

# Reduction of Damages Through Pre-Flood Management Strategies: Case Study of District Bhakkar in Punjab-Pakistan

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**Abstract**-Climate change has daunting impacts on various socio-economic sectors such as water, agriculture, health, biodiversity and forests etc. Unprecedented climate change and heavy rainfall are the most significant causes of flooding. Northern areas of Pakistan have more than 5000 glaciers and these glaciers are melting at a very fast rate(i). Rapid glaciers melting due to changes in climate is one of the causes of recent floods in Pakistan. This paper attempts to explore pre-flood management strategies for District Bhakkar to reduce the damages caused by floods. The literature on pre-flood management strategies was reviewed for this study. The findings of this paper are based on a field survey conducted with community members of District Bhakkar in Punjab, Pakistan. This survey and subsequent analysis explored the dire need of pre-flood management strategies in the case study area.

**Keywords**-Pre-flood Management, Damages, Strategies, Early Warning System, District Bhakkar

## I. INTRODUCTION

Globally climate change is possessing serious challenges to social, economic and environmental development [ii]. Unprecedented climate change and heavy rainfall are the most significant cause of flooding. Almost 90% damages caused by floods are happening in developing countries because of their low resilience to timely cope with the situation [iii]. According to Global Climate Risk Index 2014, Pakistan ranked 3rd on the list of countries most affected by climate change [iv]. Flooding is one of the devastating impacts of climate change in Pakistan [v]. Pakistan lacks a systematic approach towards floods and disaster management. Post-disaster management strategy is usually used in Pakistan. When disasters finish swallowing up lives, livestock and agriculture production then authorities come in and announce aid for affected communities. Reconstruction and rehabilitation are mostly done in flood affected areas in Pakistan [vi]. Disaster management authorities are working all over

the world to make disasters less damaging (vii). Different pre-flood management approaches are used in different countries. Usually, disaster is detected earlier and communities are warned beforehand which enables them to protect their lives and belongings. Therefore, a flood early warning system is needed which serves as a foundation for pre-flood management strategies [viii].

The International Strategy for Disaster Reduction (ISDR) defines early warning as “the provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response” [ix].

Early warning systems can provide the necessary information and strategies to a community to enable them to be proactive and better prepared for impending disasters. An effective system enables the concerned authorities and at-risk communities to know about the hazards at the locality, community vulnerabilities, and impending risk, to receive warning messages, and to mobilize their response capabilities to reduce risks. Pre-flood management strategies have a positive impact on the economic well being of society. These strategies facilitate communities to not only protect their lives but also their livelihoods [x].

## II. MATERIALS AND METHODS

Although floods of 2010 and 2013 had caused a number of damages all over Pakistan but this study was carried out in District *Bhakkar* where aforesaid floods had caused great loss of life, livestock and the livelihood of the community [xi-xii]. *Bhakkar* is located near to Indus River (see Map 1). Floods had destroyed a large number of the population who were living near the river in *Bhakkar*. Floods had destroyed many villages of *Bhakkar* city including *Bastisial*, *jam*, *Notak*, *Bilal Behal*, and *Mumdani*. After a thorough and deep study of flood-prone areas of *Bhakkar*, village “*Basti Mumdani*” had been selected as case study area for detailed survey. The reason behind the selection of village *Mumdani* was its high vulnerability to floods as compared to other villages in *Bhakkar*. Primary data

was collected by conducting surveys from community members of village *Mumdani* using the questionnaire.

Random sampling was used to select 60 respondents in this village.



Map 1. Map of Bhakkar along with Indus River

Although floods of 2010 and 2013 had caused a number of damages all over Pakistan but this study was carried out in District *Bhakkar* where aforesaid floods had caused great loss of life, livestock and the livelihood of the community [xi - xii]. *Bhakkar* is located near to Indus River (see Map 1). Floods had destroyed a large number of the population who were living near the river in *Bhakkar*. Floods had destroyed many villages of *Bhakkar* city including *Bastisial*, *jam*, *Notak*, *Bilal Behal*, and *Mumdani*. After a thorough and deep study of flood-prone areas of *Bhakkar*, village “*Basti Mumdani*” had been selected as case study area for detailed survey. The reason behind the selection of village *Mumdani* was its high vulnerability to floods as compared to other villages in *Bhakkar*. Primary data was collected by conducting surveys from community members of village *Mumdani* using the questionnaire. Random sampling was used to select 60 respondents in this village.

and Meteorology (DHM) had started a community-based flood early warning system in the West Rapti basin. Real-time information on water levels at the upstream gauging station operated by DHM is provided to communities to warn them of impending floods. This early warning system in Nepal had remained very successful to save peoples' lives and their belongings [xv].

Government of Philippines had installed 15 rain gauges on the slopes of Mt. Mayon - an early warning system against devastating floods. They have plan to install more sophisticated early warning weather stations to reduce the impacts of future flooding in Philippines [xvi]. These examples of flood early warning system can easily be replicated in other developing countries like Pakistan.

### III. LITERATURE REVIEW

An early warning system had been set up on the *Bhote Koshi* River by the *Bhote Koshi Power Company* (BKPC) in Nepal. The early warning system consisted of two sensor stations at the *Friendship Bridge* which transmit a warning in the event of a flood to sirens located downstream at the headwork and at *Hindi* village and a warning cum monitoring station at the powerhouse in Nepal. These early warning systems had reduced damages caused by floods in Nepal [xiii].

### IV. ANALYSIS AND DISCUSSION

Sixty respondents were interviewed in this survey in village *Mamdani*. Among these sixty respondents, the distribution of male and female was unequal. Females were reluctant to take part in answering the questionnaire. Therefore 48 males and only 12 females could be interviewed (see Fig 1). It shows that females are less active than males in this area to take part in any social activity.

Early warning systems require contributions from a wide range of actors and institutions, including local communities, national governments, regional organizations, NGOs, the private sector, and the science community. Since 2002, Practical Action had been working on flood early warning systems for communities in Nepal. In the initial period, observation towers were set up with a siren system to watch and warn communities of impending flood disasters [xiv]. This initiative introduced the concept of early warning systems, but the technology has now been improved.

In the western region of Nepal, Practical Action and Nepalese Government's Department of Hydrology

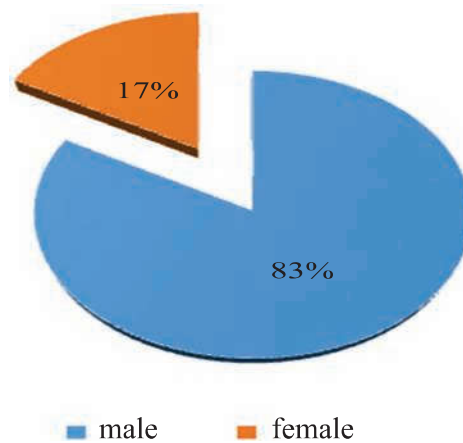


Fig. 1. Gender Ratio

Occupation of each respondent was also asked in this survey. Housewives, farmers and workers were interviewed randomly to have a variety of information in this survey. Fig. 2 highlighted that more than 50% respondents were farmers in this survey. It shows that most of the people in this village are dependent on agriculture profession for their livelihoods.

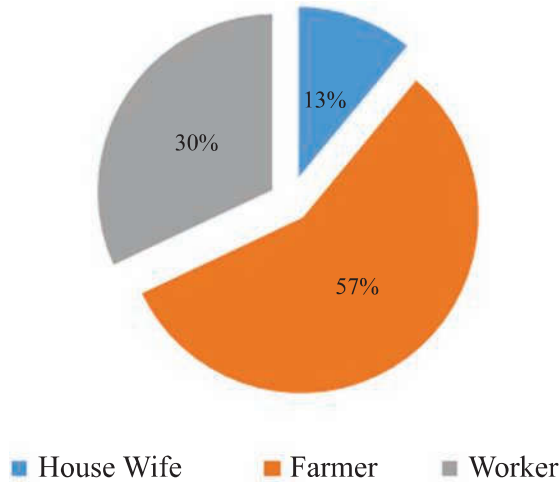


Fig. 2. Occupational Distribution

Further it was asked from the respondents what they were doing when the flood hit their village. This question indirectly unwrap the level of awareness people were having about the flood forecast. Analyses disclosed that majority of villagers were busy in their daily routine, working in fields and factories or on their shops (see Fig 3). This analysis revealed that most of the people were not aware or prepared for the upcoming flood in their area.

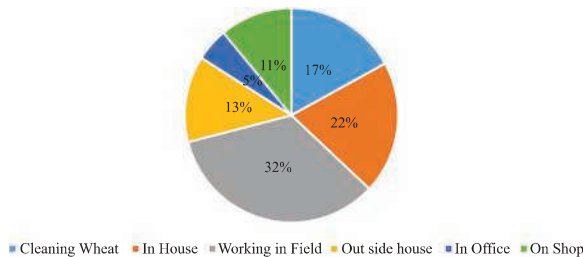


Fig. 3. Activities at the Time of Flood

Moreover, villagers were directly asked about any early warning about past floods they had experienced. The unexpected response was received from villagers. Fig. 4 shows that three-fourth (75%) of the respondents received warning for flood while remaining 25% villagers did not receive any kind of information about upcoming floods in their village. It shows some positive role of Government of Pakistan in providing early warning to the residents of flood-prone areas.

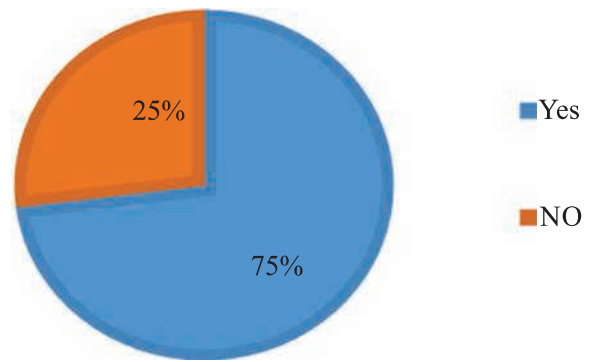


Fig. 4. Warning Received

The next interesting question was that how earlier the communities get informed about the upcoming floods. The purpose of this question was to find out that had community members got enough time to respond properly to the warning and evacuate the area? Analysis revealed that almost half of the respondents (54%) got information only 4 to 7 hours before the flood hit their area (see Fig 5). Only 18% villagers received flood warning four days before the flood hit their area. This analysis shows that majority of villagers did not receive flood warning earlier to respond before the flood hit their area.

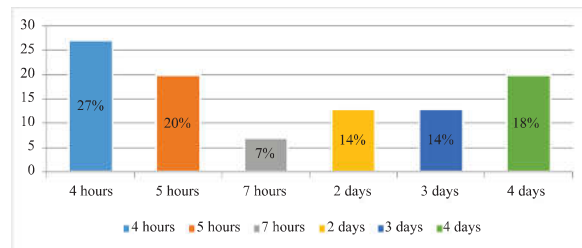


Fig. 5. Timing of Warning Received

The source of early warning system for the flood is an important indicator to find out the response of community at the time of floods. According to Figure 6, the majority of respondents (60%) had received the warning from Government announcements. Flood warning was announced in the local mosque of case study area. It was also announced that the upcoming flood will be very dangerous and soon can hit the village. Only 20% respondents received information from their friends, family and neighbors. It shows that Government is disseminating the information of upcoming floods to the local residents.

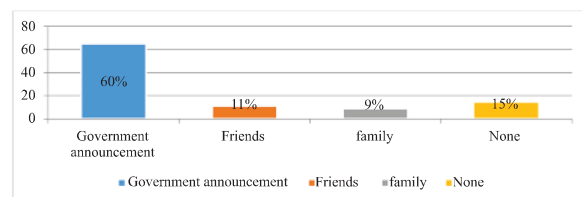


Fig. 6. Source of Warning



After disseminating the warning about the hazard, next responsibility of the Government is to suggest the safe place to the communities at the time of evacuation due to floods. Almost all respondents said that there was no single place suggested to the villagers by the Government where they could move with their necessary luggage and take their cattle with them. It shows that villagers were told to evacuate the area before the flood but no emergency shelter was provided for them to move to.

When the people were only asked for the evacuation without any safer place suggested, what could they do to avoid flood or minimize damage on their own behalf? Analysis showed that a small proportion of respondents(6%) took refuge at their relatives or friends and only 10 % respondents had evacuated the flooded area on self-help. On the other hand, a large part of the respondents (84%) did not do anything until flood trapped them.

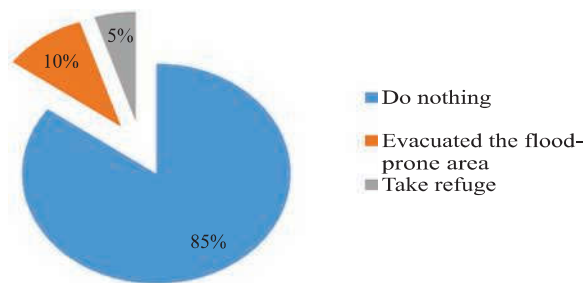


Fig. 7. Action Taken by Residents

When villagers were asked about why they did not take any step to avoid flood, variety of answers were received which unpacked one of the large gaps in the prevailing flood early warning system. Analysis revealed that two-fifths of the total respondents(40%) were not willing to leave their places because they did not believe on Government announcements about floods. A considerable portion (10%) considered the warning as false based on their previous experience of believing on the warning and evacuating the area but actually warning proved false and their area remained safe from the flood(see Fig 8). It shows the lack of trust of people on Government announcements about flood warnings.

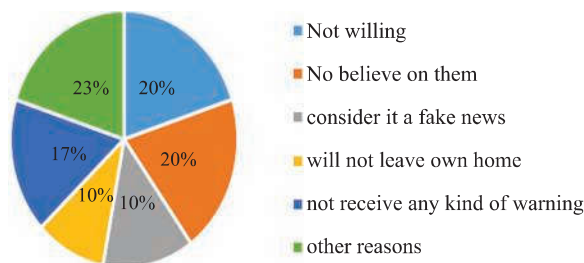


Fig. 8. Reasons behind not taking any Action

The Government of Pakistan claimed that they had prepared very detailed Flood Fighting Plan (FFP) for every district in Punjab [xvii]. But when villagers were asked whether they had been advised of any flood management plan? Almost all respondents' said that they do not know about any flood management plan. Analysis revealed that the plan had been prepared but it is not discussed or disseminated with the local community.

Further community's views were sought on strengthening flood early warning system in their area. The majority of the respondents (80%) were of the view that there is dire need of flood early warning system in their area as part of disaster management.

Suggestions were also sought from community members about how they would like to be informed in future when an early warning system is developed by Government? Respondents gave suggestions according to their local environment and available resources. According to Fig. 9, nearly half of the respondents (45%) showed their willingness to be informed on the radio as they were the regular listener of radio. Secondly, more than one-third respondents (36%) were willing to be informed on television. In addition to this, a small proportion of respondents (19%) were comfortable in receiving the text message of flood warning on their mobiles and considered this mode as most safe, applicable and credible warning mode.

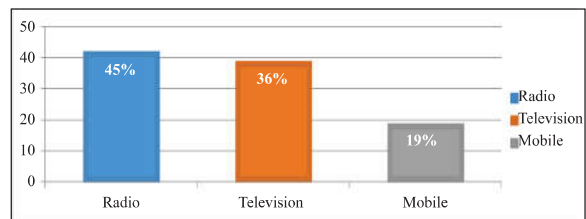


Fig. 9. Mode of Early Warning System

It can be learnt from the experience of the developed countries that there must be the restriction on the construction in hazard-prone areas (xviii). Worldwide research suggested that countries which coped well with the floods had applied effective disaster management strategies [x]. When the residents in this survey were asked that after the occurrence of floods, did government impose any restriction on the development in flood-prone areas, all of the respondents said that no restriction had been imposed on the construction in flood prone areas. It shows that Government is not efficiently working to reduce the damages of people due to floods.

Moreover, residents were asked regarding the strengthening of river embankments. The majority of the respondents(90%) said that no steps had been taken by Government to strengthen river embankment to save the village from flooding. Very few respondents (10%) said that river embankment was done at few places in

their village (see Fig 10). It shows that no effective and efficient pre-flood management strategy was adopted in the case study area.

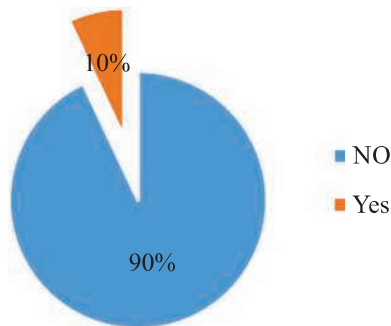


Fig. 10. Strengthening of River Embankments

## V. CONCLUSIONS AND RECOMMENDATIONS

More focused and well-tested disaster management approaches have been used in developed and developing countries to reduce casualties from floods (xix). Early warning system is internationally considered as the basis of disaster management which gives birth to properly structured safety system intended to save lives and their belongings. Community-based early warning system is becoming more common in all developed and developing countries including Pakistan because of its effectiveness and strong roots well absorbed in the local community [xx].

Pakistan lacks in the implementation of proper and well-functioning flood early warning system. Pakistan has poor dissemination and communication of flood early warning system in flood prone areas. Last but not the least; flood response capability among community members is very weak in Pakistan. Communities are unable to understand flood warning messages and its implementation.

The Government of Pakistan should give priority to improve and implement flood early warning system involving the local community and their capacity building. Flood maps can be displayed in the areas showing the location of flood prone areas and safer sites. River embankments should be improved so that these can bear the extreme flow of water during monsoon season.

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