

FLOOD VULNERABILITY ASSESSMENT IN UNION COUNCIL JAHANGIRA, DISTRICT NOWSHERA, PAKISTAN

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Abstract: Flood 2010 is one of the devastating disasters in the history of Pakistan that affected more than 70 districts and lefts millions of people at risk across the country. The rehabilitation and reconstruction process attained both national and international attention; however, some of the areas were overlooked and were not given proper attention, due to which vulnerability of the people exacerbates to future floods. Keeping in view the said situation, a research study entitled ‘Flood vulnerability assessment is conducted in Union Council (UC) Jahangira, district Nowshera, Pakistan. The main objectives of this study were to identify elements at risk, assess vulnerabilities of the people, to determine triggers for vulnerability to flood disaster and to suggest remedial measures for vulnerability reduction in the study area. A total of 60 respondents were selected through simple random sampling technique. The primary data was collected through questionnaire and interview schedule. The present study found that monsoonal rainfall is one of the main causes of floods in the area. The study area is highly exposed to floods due to its geographical location and weak physical infrastructure. The study area is located at the bank of River Kabul. Most of the houses were muddy and cannot resist flood water due to lack of engineering measures. The study revealed that agriculture sector is highly prone to floods due to its proximity and inadequate mitigation measures. The local population especially women, old aged, and disable people are more vulnerable to floods. Based on findings of the study, it is recommended that the local government should device an integrated flood management plan with active participation of the local community and other relevant stakeholders. Furthermore, local people should be educated about flood hazard and vulnerabilities in order to ensure public safety in the study area.

Keywords: Flood, Vulnerability Assessment, River Kabul, UC Jehangira, Nowshehra

Introduction

Flooding is the most frequent and devastating phenomenon around the globe (Tingsanchali, 2012). Over the past few decades, the pattern of floods risk across all continents has been changing and becoming more frequent, intense and unpredictable due to which vulnerability of the people move upward and increased significantly (IPCC,

2007; Dinha et al., 2012). Flood has a very special place in natural hazards as it is the costliest natural hazard in the world that account for 31 percent of economic losses resulting from natural catastrophes (Tingsanchali, 2012; Briguglio & Kisanga, 2004). Each year, it renders millions of people across the world and results in extensive socio-economic and human losses (Birkmann, 2006; Briguglio et al., 2009). According to

Tingsanchali & Karim (2010), the potential risks posed by flood hazards are globally and widely distributed to human life, property and livelihoods, and therefore, the demand for vulnerability analysis is increasing day by day across the globe (Rahman & Shaw, 2015b; Balica et al., 2013). The results of vulnerability analysis could be used to map out the flood prone areas and to develop integrated flood risk reduction measures (Balica, Douben, & Wright, 2009). These measures should be involved both structural and non-structural measures such as dams, protection walls, levees, forecasting, training, education and building codes application (Ahmad, Kazmi, & Pervez, 2011; Douben, 2006).

Vulnerability of the communities to floods is mainly exacerbated by geographical location, house's type, low preparedness level, inadequate planning and insecure livelihood sources (Adger, 2006; Balica et al., 2013). Furthermore, the socio-economic factors such as age, education, gender, poverty, physical health, social relations, and population with special needs also affect the vulnerability of the individuals to floods (Adger, 1999; Alwang, Siegel, & Jørgensen, 2001). Vulnerability analysis is one of the integral components of disaster risk assessment and is considered as a key step towards effective risk reduction and risk management (Rahman & Shaw, 2015a; Du et al., 2015). Flood vulnerability analysis is the process to determine the level of vulnerability and potential threats posed by flood hazards (Chen et al., 2013; Fekete, 2009)). It is a multi-dimensional process as it covers socio-economic, physical, environmental and institutional patterns of the societies (Chakraborty & Joshi, 2016; Fernandez, Mourato, & Moreira, 2016). The basic aim of this process is to determine elements at risk, and to identify the roots causes of their

vulnerability to floods (Tingsanchali & Karim, 2010; Cutter et al., 2003). Various research methods have been used by experts to assess flood vulnerability. It includes computer modelling method, Geo-spatial modeling and mapping, parametric method, curve method and flood vulnerability index method (Balica et al., 2013; Downton & Pielke, 2005). The present study has used descriptive research method with quantitative approach to assess flood vulnerability in district Nowshehra.

District Nowshehra is one of the most flood prone districts in Khyber Pakhtunkhwa province (GoKP, 2015). As per the National Disaster Management Plan (NDMP) 2013-22, the district has a total risk weight of 24.12 in overall relative severity index of the country (GoKP, 2014). The district is located at the banks of River Kabul and is highly exposed to riverine floods (Rahman & Khan, 2013; Tariq & Giesen, 2012). Indus Kabul Rivers and its tributaries like Kalpani Nullahover flows in monsoon season and generate severe flooding in district Nowshehra (Sayama et al., 2012). Besides, the rapid population expansion and urbanization along with illegal encroachments in active flood plains increased vulnerability of the district to flood hazards (GoKP, 2014). Moreover, low public awareness and negative perceptions of people regarding disasters risk reduction also exacerbates vulnerability of the people (GoKP, 2015). The vulnerability of the district is also triggers by weak institutional mechanism, lack of building codes, inappropriate land use planning and deforestation (GoKP, 2014). Union Council Jehangira is situated at the convergence point of Kabul and Indus Rivers near Attock district. It is located in active floodplain zone and is highly vulnerable riverine flood due to topography, extreme poverty, public apathy, and weak organizational mechanism (GoKP, 2015).

Materials and Methods

The data obtained from both primary and secondary sources. The primary data were collected directly from the field using questionnaire and interview schedules. The questionnaire was distributed among the educated respondents, while the interview schedule was used to collect data from uneducated respondents of the target area. Simple random sampling method was used to select a sample size of 60 respondents, belonging to different professions and fields of expertise. The secondary data were obtained from different secondary sources including government and non-government departments, United Nations (UN) agencies, research reports, journal articles, books, newspapers, and electronic databases. The field data were analyzed with the help of Statistical Product and Service Solution (SPSS) and Microsoft Excel to calculate the frequency and percentage of each variable. The analyzed data were then presented in tables, graphs, and described accordingly in Microsoft Word.

Results and Discussion

District Nowshera is located in the proximity of River Kabul and Indus and highly prone to flood hazards (GoKP, 2014). Each year, monsoonal rainfall in summer season along with snow melting in mountainous region generates floods in river Indus and its tributaries (Sayama et al., 2012). The flood water over flow the surrounding areas and caused severe destruction to human settlements (Rahman & Khan, 2013). The present research revealed that monsoonal rainfall is the major cause of flooding in the study area. During field survey, most of the respondents (52%) stated that heavy rainfall in monsoon season is the major cause of flood in the study area. About 48% respondents mentioned that mitigation measures including

embankment, protection wall and public awareness are main the causes of floods in the study area (Fig.1).

The type and location are considered to be the critical factors in vulnerability analysis of the housing units (Chakraborty & Joshi, 2016). Inappropriate structure and flood prone location increase vulnerability of the houses to flood hazards (Du et al., 2015). In addition, improper construction material and lack of building codes also intensify vulnerability of the houses to floods (Tingsanchali & Karim, 2010). The present study found that most of the houses are constructed in traditional way and lack engineered measures. There are three types of houses in the study area i.e. Muddy, Partial Concrete, and Concrete. The study revealed that majority of the houses are Muddy (48%), while (40%) of the houses are Partially Concrete. Only 12% of the houses are Concrete and constructed with proper engineered measures. The study explored that majority of the housing units of the study area are located in active flood plains with steep slope (58%), while 42% of the houses are located in plain area. The study revealed that most of the houses are incapable to withstand flood water and would suffer severe physical damage in near future (Fig.2).

Each year, floods caused severe damages to livelihood sector and results in extensive economic losses (Briguglio & Kisanga, 2004). Flood is one the potentials hazards that caused severe damages to livelihood sector of the study area especially the agriculture sector (Briguglio et al., 2009). During this study, the respondents were asked about the vulnerable sectors in the study area. According to the field survey, 60% of the respondents stated that agriculture is highly vulnerable sector, following by 30% housing, 13% livestock and 17% other sectors like health, education and businesses etc (Fig.3).

Vulnerable population refers to any group or individual that experiences higher risk than the general population (Blaikie et al., 2014). The vulnerability of these groups may be due to their physical, socio-economic, political and religious factors (Wisner et al., 2003). Vulnerable population includes children, elderly, women, disable people, poor, and minorities etc. (Oliver-Smith, 1996). The analyzed data shows that 33% of the

respondents considered women as the as the most highly vulnerable group followed by elderly people (30%), disable people 27%, and children 10%. The basic reasons of women vulnerability were the cultural constraints and high responsibilities of household chores. On the other hand, children were seemed as less vulnerable due of their quick escape to the safe places (Fig.4).

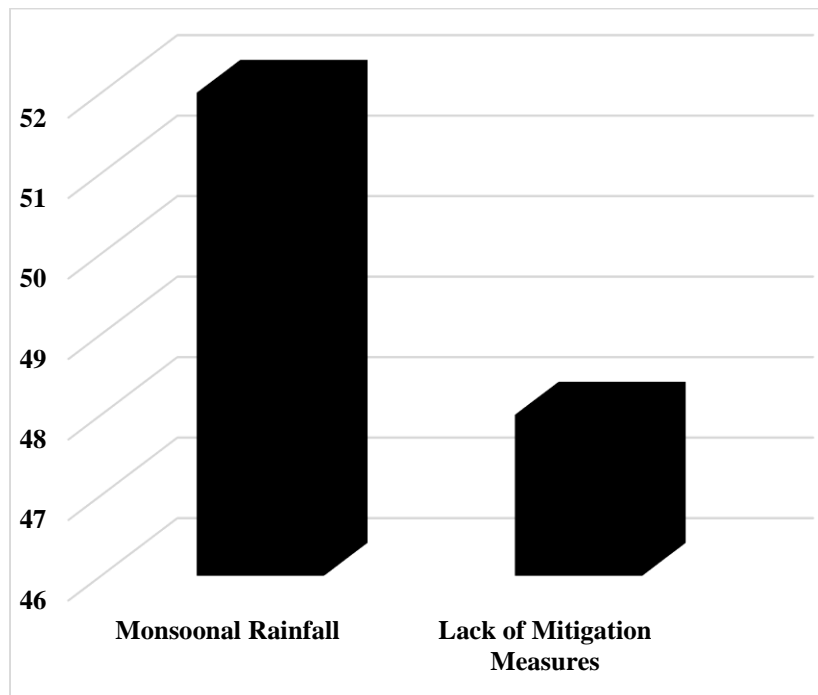


Fig. 1. Causes of Flood in the Study Area

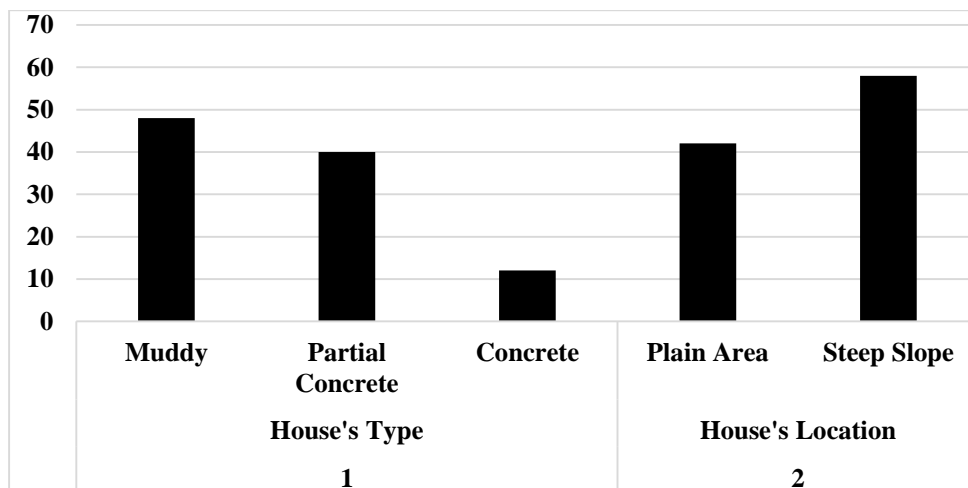


Fig. 2. House's Type and Location

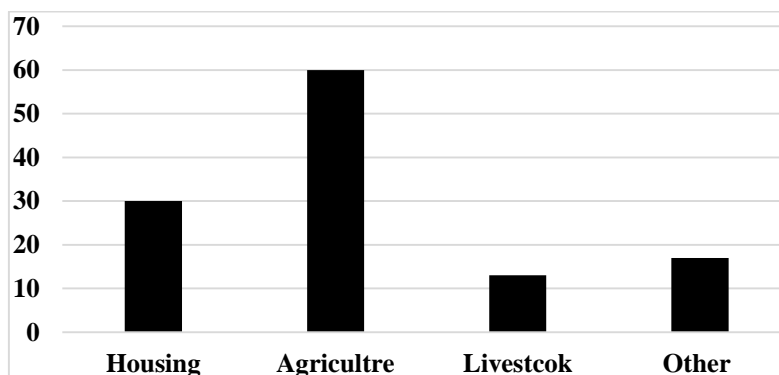


Fig.3. Vulnerable Sectors in the Study Area

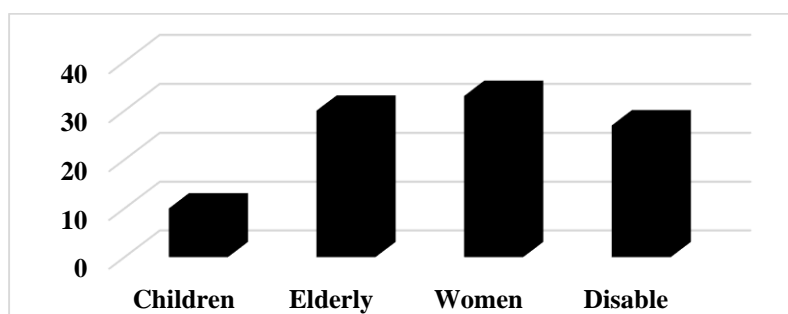


Fig.4. Vulnerable Groups in the Study Area

Mitigation measures refer to the actions or programmes intended to reduce the impacts of hazards on human system (Khan & Rahman, 2012). It includes both structural and

non-structural measures (Douben, 2006). Structural measures include actions or efforts with physical construction such as protection wall, gabion wall, embankments, levees,

dikes, and dams etc. (Rahman & Shaw, 2015b). Similarly, non-structural measures are taken in the form of soft activities and are used to strengthen the structural measures (Tariq & Giesen, 2012). These include building codes, land use planning, training, awareness and education etc. (Ahmad, Kazmi, & Pervez, 2011). The present research determines the

type of mitigation measures which have been adopted in the study area. Most of the respondents (88%) stated that the study area lacks both structural and non-structural mitigation measures. Only few of the respondents (12%) mentioned that mitigation measures exist in the form of gabion wall in the study area (Fig.5).

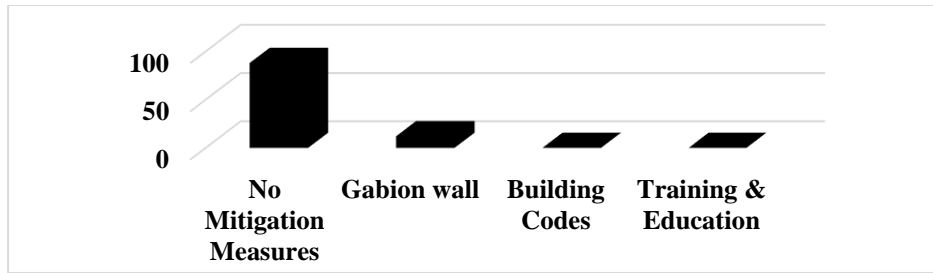


Fig.5. Mitigation Measures in the Study Area

Community bonding is the cohesive quality of a society that aims to works toward the well-being of all its members, fights exclusion and marginalization, creates a sense of belonging, promotes trust and extends support to each other in times of crises (Galabuzi & Teelucksingh, 2010). Communities having strong social cohesion work better and are less vulnerable to external shocks (Schwarz, et al., 2001). On the other hand, community or groups which have less cohesion can run into problems and may break apart during any undesirable situations (Horowitz, 1985). The present study has assessed the level of social cohesion and community bonding among the community members of the study area. According to the

field survey, majority of the people in the study area support each other during flood situations. The local people extend their support to each other in the form of manpower, food, shelter, equipments, and financial aid etc. the analyzed data shows that majority of the respondents (48%) support each other in the form of man-power, followed by food supplies (20%), shelter provision (14%), equipments (8%), and financial aid 6%. Only 4% respondents stated that they did not receive any support from their neighbors during flood disasters. The highest proportion of self-help and support shows that local community has strong ties and relationship that could be used for supporting each other during flood situation (Fig.6).

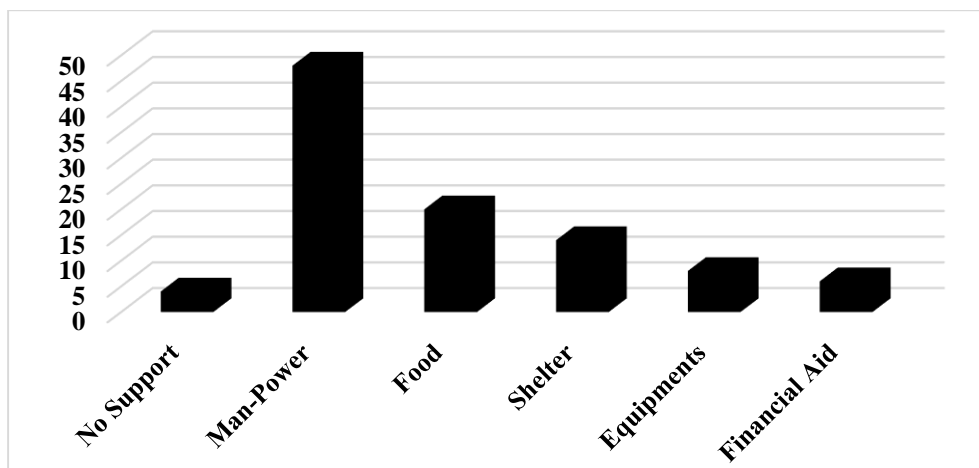


Fig.6. Community Help and Support System

Conclusion

District Nowshehra is one of the most flood prone districts in Khyber Pakhtunkhwa-Pakistan. The geographical, topography and climatic factors of the study area are the critical factors responsible for flood hazards in district Nowshehra. The district is located at the merging point of Kabul and Indus Rivers. The monsoonal rainfall coupling with snow melting in Northern mountainous region generate riverine floods in River Kabul and its tributaries. The physical infrastructure of the study area is weak due to improper construction material and lack of mitigation measures. Majority of the houses are muddy and cannot withstand in flood water. Due to proximity to River Kabul, the agriculture land of the study area is highly prone to floods. The vulnerable population of the study area includes women, elderly people, and disable people. The study area lacks both structural and non-structural mitigation measures; however, the social bonding among community members is very strong and the local people help each other in the form of manpower, food, shelter, equipments, and financial aid during flood disasters. Based on

the study findings, few important recommendations have been proposed that could be helpful in reducing the risk of future floods in the UC Jahangira in particular and in district Nowshehra in general. An integrated flood management plan should be devised by the local government in active participation and collaboration of the local community and other relevant organizations. The structural measures should be adopted in the form of protection walls and embankments along the river banks should be constructed and strengthened with maximum height in order to reduce the damages of future floods in the study area. The traditional muddy houses should be replaced with concrete and cemented houses and the local people should be educated about flood hazards and vulnerabilities in order to ensure public safety in the study area. The government agencies along with local community should devised flood preparedness plan for the protection and safety of marginalized community.

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