

Flood Damages and its Management Strategies (2010) in Layyah district, Pakistan

Maria Neelam, Iqra Afzal, Muhammad Nawaz, Sheikh Saeed Ahmad

Abstract-Floods are the infrequent occurrence of water on land that affects normal activities. Pakistan suffered nationwide floods after exceptional monsoon rains in July 2010. Generally, Pakistan has a history of floods which primarily occurred due to monsoon incursions, unexpected and abnormal releases of water by India. Besides low floods, the country suffered from high floods in several years i.e. in 1950, 1956, 1957, 1958, 1963, 1965, 1973, 1976, 1988 and 1992 and onwards till 2014. Punjab had worst floods since 1929 and 13 districts are said to be hit, more than 3.3 Million people have been hit. Muzaffargarh, Rajanpur, Layyah and D.G. Khan Districts are among the districts badly affected. The floods that arose in the north-west of Pakistan in July 2010 followed the heaviest monsoon rains that the country had seen for 80 years. In the major flood of 2010, more than 31,658 houses had been washed away alone in the District Layyah of 500,000 for all over Punjab. The two Union Councils Baseera and Sahu Wala in the district Layyah have been heavily destroyed. Various strategies can be planned for managing the upcoming floods in north-west Pakistan including Layyah as the climate change trend is moving towards north-west of Pakistan. Structural measures are needed to avoid damages along with the flood forecast preparations and warnings that can be issued by Pakistan meteorological department. Improved rainfall-runoff and flood routing models have been developed by National Engineering Services Pakistan (NESPAK). WAPDA Flood reservoir management in Pakistan is restricted to dam structures safety that revised the guidelines for dam management to avoid flood losses.

Key words-Climate change, Flood prone areas, Flood management, Layyah district

1 INTRODUCTION

FLOODS are the infrequent occurrence of water on land that affects normal activities. River and flash flooding occurs due to heavy rainfall over an area in a short time period [1]. Deforestation in water catchment area and sedimentation of river beds can aggravate conditions resulting in floods in river valleys.

livestock, maritime industries and food stock etc.[3]. Seasonal floods can be a fundamental source of nutrients for agricultural lands, and recharge water supplies in dams and underground aquifers. In some parts of the world, lack of seasonal floods is also a disaster [2].

Generally, Pakistan has a history of floods which primarily occurred due to monsoon incursions, unexpected and abnormal releases of water by India. Besides low floods, the country suffered from high floods in several years i.e in 1950, 1956, 1957, 1958, 1963, 1965, 1973, 1976, 1988 and 1992 and onwards till 2014 [4],[5].

Flash Floods generally come because of hill torrents on each side of Suleiman Range, Western Punjab and Baluchistan. Insufficient facilities of drainage in urban centers cause Urban Flooding. Cyclonic activities, which are prevalent before and after the monsoon incursions, produce Coastal Flooding. Global warming and climate change fallout in extreme melting of glaciers which forms glacial lakes following the moraine. These lakes may form causing Glacial Lake Outburst Flood (GLOF) [6], [7].

Maria Neelam: MPhil leading to PhD, Environmental Sciences Department, Fatima Jinnah Women University, The Mall, Rawalpindi.marianeelam35@gmail.com

Iqra Afzal: MPhil leading to PhD, Environmental Sciences Department, Fatima Jinnah Women University, The Mall, Rawalpindi.iqraafzal1990@yahoo.com

Muhammad Nawaz: Environmental Sciences Department, Bahaudin Zakriya University

Sheikh Saeed Ahmed: Associate Professor, Environmental Sciences, Fatima Jinnah Women University.

Risk of flash floods is significantly increased due to deforestation and tiling over land.

Development in flood plain areas or in environmentally ruined areas, or altering the systems of natural drainage, can significantly increase the risk of flood damage [2] [3].

Elements that are at highest risk of damage by the floods can be any structure situated within flood plains, buildings having feeble resistance to loads, roads and bridges,

Monsoon depression provides rain because of orographic lifting but at times serious downpour is due to its interference with westerly cold winds. Different impacts of climate change i.e elevated temperatures, extreme weather events and variable precipitation are being felt all over world including South Asia e.g. recorded increase of about 55 ppm in CO₂ concentration in the atmosphere that caused

1.5° C rise in temperature in Pakistan and surrounding regions [3],[8].

Based on last 70 years, the recent trend of climate change in Pakistan climatic data, compiled by Pakistan Meteorological Department indicated that there is an increase of 18-32% in rainfall in monsoon season and Monsoonal region of Pakistan (region receiving 65% of total monsoon rains) has shifted 80-100 km from North East (upper Punjab + Kashmir) towards North West (KPK + North West Punjab), therefore, in future the chance of heavy rainfall during the season of monsoon, would be more likely over North West Pakistan instead of North East [7],[9].

The floods that arose in the north-west of Pakistan in July 2010 followed the heaviest monsoon rains that the country had seen for 80 years. The devastation soon swept south along the Indus River, destroying agricultural land and entire villages and leaving millions of people vulnerable to starvation and disease, not to speak of the thousands dead and several million left homeless. Government reports show that over 18 million people have been affected by the deluge; over 11000 villages and 1.74 million homes have been destroyed or damaged. The death toll stands at 1, 985 [10], [11].

Heavy rains of monsoon season in the months July and August 2010 have triggered both river line floods and flash floods in different parts of the country resulting in a loss of life and widespread displacement especially in Punjab, Khyber Pakhtunkhwa, Sindh and Baluchistan that have been the most terrible affected areas. Roads and bridges damaged and crops have been destroyed. Punjab had worst floods since 1929 and 13 districts are said to be hit, more than 3.3 Million people have been hit. Muzaffargarh, Rajanpur, Layyah and D.G. Khan Districts are among the districts badly affected [3], [12].

2 LAYYAH FLOODS (2010)

The district of Layyah lies among 30-45 to 31-24° North latitudes and 70-44 to 71 -50° East longitudes. Total area of district is 6,291 sq. K.M. The Population of district is 1,121,951. Population density of is 178.2 people/sq km. The climate of district ranges from too hot in summers and too cold in winters. Observed highest temperature is beyond 45° C in the month of June and is lowest till 02° C in the

month of January. Average rainfall does not exceed 18.7 centimeters that is usually in the month of July and August (monsoons), though some variations have occurred in the past. Conversely intense rain anywhere in district, results in floods in river of Indus. These floods results in havoc particularly in the low lying areas down the banks of river (North West to south west of whole district). High floods in months of monsoon of 2010 caused huge loss of human lives, houses, land cattle and crops [13], [14].

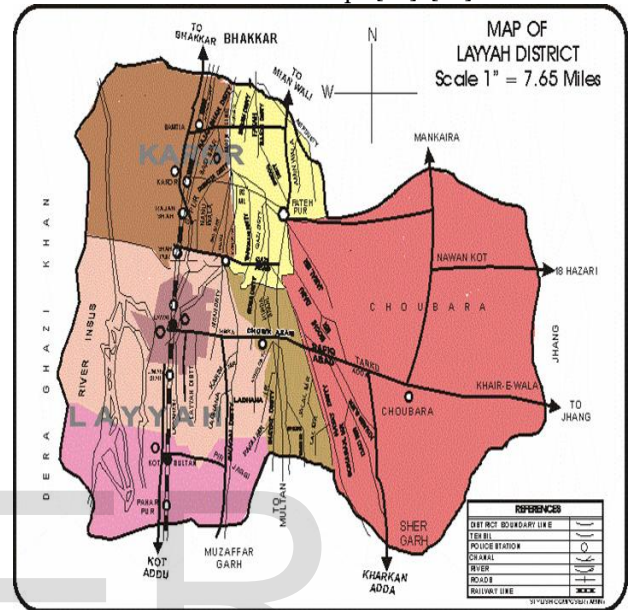


Figure 1: Map of Layyah District

In the major flood of 2010, more than 31,658 houses had been washed away alone in the District Layyah of 500,000 for all over Punjab. Almost 154,000 affected families belong to the most vulnerable category. Different Reports indicated that in Layyah, more than 50,000 homes have been underwater and that 15 Union Councils have been affected, with a total of almost 405,258 affected individuals. The linking road between Multan and Layyah, which leads to the main transportation road to Islamabad had also been destroyed and cut off. The two Union Councils Baseera and Sahu Wala in the district Layyah have been heavily destroyed and most of their inhabitants have been rubbed of their valuable goods, livelihood and houses.[15],[16],[17],[18]

One of the important sources of income for inhabitants before floods was as laborers (generally unskilled) and livestock. Almost all of the live stock in the village has destroyed due to severity of flood. Therefore, majority of community members do not have their own land or they

don't have the financial resources to buy the agriculture inputs to initiate activities. The devastating flood has badly damaged the agriculture related infrastructure which includes destruction of irrigation networks and increase in water logging and salinity due to the raise of water in the flooded areas. As a result, destruction of standing crops and livestock has formed a resource gap for the refugees of their survival. [18],[19]

Layyah district was significantly affected as houses are damaged at a very large scale but other infrastructures are also damaged that can take longer time to recover. Irrigation system was damaged due to losses of canals, machinery, agricultural tools. This infrastructural destruction would have a substantial impact on all crops. Total agricultural losses are about \$3 billion. There is always a high risk of disease epidemic due to inadequate drinking water and sanitation facilities. [20]

Table 1: Demographic Information about Layyah Flood Damages 2010

Demography	Total	Affected
Population	1,514,073	360,647
Area (Sq km)	6,291	1,039.45
Number of Tehsil	3	3
Union councils	44	18
Villages	733	122
Household size	6.9	-
Houses Damaged	-	31,650 approx.
Agriculture	-	143,500 acres
Livestock	2,012,010	1,300,237

Table 2: Initial Assessment of Damages (2010)

Sectors	Amount(Billion PKR)
Infrastructure	0.53

Education	1.38
River and bridges	0.53
Irrigation	1.00
Sanitation	0.5

Since this natural disaster was bigger than any recent disaster, there was a dire need of aid to Pakistan both at national and international levels. Several services were given at remote locations of the Layyah district, to the flood refugees for saving life rescue during Layyah Flood 2010. The services were provided together with the cooperation of local government and other community organizations using various domestic and large vehicles and Camp Management that included food distributions to the affected people. The supply of various Essential Kits to affected people includes distribution of hygiene kits, nonfood items kits and winterization kits. To provide standard and safe livelihood conditions for the flood affected area, project named One Room Shelter also known as ORS with hygiene facilities was started in five different union councils of Layyah district that included Lohanch Nasheeb, Jhakar, Sahoowala, Baseera and kotla Haji Shah. Four hundred and ten ORS with sanitation facilities were done [20].

Through the Assessment of beneficiaries Awammi Development Organization Hygiene team delivered 74 sessions in five union councils of district Layyah. The purpose of these hygiene sessions was to create awareness for cleanliness to local poor community about life standards. Hygiene kits were also distributed in the participants after the sessions, for adaptation and daily life use. For the Disaster Risk Reduction (also known as DRR) Awammi development Organization conducted 19 trainings for local people to be introduced to the DRR building tools & its techniques and to enhance their skills. Essentials were distributed among the flood victims including food items, cash amount, school uniforms, books and fee for children.[3],[20]

UN aid agencies along with other international aid organizations have helped Pakistan greatly in relief efforts and are still playing a vital role in easing the miseries of the affected population. UN launched an appeal of \$460million for the flood victims. UN agencies that were prominent in flood relief efforts include WFP, WHO, FAO, UNDP, UNICEF, UNHCR [21], [22], [23].

3 CONCLUSIONS

Layyah district of Pakistan lies in areas where various manmade and natural disasters have become usual occurrence. Various strategies can be planned for managing the upcoming floods in north-west Pakistan including Layyah as the climate change trend is moving towards north-west of Pakistan [24].

4 RECOMMENDATIONS

Structural measures are needed to avoid damages i.e construction of embankments, spurs/battery of spurs, dikes/gabion walls/flood walls, dispersion/ diversion structures, delay action dams, circumvent structures and channelization of flood water. Along major rivers and their tributaries approx 5,600 km of embankments has been constructed in Pakistan along with more than 600 spurs to protect these embankments. Flood forecasts preparation and warnings including their dissemination to public and concerned agencies and data can be issued by Pakistan meteorological department (PMD) that uses weather radar prediction. Improved rainfall-runoff and flood routing models have been developed by National Engineering Services Pakistan (NESPAK) for PMD to provide more consistent and clear flood information to a flood prone population [25],[26],[27].

WAPDA Flood reservoir management in Pakistan is restricted to dam structures safety. To avoid flooding in downstream area by reducing the out flow to a safe limit, guidelines for flood management of dams were revised. Guidelines were further customized later. Land use Changes can affect the regularity of the floods so the chance of floods happening can be reduced by managing and restoring land, drainage and river systems by using land along ecological reserves. Prepare the communities with the awareness and power to be active for effective disaster risk management at the times of disaster in order to avoid the losses and damage to property and lives by publicizing the impact assessments[28],[29],[30].

5 REFERENCES

- [1] "Pakistan Flooding", Executive Brief, August 26, 2010, www.fao.org
- [2] Asian Development Bank and World Bank, Pakistan Floods. Preliminary Damage and Needs Assessment, November 2010
- [3] Asrar-ul-Haq, E., & Zaidi, E. S. M. A. Flood 2010: The Event, Issues and Way Forward. *FLOOD.2010*
- [4] Murtaza, N., Mohammed, N., Bhatti, S., Akhtar, S., Harrison, S., & Ferretti, S. (2011). *PAKISTAN FLOODS 2010*.
- [5] Houze, Jr. et. al., Anomalous Atmospheric Events Leading to the Summer 2010 Floods in Pakistan, University of Washington, December 2010.
- [6] Economist Intelligence Unit, Pakistan Country Report, December 2010
- [7] Houze, R. A., Rasmussen, K. L., Medina, S., Brodzik, S. R., & Romatschke, U. Anomalous Atmospheric Events Leading to the Summer 2010 Floods in Pakistan. *Bulletin of the American Meteorological Society*, 92(3), 2010.
- [8] Kronstadt, K. A. (2010). *Flooding in Pakistan: Overview and issues for congress*. DIANE Publishing.
- [9] Shabir, O. A summary case report on the health impacts and response to the pakistan floods of 2010. *PLOS Currents Disasters*. 2013 Apr 11. Edition 1. doi: 10.1371/currents.dis.cc7bd532ce252c1b740c39a2a827993f
- [10] Pakistan Revised Emergency Response Plan, September 2010
- [11] Polastro, R., Nagrah, A., Steen, N., & Zafar, F. Inter-agency real time evaluation of the humanitarian response to Pakistan's 2010 flood crisis. Madrid: DARA.2011
- [12] Khaleeq Kiani, "150 major irrigation structures damaged by floods", Dawn, August 27, 2010
- [13] Oxfam International, Missing Pieces? Assessing the impact of humanitarian reform in Pakistan, October 2009
- [14] Oxfam International, Six months into the floods, January 2011
- [15] Pakistan Flood Relief and Early Recovery Response Plan – Revision,138, November 2010.
- [16] Pakistan Initial Floods Emergency Response Plan, Aug 2010

- [17] NDMA, A Review of the Pakistan Flood Relief and Early Recovery Response Plan, January 2011
- [18] Anonymous. (2012, July 31). Flood hits Layyah, Multan districts; DG Khan & Jhang alerted. Dawn.com. Retrieved from <http://www.dawn.com>
- [19] European Commission's Humanitarian Aid Office (ECHO), Emergency Market Mapping and Analysis (EMMA) Punjab Report, September 2010
- [20] Anjum, M.A. Flood disaster. Relief & evacuation plan - 2011 District layyah, Flood Contingency Plan.2011
- [21] OCHA, Pakistan Humanitarian Bulletin 1-12, Sept 2010 – Jan 2011
- [22] Simon. R and Maseeh. R. Pakistan Flood Toll Rises But international Aid Fails to Flow“, Guardian. August 10, 2010. www.guardian.co.uk/world/2010/aug/10/Pakistan-flood-international-aid
- [23] Solberg, K. Worst floods in living memory leave Pakistan in paralysis. *The Lancet*, 376(9746), 1039-1040. 2010.
- [24] Turner, G., Said, F., Afzal, U., & Campbell, K. The effect of early flood warnings on mitigation and recovery during the 2010 Pakistan floods. In *Reducing Disaster: Early Warning Systems For Climate Change* (pp. 249-264). Springer Netherlands.2014
- [25] UNDAC, Key Findings: Pakistan Floods. Report No.1, Aug 15, 2010.
- [26] UNDAC, Key Findings: Pakistan Floods. Report No.2, Aug 22, 2010.
- [27] UNDP, Early Recovery Needs Assessment, 2010.
- [28] United Nations, Pakistan Floods 2010: Integrated Survival Strategy, October 2010.
- [29] Van Aalst, M. K. The impacts of climate change on the risk of natural disasters. *Disasters*, 30(1), 5-18, 2006.
- [30] Tariq, M. A. U. R., & van de Giesen, N. Floods and flood management in Pakistan. *Physics and Chemistry of the Earth, Parts A/B/C*, 47, 11-20. 2012