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Flood disaster profile of Pakistan: A review

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Abstract: Floods- Disaster profile of Pakistan clearly entails that the country has experienced severe and life-threatening flooding in the recent past. During heavy monsoon rains every year, people's exposure and vulnerability to extreme flooding increases due to the country's current socioeconomic conditions. A fundamental change in the country's development path is needed to prevent future catastrophic floods that decouples exposure and vulnerability from economic growth and is more in harmony with the functioning, capacities and thresholds of the natural environment. The catastrophic flooding in the country could have been curtailed with the benefit of hindsight and given the optimum management of its political, social and economic spheres. Mainstreaming disaster risk reduction in the areas of water, sanitation, health, shelter and livelihoods can enhance community resilience to future disasters by providing stronger shelter, water and sanitation structures which can withstand floods better; and increasing people's assets and knowledge.

Keywords: Floods, Disaster, Vulnerability, Pakistan

1. Introduction

World statistics reflect an increase in the pattern of disasters, ranging from natural events such as earthquakes, floods and cyclones, to disasters caused by human factors ('manmade') such as oil spills, transport accidents, infrastructure collapses and large-scale population displacement due to conflict. [1] The impact of such disasters on the populations and the material losses is not at all similar. Over 95% of all disaster related deaths occur in developing countries. Losses due to natural disasters are twenty times greater in the developing world than those in industrialized countries. This differential impact depicts that disasters should not be considered as isolated events at all: they are most likely connected to the physical, social, political and economic milieu in which they occur. [2] Specifically, the chances of a disaster happening and the impact of a disaster depend on exposure to hazards and vulnerability of populations.

Pakistan is a low-income country where large segments of the population are below poverty level, suffer from food deficiency, unfavorable social indicators and insecurity. [3] Women in particular suffer majorly due to poverty, lack of education and low access to healthcare. Low literacy rates, poor health and high maternal mortality are common indicators. Pakistani women lack the power and freedom to make decisions due to social pressure and cultural practices. Despite bearing the burden of multiple responsibilities they are not the decision-makers; and usually deprived of economic resources as well as lack control over their own assets or household incomes.

Poverty Reduction Strategy Paper (PRSP), government's long-term commitment to poverty alleviation through sustained growth in agriculture and rural economic activities will result in broad-based economic growth. With special emphasis on vulnerable group the key to human development and economic growth depends on access to education, health, safe drinking water and rural infrastructure. The ultimate strategy is to mobilize and uplift women.

Pakistan is a disaster-prone country. The very diverse Terrain and Climatic conditions make it susceptible to various forms of disasters. Mountainous areas in the north are at risk of earthquakes, snowstorms, landslides and avalanches. Coastal areas face the risk of flooding and cyclones. Deltas and mid-river basins also face flooding risks, while arid and semi-arid areas in southern Punjab, Sindh and Baluchistan are vulnerable to drought. Pakistan is also located in a seismically active zone on account of its proximity to the Indo-Australian and Eurasian plates. In short, The Northern Area & parts of Baluchistan are Seismic Prone, where as floods are a common phenomenon in the provinces of Punjab and Sindh. The aftermaths invariably sport indelible marks in the form of

human fatalities, property losses, and environmental degradation and, above all, painful memories.

It is clearly evident from the disaster profile of Pakistan that it is a disaster-prone country of South Asia with huge losses of property, flora and faunas occurring every year. Pakistan continues to suffer from a plethora of natural and human induced hazards that threaten to affect the lives and livelihood of its citizens. Frequent occurrence of flood causes severe disaster in Pakistan, followed by tropical cyclone, infrequent strong earthquakes and landslide in the country.

Add to these natural events numerous manmade hazards: poor construction, which can lead to collapse of buildings and infrastructure, fires, conflict and military operations, oil spillages, etc. Pakistan has also been wreaked by violence for the last 20 years. In 2009 more than three million people in Pakistan were forced to flee their homes in the country's northwestern areas as a result of political insecurity. More than 2 million people have voluntarily returned to their areas of origin since July 2009 while forced displacement still exists in Khyber Pakhtunkhwa province since 2010.

Risk Factors that increase vulnerability and contribute to the severity of disasters in Pakistan are: (i) Poor infrastructure and limited enforcement of existing building code; (ii) Lack of timely warning systems; (iii) Limited awareness and education on disasters and response; (iv) Limited manpower and coordination among various government disaster response agencies; and (v) Large number of impoverished communities susceptible of disaster.

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. Approximately 90 percent of the damage related natural disasters (excluding droughts) are caused by floods and associated debris flows. Floods can damage and devastate homes and farms, displace families, pets and livestock, damage crops, and disrupt agriculture and business. [4]

Pakistan, a part of the South Asian countries, has the highest annual average number of people physically exposed to floods, which occur normally due to storms that originate from Bay of Bengal during the monsoon from July to September. The storms originating in Bay of Bengal passing over lower Central India and Rajputana enter Pakistan and continue towards North into Kashmir. The mountain ranges in the extreme north of Pakistan provide a perennial source of inflow into the rivers. Floods particularly hit Punjab and Sindh while hill torrents tend to affect the hilly areas of Khyber Pakhtunkhwa, Baluchistan and Gilgit Baltistan areas. Flood events of 1950, 1992 and 1998 caused many deaths and huge losses to the national economy. According to official sources, during the decade 1991 to 2001 floods in Pakistan caused an estimated damage of approx USD 800,000 to property. [5]

Most of the flooding occurs in late summer during the monsoon season but flooding can also occur as the result of glacial lakes breaking that are caused by high summer temperatures. In 2007, monsoon rain induced flooding damaged the rice crop in Sindh and Baluchistan provinces and reduced production by as much as 200 thousand tons, which equals approximately 3.5 percent of the crop. Since rice is a high value crop the loss had a significant impact on the farm value added in the agriculture sector and led to a huge reduction in export earnings.

Over the years, major floods have occurred with increasing frequency in Pakistan, causing huge loss of life and property, despite huge investments in river control. Annual floods are often deadly in Pakistan. [6] In 2009, dozens were killed; in 2008, floods displaced 82,000 people; in 2007, 300 died and 2.5M people were affected.

2. Methods

Using PRISMA methodology [7] of literature review, 54 articles were retrieved using Pub med and Google Scholar databases and country level reports on 2010 Pakistan Floods. 34 articles were included in the initial review. 23 articles were excluded from the review after reading the whole content because they did not match the objectives of the literature review and the inclusion criteria. A total of 11 articles were included in the review including two national reports. (Figure 1).

Key words used to search the articles are: Pakistan and floods, impact of Pakistan floods, disasters in Pakistan, monsoon rains in Pakistan, Disaster management Policies in Pakistan, NDMA, Poverty and floods, Disaster profile of Pakistan. Database searches were performed during November-December 2013 to retrieve the articles related to Flood-Disasters in Pakistan.

Inclusion Criteria: Studies from 2003 to 2013 were retrieved on Floods in Pakistan. All the Government sites responding to flood response were also included in the review.

Exclusion Criteria: Studies focusing majorly on earthquakes in Pakistan or any other natural calamity during 2003 to 2013. Though the articles published in the last 10 years were of prime concern initially but data from a few older articles were also extracted in order to give meaning to the paper.

3. Results and Discussion

3.1. Impact of Floods

The impact of disasters is ravaging on Pakistani population, as the exposure and vulnerability levels both are very high. Populations live in high-risk areas, infrastructure is constructed in/adjacent to such areas, education and literacy levels are low, poverty is high, there are few social safety nets, there is little awareness either in government or among communities about how to mitigate disasters and how to prepare for dealing with them.

As is often the case, during a major disaster, the severity of a crisis can provide a major incentive to reform the system, highlighting mutual dependencies, exposing deficiencies in government development and disaster risk management policies and practices. Once the intensity of the monsoon rains is realized it is possible to save lives and reduce losses through effective community based early warning system

giving people time to sound the alarm and take evasive action – moving families, livestock and essential belongings to higher land. In terms of managing an effective emergency response, numerous agencies including the United Nations have highlighted lack of adequate response from government. Shortage of basic emergency supplies and reported tensions between military and civilian authorities as to who has control of the emergency response program is prerequisite.

Pakistan's 2010 floods were one of the biggest calamities ever with almost 20 million people affected. [8] Besides the slow response, absence of comprehensive DRR and preparedness mechanisms in the country was a major factor that caused the large-scale destruction. [9]

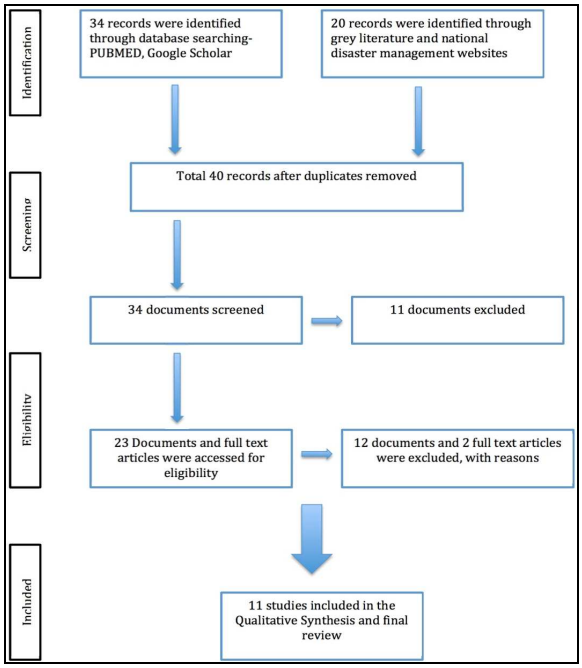

Figure 1. *Methodology based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement.*

3.1.1. Impact of Devastating Floods

- *Loss of livelihood:* Tremendous loss to farmers as a result of widespread destruction to crops, livestock, seeds, tools, food stocks, assets and arable land. Irrigation systems wiped out.
- *Impact on Crops: Significant impact on* (harvest in Aug), cotton, groundnut, millet, Rice, Soybean and sugarcane (Grown in Aug) and Sorghum (planting in Aug)
- *Impact on food availability and access:* Staple food availability, access to food from own production and from decline in the procurement of food. Further impact through increase in the market prices of food. Decreasing employment opportunities affect the incomes of the household.
- *Impact on food consumption:* Lower quantity of food consumed due to decreased availability and/or increased prices. This leads to lower quality of diet and overall shortage of food.

3.2. Disaster Risk Reduction

While the government has established a comprehensive DRR governance system in Pakistan on paper, in reality the system suffers from lack of political commitment, funding, skilled human resources, coordination, fragmentation, overlapping and unclear agenda among government agencies horizontally and vertically. The system is especially weak at the local district levels where the bulk of implementation occurs.

The national DRR system focuses mainly on response and ignores other more sustainable and durable dimensions of disaster, such as prevention and mitigation which can address the root causes of disaster risk within the country, which because of its geographical diversity is vulnerable to a large range of physical hazards, such as floods, earthquakes, tsunamis, and cyclones. [10]

Government programs and policies often end up increasing people's exposure to physical hazards. The malpractices of local elites reduce people's access to resources and information.

CBDRM has helped increase people's strength through community-based organizations who developed contingency plans for dealing with disasters, developing linkages with external governmental and non-governmental stakeholders involved in preparedness and response activities and undertaking micro-mitigation work within communities. Agencies have also become better organized coordinating their DRR work and undertaking DRR-related advocacy through the establishment of a DRR Forum. However, coordination among NGOs at local level is still low. There is no to little exchange of information, resources etc. at the lower level and very limited attempts have been made to develop broader perspectives on the vulnerability status of communities within districts.

Moreover, DRR work is mainly being done by agencies as part of emergency work. CBDRM mostly focuses on response and avoidance and ignores DRR prevention and mitigation dimensions.

3.3. Flood

Disaster management in Pakistan essentially revolves around flooded areas with a primary focus on rescue and relief. After each disaster episode, the government spends resources at rescue, relief and rehabilitation. [11]

Disasters are viewed in isolation from the process since cost effective methods do not influence disaster management policy and responses. After 1992 floods, a comprehensive flood forecasting and warning system were established under the auspices of the FFC and the PMD. The Indus Flood Forecasting System includes weather radars, an HF radio system for communication, gauges within the river system to monitor water flow, development of training and user manuals, and preparation of computer simulation models. The PMD issues warnings to the PDMAs and district authorities regularly based on this system. However, there is a need to

distribute information using less technical hydrological information for an appropriate and scalable response from district authorities.

In addition, flash floods are inherently difficult to predict. Moreover, even with rive floods, the scope of the floods caused by breaches in the irrigation system may be difficult to predict, as was the case during the destructive 2010 floods. Thus, there is a need to enhance the technical capacities of the system further and enhance its ability to provide user- friendly information to district authorities. In addition, district authorities often lack the resources to transmit the information down to communities. Thus, less than 10% of the affected villages in 2010 floods had received advanced warning and that too was usually from mass media sources or word of mouth. The flood warning system is the most comprehensive one in Pakistan despite all its weaknesses. There are pilot EW systems along the coast for tsunamis and cyclones. However, these systems are not fully functional.

3.3.1. Flood-Disaster Risk Reduction: Prevention and Mitigation

Although individual flood events cannot be linked with certainty to climate change, a rise in global floods is increasingly seen as a partial factor to global climate changes. As such, a reduction in their frequency will require international coordination by all countries. [12] Given its high vulnerability to floods, Pakistan must play an active and meaningful role in global climate change negotiations and increase its contribution.

The government of Pakistan had set up a Climate Change Ministry in 2010 and the NDMA has been merged into it recently. [13] However, the ministry is too new at the moment to have taken any major steps to deal with climate change.

The high degree of deforestation that has occurred throughout Pakistan is also contributing to increased occurrence of floods. Extensive deforestation in the upland catchment area for timber and fuel wood reduces the water-retention capacity of the forest eco-systems. This can increase surface water runoff and soil erosion, increasing the quantity, velocity and sediment load of the headwaters entering the river system. In turn this causes repeated landslides, damages riverine infrastructure and results in further siltation of the downstream water channels. While some small-scale reforestation programs exist, major steps are needed to reverse the deforestation. [14]

Another major factor undermining people's strength is the social structure in rural Pakistan since resources are controlled by local elites, such as landlords and tribal leaders. Land ownership is heavily concentrated in Pakistan and poor communities are often pushed into cultivating marginal land, which is less productive and also located in areas more vulnerable to disasters. [15] During the 2010 floods, there were numerous complaints against landlords and government officials conspiring to divert floods away from the lands of rural elites and towards their lands.

3.4. Flood Mitigation Activities

Flood mitigation activities do occur annually in Pakistan under the auspices of the FFC and the provincial irrigation departments. These departments plan, design, construct, and maintain flood protection works through flow measurement at specific sites on rivers, canals, and 'nullah' and construction, and maintenance of flood protection irrigation channels, small dams and protective works. However, there is no easily available master plan linked to a national hazard and vulnerability atlas which could highlight the main points of vulnerability throughout the country and help in analyzing whether these departments are focused on the most crucial points of vulnerability and how effectively and efficiently they are addressing them.

In addition, reduction of mitigation is a serious issue in Pakistan due to the construction of large-scale development project without adequate analysis of their impact on disaster risks. [16] Thus, communities view several large-scale projects as having increased their vulnerability, e.g., the World Bank-funded Left Bank Outfall Drainage Project (LBOD), is viewed as having blocked most of the natural rainwater flow. [17] People feel that it is important that the government re-opens all these flows so that access rainwater would drain its self out. Such projects are altering delicate ecological balance, enhancing environmental degradation, exacerbating conflicts over resources and enhancing power inequities within the country.

3.4.1. Disaster Preparedness: Avoidance and Response

The level of preparedness for floods in Pakistan is higher than for other natural hazards. The Ministry of the Interior through the National Crisis Management Cell round-the-clock monitors emergencies. It coordinates with the provincial Crisis Management Cells and all other security agencies to provide information for any emergency situation.

However, in practice, these institutions require more effective capacity for dealing with large- scale disasters as evident during the 2005 earthquake and 2010 floods. Practically, only the Pakistan Army, because of its superior communications, transportation facilities, and skilled human resources, has a high degree of effective relocation, rescue and immediate response capacity. The DDMAs, which are the main implementation focal points during emergencies, mentioned their dependence on the army and NGOs for disaster response purposes. Most District authorities currently lack the capacity to implement the plans in even medium scale emergencies.

3.4.2. Strengthening Coping Mechanisms

Vulnerable people individually and collectively develop their own means, resources and strategies to cope with flooding. All of these mechanisms, however, have financial, social and/or opportunity costs. A review of a preparedness programme in Bangladesh shows that vulnerable people have little or no surplus income to invest in the measures that can protect them from flooding although they know what to

do. [18] Social capital, e.g., reciprocal support among neighbors, support from immediate family members and wider kinship networks, is a vital safety net for people in coping with recurrent flooding. The destruction of assets, which function as a buffer, can make people more vulnerable to the next flood. Both flood risk reduction and response are more likely to be effective when they include coping mechanisms in the assessment and programme design. [19] Programmes that directly support communities and their local organizations have proved to work best for immediate reinforcement of coping and resilience capacities. [20]

3.5. Rights based Approach on Disaster Management

To develop a rights-based, constitutionally-mandated perspective on disaster management, it would be useful to link Pakistan's constitution ACT, which requires the government to safeguard and protect the lives and properties of all citizens. A more participatory and consultative approach in developing the Act would also be helpful.

Pakistan's current socio-economic development path has created disaster risk by increasing people's exposure to extreme flooding during heavy monsoon rains. To prevent future catastrophic floods a fundamental change in the country's development path is needed that decouples exposure and vulnerability from economic growth and is more in harmony with the functioning, capacities and thresholds of the natural environment. It is apparent the catastrophic flooding in Pakistan was far from "natural" or an "act of God" The catastrophic flooding in the country could have been curtailed with the benefit of hindsight and given the optimum management of its political, social and economic spheres by the government. [21]

In this respect adopting a risk management approach in the post-disaster recovery offers a unique opportunity to build a safer more resilient society that provides for the basic protection and wellbeing of its citizens; [22] in the short term the increased sense of awareness and interest for disaster risk reduction can provide the impetus to raise levels of disaster preparedness through developing forecasting, early warning and evacuation systems. In the longer term, the greatest opportunities to prevent future disasters lies in harmonizing actions on disaster risk reduction, climate change (mitigation and adaptation) and livelihood resilience to address the "underlying drivers" that configure risk in the first place.

4. Conclusion

Pakistan is a developing country and does not have the resources to be able to cope with and recover from numerous large-scale disasters. It needs to take steps to reduce exposure and vulnerability, to mitigate the impact of disasters, and prepare for these so it can respond effectively when they occur. In other words, it needs to strengthen its disaster risk management.

While Pakistan has set up the DRR governance system, it needs greater funding, political will, and coordination to work more effectively. Most of the focus is on avoidance and response, the least sustainable form of DRR and even these activities are not highly efficient or effective.

Mainstreamed DRR work in the areas of water, sanitation, health, shelter and livelihoods can enhance community resilience to future disasters by providing stronger shelter, water and sanitation structures which can withstand floods better; and increasing people's assets and knowledge.

4.1. Coordination between Federal and Provincial Agencies

As with the vertical linkages among the NDMA, PDMAs and DDMAs, there is a need to further enhance coordination among these federal and provincial agencies horizontally. Since the total DRR agenda of prevention, mitigation, early warning, avoidance and response is divided across multiple agencies, they should coordinate more regularly and formally. Having one agency with complete oversight over the entire DRR national agenda would increase synergy among the different DRR activities.

4.2. Knowledge, Awareness-Raising and Attitude and Practice Change

The NDMA is active in undertaking awareness-raising and capacity-building activities on DRR in Pakistan. However, there is a need to collate information about actual DRR mainstreaming in regular development work of the government. A high number of NDMA activities occur at the national and provincial level, but there is a need to do more at the local and community levels.

In the situation where rehabilitation of those suffered severely from catastrophes in the form of severe 2010 and 2011 flood is still in progress, another plague of such worst level would wipe out everything.

Based on the above analysis the following priorities have to be considered: (i) Increase clarity regarding the roles of both government and non-government stakeholders, and established mechanisms for coordination among them; (ii) Given the scale of disaster risk, individual agencies can play a more effective role if they pool their resources and coordinate more effectively, especially locally; (iii) Increase attention to the DRR/M issue of vulnerable and marginalized groups, including persons with disabilities and older persons; (iv) Ensure sustained funding for dedicated human resources in Disaster Management Agencies at the Provincial and District levels; (v) Inclusive, participatory, gender sensitive, child friendly, eco-friendly and disabled friendly disaster management programs and policies.

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