building of disaster related agencies at local, district, provincial and national level. As after the earthquake, numerous challenges emerged and encounter the situation. Keeping in view this alarming situation, the government of Pakistan formulate the NDMO in 2006, now NDM Act 2010. According to the ordinance, NDM System was introduced in the state. Likewise, NDMC was established at the federal and provincial level etc. The NDMC was assigned the task of preparing and approving guidelines, policies and plans for DRR. Finally, NDMA was established to follow-up the directions of commission. The 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. The National NDRMF was prepared by the NDMA in March 2007, which serves a general guide for DRM at all levels. In March 2010, the NDMA formulated the NDR Plan to identifying specific roles and responsibilities of the main stakeholders in emergency response including SOPs. In addition to this, the NDMA, in association with nationwide and international partners has been in the process of strengthening the disaster risk management (DRM) system in the country. In 2012, with technical assistance of JICA, NDMP was prepared. The government approved the project which span on long 10 years (2012– 2022) with an estimated cost of 1.040 Billion US Dollars. The NDRR Policy 2013 was developed after the preparation of NDMP, which is technically wrong because policy is known as the commitment, direction, motivation and inspiration and in that direction Plan and programs are prepared and implemented.

"A policy may be considered as the inspiration and guidance for action, a plan as a set of co-ordinate and timed objectives for the implementation of the policy Wood & Djeddour, (1992). But in case of Pakistan disaster management system it is totally reverse here policy is developed in 2013 where as other documents like Plans and Framework are prepared prior to Policy preparation, it result in a week governance, policy distortion and lack of cooperation among institutions. The current National Disaster Management system of the

country after earthquake 2005 is shown in Fig 4.2 (a) .The distortion that exist in the current Disaster Management System is shown in Fig 4.2 (b) .

Fig 4.2 (a) current NDM system

Fig 4.2 (b) proposed NDM system

IV. External coherence and distortion of NDRRP 2013 with selected National Policies and vision

The climate change policy focus on the climate change adaptation and mitigation through energy conservation, improve energy efficiency, and promotion of renewable energy production etc. for reduction in GHG emissions but in case of NDRR policy to reduce GHGs emissions there is a lacking the measures/actions. It is recommended that there is a dire need to integrate the measures /actions related to climate change adaptation and mitigation in NDRR Policy because most of the disaster like flood is due to GHGs emission and climate change. The national education policy 2009 states that an emergency related material shall be maintained at all levels.

National Power Policy 2013 is committed to using coal as a resource for energy production may cause flooding through more GHGs emission. The national water policy draft 2012 have coherence to NDRR Policy because both emphasis on structural and non-structural methods for flood management.

National Forest Policy 2009 (draft) policy objectives is to restore, conserve and sustainable management of natural resources and forest to make sure the sustainability of ecosystem functions and services, which not only reduces the flood risk but also enhance and protect the ecosystem services. The objective of NDRR Policy related to the structural measure for flood risk reduction can negatively affect the national forest policy. So proper mitigation measure and alternative should be consider in case of any construction like dram or embankment.

National Wetlands Policy 2009 (draft) is to restore the degraded rangelands and pastures to mitigate the negative impacts of global climate change hence reduce the risk of flooding.

The National Housing Policy is completely lacking the consideration of DRR and it promote reduced housing standards while NDRR Policy emphasis to develop resilience in society and infrastructure against disasters such as floods.

The NDRR Policy structural and non-structural measures aim to reduce flood risk but vision 2025 is committed to operationalize the immense potential of Thar coal with 6600 MW capacity which can enhance risk through increased GHGs emission, resulting in global warming and flooding in the region.

V. Impact Assessment of the actions /measures of FRR strategies on SEA topic & SEA objective

Non –structural actions have possibly significant positive effects on the SEA objectives for human health and material assets, also help in adapt to a changing climate (climatic factors) and have no or negligible effects on fauna, flora and biodiversity, soil, water, cultural heritage and land scape. The actions related to run off reduction are significant to meeting the SEA objectives to protect human health and material assets, help to adapt to climate change, positive effects on SEA landscape objectives, potentially significant benefits to the SEA objectives for biodiversity, flora and fauna and diverse and uncertain effect on the SEA objective for cultural heritage. The actions for river restoration have possible significant benefits to the SEA objectives to protect human health and material assets. Restoration actions can lead to improvements to water quality, restoration /creation of woodlands and wetlands can increase the capture and storage of carbon, potentially significant benefits to the SEA objectives for biodiversity, flora and fauna, the possible effects are diverse for the SEA objective to protect valuable agricultural land (soil). The actions are likely to have positive effects on SEA landscape objectives through protecting and enhancing the diversity of

landscape. The actions for cultural heritage is diverse and uncertain. The actions related to storage, conveyance and control are potentially significant to meeting the SEA objectives to protect human health and material assets, mixed effect on the SEA objective to promote healthy lifestyles and protect human health due to negative effects on cultural services, significant negative effects on (biodiversity, flora and fauna), the possible effects are diverse for the SEA objective to protect the function and quality of agricultural land (soil), negative effects on water quality and aquatic species (biodiversity, flora and fauna), effect on the SEA objective for cultural heritage is mixed and uncertain. The potential effects on landscape are negative. The actions for river defences are possibly significant to meeting the SEA objectives to protect human health and material assets, possibly negative effects on cultural services, mixed effect on the SEA objective to promote healthy lifestyles and protect human health, possibly be significant negative river defences on the SEA objectives for the aquatic environment due to possible increase soil erosion upstream or downstream of the actions hence these effects could be significantly negative on (biodiversity, flora and fauna), negative effects on carbon storage (climatic factors) due to loss of wetland habitat, possible effects on landscape may be negative by interrupting the views of rivers, the effect on the SEA objective for cultural heritage is mixed and uncertain. The actions of sustainable urban drainage system are possibly significant to meeting the SEA objectives to protect human health and material assets, help adapt to climate change (climatic factors) like local cooling effect of the ponds, possible significant to the SEA objectives to protect water quality hence positive effect on (biodiversity, flora and fauna). The quality of urban landscape may be enhanced and the effect on the SEA objective for cultural heritage is mixed and uncertain.

4.13. The major issues identified

- Most of the national policies and strategies are in the draft form like agriculture and food security policy 2013, national sustainable development strategy 2012, national water policy 2012, national forest Policy 2009, national rangeland policy 2010 and national wetlands policy 2009 etc.
- Absence of National Flood Risk Management Policy.
- Discontinuous and short-term planning.
- Isolated planning missing the concept of integration linked with other development sectors and environmental protection sector.

- Flood management planning is done at higher tiers in isolation without providing the opportunities for public participation.
- Inadequate structures playing major role in discharge of peak flood flows (e.g bridges and roads).
- Deferred maintenance of embankments (the major issue is the inability of the structures to cope with increasing flooding levels).
- Encroachment of flood plains.
- Lack or low response mechanism from affectees to early warnings (as people are not ready to leave their homes after receiving early warnings from the administration).

4.13.1. Recommendation

- The biggest gap is the absence of flood management policy which should be the guiding framework for flood management planning at all tiers of administration. The policy is needed to address climate change; expected increase in torrential monsoon rainfalls and increasing frequency of flooding; need for enhancing and improving the water storage capacity of the country and strategic flood management planning. Further the management policy is needed to develop a vision of sustainable water resource management based on long-term flood and water scarcity management planning considering environmental and socio-economic concerns. A flood management approach is essential in order to do in advance the cumulative demand of enhancing water storage capacity and to address the environmental concerns of the alternatives to meet the objectives.
- Strategies, plans, policies and programmes must be made taking societal, governmental, fiscal and environmental capacities and constraints into account.
- There should be some directions with regarding to amount of funds that would be reserved in the annual budget for the DM activities at all levels i.e. district, provincial and national.
- In section 2(b) of NDM act 2010 the word degradation of the environment should be inserted after property in the last line.
- The heading of the section 2(c) of NDM act 2010 should be new from DM to DRM and the words prevention and risk reduction should be inserted before preparedness.
- The DRM framework should be people rather than donor-oriented.

- A six-monthly work plan of what is achievable in different stages should be developed and a review committee consisting of members of legislative, executive and judicial bodies, civil society and media should be constituted.
- Above all, DRR and DRM policies and plans in Pakistan need a strong political support at the highest level such as the Prime Minister at the national level and the Chief Minister at the province level as well as financial commitment through annual budgets at both the federal/national level and the provincial level.

4.14. The Constraints to SEA in Pakistan

Although environmental legislation is completed and a lot of programmes for environmental protection are completed and many under process in the country, there are a lot of identified constraints to SEA practice in Pakistan such as;

- Lack of organized baseline data;
- Lack of environmental awareness;
- Lack of local SEA experts;
- Institutional problems;
- Financial constraints;
- Lack of public involvement;
- Monitoring

4.14.1. Constraints and Recommendations

Sustainable development of water resources management achieve the objectives for security and preserving the associated natural environment (McKinney, 2003). In conducting an SEA for Pakistan's water resources management/flood risk reduction following key issues are identified:

Legal and Institutional Frameworks:

Although EIA regulations do exist in Pakistan, there are no legal or institutional frameworks concerning SEA. The only attempts at using SEA in Pakistan have been on minimal and pilot basis. However, various institutions (EPAs, Planning Commission, and Ministry of Climate

Change etc.) related for implementing SEA in Pakistan are available and what is needed is the strengthening of these institutions. Legal frameworks for SEA in Pakistan are also lacking but regulations on EA can be extended to cover SEA specifically for water resource management and flood risk reduction.

Alternatives to PPPs:

SEA could provide for consideration of a larger range of alternatives than is normally possible in project EIA. Therefore SEA is seen as a more effective means of weighing issues at the 'upper stream' so as to select the policies which has less effect on the environment. An important element of environmental assessment is the consideration of several alternatives. Assessment of alternatives is therefore to be adequately handled in making an environmental assessment effective. One important option to consider is the 'no-action' alternative. Despite the advantages of SEA in identifying alternatives to PPPs, it is equally difficult to achieve this feat. Therefore for a small country like Pakistan, an ability to take on SEA would be seen as a major achievement for others in the sub region.

Background Data on Environment:

Issues of environmental baseline data in Pakistan are very inconsistent. There seems to be some form of data on the environment, however, these data has been dispersed among the various institutions responsible for the environment and the various NGOs operating in the environmental sector. Pakistan lacks a central repository for accessing information on the environment. This is one of the constraints highlighted in the study. However, baseline data is not available for the conduction of any successful SEA and EIA.

Financial and Budgetary Restrictions:

Often lack of political will has been identified as one of the constraints of EIA and SEA in Pakistan but this when looked in detail is due to financial restrictions. Most of the priorities of the government are geared towards alleviating poverty and the creation of jobs. Therefore the little revenue generated is pushed more into these areas than for solving environmental problems. There is therefore an inadequate financial resource for SEA training and capacity building.

Donor Support and Role of NGOs:

SEA of Pakistan's water resource sector/flood risk reduction needs the help of the donor community and NGOs in the environment. This is because financial restrictions have been the root cause of under-development in impact assessment studies in Pakistan. The role of NGOs in Pakistan has been limited to environmental education programs and helping in formulation and implementation of environmental policies. NGOs in Pakistan are yet to be involved in environmental data gathering activities and research on the environment. Involvement of NGOs in environmental research would also help them in stating their case when it comes to issues of environmental protection and also protection of local rights and customs.

Issue of Capacity Building and Public Participation:

Mandatory public participation in EAs and water resource development programmes has been lacking in Pakistan. Although the steps of EIA do require this approach, there are no monitoring guidelines to ensure that this stage of the EIA process is fully enforced. This is one of the areas, which will be vital in developing SEA for Pakistan's water resource sector/flood risk reduction. Legal guidelines could be incorporated into such programs through the use of SEA. This can complement the public participation step of EIA.

Capacity building has been identified as one of the areas, which can help in advocating for SEA. However, training workshops for personnel's and NGOs has mostly been directed at social and economic problems in Pakistan instead of environmental issues. Environmental and human settlement policies, strategies and programs of Pakistan presently have been unable to ensure sustainable and active public participation at the societal level. This has been linked to the fact that foreign experts have prepared some of these policies with little emphasis on local values and customs. SEA can help recognize the need for adequate involvement of the public on policy level as well as on sector and project levels. However, achieving this feat is not always easy due to the fact that responsible establishments and other politicians do not always view public participation as advantageous. This has been so because of the discreet nature of government policy in Pakistan.

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FACULTY OF MANAGEMENT SCIENCES

Please find enclosed a bill No.5282, dated 01-02-2016 amounting to **Rs.3,920/-** (Rupees three thousand nine hundred and twenty only) received from M/s. **Safeer Photocopy, Islamabad** on account of photocopies of **official letters, Notifications, Indent Forms, Daily Dak, Meeting circulars**. For the **Faculty of Management Sciences** during the month of **January, 2016.**

Additional Director (Finance) is requested to sanction the payment of **Rs.3,920/-** (Rupees three thousand nine hundred and twenty only) to **M/s. Safeer Photocopy, Islamabad.**

M. Numan Raiz
Assistant Admin officer (FMS)

Deputy Dean, (FMS)

Additional. Director (Finance)