

**Evacuation Decision Making and Behavior in
Flood-Prone Rural Areas: A Case Study of
Dera Ismail Khan**



Abdul Muqet Shah
Regn Number
00000277100

Supervisor
Dr. Irfan Ahmad Rana

DEPARTMENT OF URBAN AND REGIONAL PLANNING
SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING
NATIONAL UNIVERSITY OF SCIENCES AND TECHNOLOGY
ISLAMABAD, PAKISTAN

Evacuation Decision Making and Behavior in Flood-Prone Rural Areas: A Case Study of Dera Ismail Khan

Abdul Muqet Shah
Regn Number
00000277100

A thesis submitted in partial fulfillment of the requirements for
the degree of MS Urban & Regional Planning

Thesis Supervisor:

Dr. Irfan Ahmad Rana

Thesis Supervisor's Signature: _____

DEPARTMENT OF URBAN AND REGIONAL PLANNING
SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING
NATIONAL UNIVERSITY OF SCIENCES AND TECHNOLOGY
ISLAMABAD, PAKISTAN

THESIS ACCEPTANCE CERTIFICATE

Certified that final copy of the thesis titled “Evacuation Decision Making and Behavior in Flood-Prone Rural Areas: A Case Study of Dera Ismail Khan” written by Mr. Abdul Muqet Shah (Registration No. 00000277100), of Urban and Regional Planning (NIT-SCEE) has been vetted by the undersigned, found complete in all respects as per NUST Statutes/Regulations, is free of Plagiarism, errors and mistakes and is accepted as partial fulfillment for the award of MS degree. It is further certified that necessary amendments as pointed out by GEC members of the scholar have also been incorporated in the said thesis.

Signature: _____

Name of Supervisor: Dr. Irfan Ahmad Rana

Date: _____

Signature (HOD): _____

Date: _____

Signature (Dean/HOD): _____

Date: _____

DEDICATION

This thesis is dedicated to my beloved parents, brother and sisters for always being an unending source of love and encouragement.

ACKNOWLEDGEMENTS

All praises to the Allah Almighty, the merciful and the most beneficent who showers his blessings upon us every day. He beholds all the knowledge of the universe and beyond.

I would like to thank my supervisor **Dr. Irfan Ahmad Rana** for all the help, guidance, inspiration, and support throughout the research project. His assistance and valuable feedback enabled me to achieve a solution-oriented research experience. Intellectual input and assistance at every stage enabled me to gain valuable knowledge and a better solution to the problems faced during the research phase.

Abdul Muqeet Shah

ABSTRACT

Climate change has posed an increasing threat of extreme events. Evacuation is considered an important process for safeguarding lives in an emergency. It is essential to identify the factors associated with evacuation decision-making. Socioeconomic conditions and risk perceptions can directly or indirectly influence the evacuation decision. This research explores the evacuation dynamics in flood-prone rural areas along the Indus River. Risk perception is quantified using well-established indicators. Yamane sampling method was used, and 500 samples were collected using household questionnaires from high flood risk and past affected rural areas along the river. Pearson's correlation technique was used to identify the relationship between flood risk perception indicators and the likelihood of evacuation. A binary logistic regression test was developed to identify socioeconomic factors influencing evacuation. Results show that people who stayed near the rivers had a lower risk perception. However, fear was high among all respondents. Age and hazard proximity was found to be influencing the willingness to evacuate. The results imply an urgent need to launch awareness campaigns in settlements near the river.

Table of Contents

Chapter 1.....	12
Introduction.....	12
1.1 Background.....	12
1.2 Justification.....	13
1.3 Research Questions.....	14
1.4 Research Objectives.....	15
1.5 Scope of the Study.....	15
1.6 Conceptual Framework.....	16
Chapter 2.....	17
Evacuation and Disaster Risk Reduction.....	17
2.1 Rural Vulnerability.....	17
2.2 Concept of Evacuation.....	18
2.3 Factors Affecting Evacuation.....	21
2.4 International practices.....	24
2.5 Evacuation in Pakistan Departments.....	26
Chapter 3.....	27
Research Methodology.....	27
3.1 Research Design.....	27
3.2 Study Area.....	27
3.3 Sampling.....	34
3.4 Data Collection and Questionnaire Design.....	35
3.5 Indicators.....	37
3.6 Data Analytical Methods.....	43
Chapter 4.....	45
Socio-Economic Profile of Respondents.....	45
4.1 Age of the Respondents:.....	45
4.2 Gender:.....	46
4.3 Education:.....	46
4.4 Income.....	47
4.5 Family Type:.....	49
4.6 Household size:.....	50
4.7 Occupation:.....	51
4.8 Summary of the Chapter.....	52

Chapter 5.....	54
Evacuation Dynamics and Perceptions.....	54
5.1 Evacuation Dynamics.....	54
5.1.1 Willingness to Evacuate.....	54
5.1.2 Likelihood of Evacuation.....	55
5.1.3 No of Person Evacuated Last Time in the Household.....	56
5.1.4 Time Need to Evacuate (Hours).....	57
5.1.5 Household Last Time Evacuation.....	58
5.1.6 I could ride it out.....	59
5.1.7 Bag Pack for Emergency.....	59
5.1.8 Household Given Awareness to Children.....	60
5.1.9 Household Aware about EWS.....	61
5.1.10 Household Evacuation Based on Neighbors and Friends.....	61
5.1.11 Reason did not evacuate.....	62
5.1.12 Household having means of Transportation.....	63
5.1.13 Household Received Info. From Officials.....	64
5.1.14 Assembly Points by Officials Last Time.....	65
5.1.15 Assembly Points by Officials this Time.....	65
5.1.16 Where to GO..... Told by officials.....	66
5.1.17 Frequency of Public Awareness Programs/Drills Attended by Household Members (in Number).....	66
5.1.18 Availability and Circulation of Emergency Plans to Households.....	67
5.1.19 Public Shelter.....	67
5.2 Perceptions Descriptive Statistics and Index.....	68
5.2.1 Household Have any Fear of Flood.....	68
5.2.2 Chances of Flood Occurrence.....	69
5.2.3 Household Perceived Danger to Life and Family.....	70
5.2.4 Household Perceived Capacity not to Deal.....	71
5.3 Relationship between flood risk perception and the likelihood of evacuation ...	72
5.4 Factors affecting willingness to evacuate.....	73
Chapter 6.....	76
Institutional Challenges in Evacuation.....	76
Chapter 7.....	80
Conclusion and Recommendations.....	80

References.....	82
ANNEX-I.....	92
Household Survey Questionnaire	92
ANNEX-II	95
Institutional Survey Questionnaire	95

List of Figures:

<i>Figure A: Conceptual Framework</i>	16
<i>Figure 1 Map of District D.I.Khan</i>	28
<i>Figure 2 Map of Tehsil D.I.Khan</i>	29
<i>Figure 3 Map of Tehsil Daraban</i>	30
<i>Figure 4 Map of Tehsil Kulachi</i>	31
<i>Figure 5 Map of Tehsil Paharpur</i>	32
<i>Figure 6 Map of Tehsil Parova</i>	33
<i>Figure 7 Seasonal Calendar of D.I.Khan</i>	34
<i>Figure 8 Age of respondents:</i>	46
<i>Figure 9 Educational Level of respondents</i>	47
<i>Figure 10 Income of respondents</i>	48
<i>Figure 11 Family Type of respondents</i>	49
<i>Figure 12 Household Size of respondents</i>	50
<i>Figure 13 Occupation of respondents</i>	51
<i>Figure 14 Willingness to Evacuate</i>	54
<i>Figure 15 Likelihood of Evacuation</i>	55
<i>Figure 16 No of Person Evacuated Last Time</i>	56
<i>Figure 17 Time Needed to Evacuate</i>	57
<i>Figure 18 Household Last Time Evacuation</i>	58
<i>Figure 19 Awareness in Children</i>	60
<i>Figure 20 Reason Didn't Evacuate</i>	63
<i>Figure 21 Transportation</i>	64
<i>Figure 22 Fear of Flood</i>	69
<i>Figure 23 Chances of Future Flood Occurrence</i>	70
<i>Figure 24 Perceived Danger to Life and Family</i>	71
<i>Figure 25 Perceived capacity not to deal</i>	72

List of Tables:

<i>Table 1 Age of Respondents</i>	45
<i>Table 2 Education of Respondents</i>	47
<i>Table 3 Income of Respondents</i>	48
<i>Table 4 Family Type of Respondents</i>	49
<i>Table 5 Household size of Respondents</i>	50
<i>Table 6 Occupation of Respondents</i>	51
<i>Table 7 Willingness to Evacuate</i>	54
<i>Table 8 Likelihood of Evacuation</i>	55
<i>Table 9 No of Person Evacuated Last Time</i>	56
<i>Table 10 Time Needed to Evacuate</i>	57
<i>Table 11 Household Last Time Evacuation</i>	58
<i>Table 12 I Could Ride it Out</i>	59
<i>Table 13 Bag Pack for Emergency</i>	59
<i>Table 14 Awareness in Children</i>	60
<i>Table 15 Awareness about EWS</i>	61
<i>Table 16 Evacuation Based on Neighbors and Friends</i>	61
<i>Table 17 Reason Didn't Evacuate</i>	62
<i>Table 18 Transportation</i>	63
<i>Table 19 Info. From Officials</i>	64
<i>Table 20 Assembly points by officials last time</i>	65
<i>Table 21 Assembly Points by Officials this Time</i>	65
<i>Table 22 Where to GO..... Told by officials</i>	66
<i>Table 23 Frequency of Public Awareness Programs</i>	66
<i>Table 24 Availability and Circulation of Emergency Plans</i>	67
<i>Table 25 Public Shelter</i>	67
<i>Table 26 Fear of Flood</i>	68
<i>Table 27 Chances of Future Flood Occurrence</i>	69
<i>Table 28 Perceived Danger to Life and Family</i>	70
<i>Table 29 Perceived Capacity not to Deal</i>	71
<i>Table 30 Pearson's correlation between flood risk perception and the likelihood of evacuation</i>	73
<i>Table 31 Factors affecting willingness to evacuate</i>	75

Chapter 1

Introduction

1.1 Background

Pakistan is exposed to a diversity of natural hazards. The most damaging are droughts, cyclones, earthquakes, landslides, and floods. In the last few decades, the number of disasters has been increasing day by day. The numbers of natural hazards are increasing considerably in the 21st century compared to the 20th century. According to CRED, the total no of disaster only in 2018 were 315, which affected 68 million people(CRED, 2019). As the number of disasters increasing the vulnerabilities of individuals are also increasing. According to UNDRR, between 1998 and 2017, a total of 1.35 million people died due to climate-related and geophysical disasters, and 4.4 billion were hurt, homeless, displaced. Most of the mortalities were due to geophysical events, mostly earthquakes and tsunamis. On the other hand, 91% of all disasters were caused by floods, storms, droughts, heat waves, and other extreme weather events(Wallemacq, 2018). As the people are exposed so their vulnerabilities increase. Most importantly the people living in rural areas are most exposed to disasters because of their economic, socio-economic, physical, and infrastructural status.

From the previous data, it can be seen that approximately 60,000 people died due to natural hazards per year. Pakistan was in 12th position among countries that are most vulnerable to impacts of climate change in 2009(Nature, 2009). From 1998 to 2017 the total numbers of deaths caused by floods was 142088 which contributed

11% to total deaths caused by natural hazards (CRED). The economic losses due to floods between 1998 and 2017 are US \$ 656 billion which contributes 23% of total economic losses. Only in 2018, the total number of natural disasters that occurred was 315. Among them, 127 were floods with 11804 death and economic losses of US\$ 131.7 billion. While in the previous decade (2008-2017), the natural hazards that occurred were 348, among which 153 were floods, and 67572 died with economic losses of US \$166.7 billion(CRED, 2019). In the decade of 2006-2015, the average mortality for all types of natural hazards increased to 69800 per year, which was up from 64900 between 1996 and 2005. The average number of deaths per disaster also rose to 194 from 187. While the deaths in Pakistan between 1996 and 2015, were 85,400. In Pakistan, during 2006-2015 more than 5100 people died in floods, up from 2470 in 1996-2005, by placing Pakistan in third place for flood mortality behind India and China in the past decade. In 2010, flooding killed 2,200 people in Pakistan(CRED, 2019).

1.2 Justification

As we know that Pakistan is multi hazard-prone area but it is highly exposed to flooding. It has affected a large junk of population during every event in various areas. Due to which life losses and also the economic losses occur due to which the development process stops, and the rehabilitation process is started. So to reduce these losses, evacuation is a potential measure. Many lives, goods, animals, and other necessary things can be saved with the help of evacuation. As the rural areas are already very exposed and are at risk due to their economic status(Dasgupta, 2014) then they become more at risk with floods. 68% area of Pakistan is a rural area, and most of the areas are flood-prone areas(Statistics). In developing

countries, the main focus has always been on urban areas, whereas rural areas are ignored. Pakistan was placed at 1st in 2010 while 5th in 2014 by climate risk index due to continuous floods in the previous years(Kreft, 2015). According to a report from 1950 to 2015, approximately \$21 billion were incurred in damages(DAT, 2016).

The D.I.Khan district is located on the west of the Indus River, making this district vulnerable to floods. D.I.Khan has faced the flood of 1976, 1982, 1988, 2005, 2006, 2007, and 2010. D.I.Khan, Peshawar, Kohat, Swat, and Mardan commonly experience flash floods(Khyber & Pakhtunkhwa, 2012). The main cause of this flood was heavy monsoon rainfall and Noose water(Mehmood & Yaseen, 2018). Studies concluded that D.I.Khan is one of the most affected and is still vulnerable to flood(Mehmood & Yaseen, 2018). That's why D.I.Khan is selected as a study area for this research.

1.3 Research Questions

1. How to assess the readiness and willingness of people to evacuate in flood-prone areas?
2. How do factors affect evacuation decisions of rural households?
3. What are the challenges faced by institutions in the evacuation?
4. What are the proposed policies and strategies for effective risk Reduction?

1.4 Research Objectives

The main objectives of this study are:

1. To assess readiness, willingness, and risk perception of people to evacuate in flood-prone areas
2. To determine key factors affecting evacuation decision of rural households
3. To identify challenges faced by institutions in evacuation
4. To propose policies and strategies for effective risk reduction

1.5 Scope of the Study

The main purpose of this research is to identify the factors affecting the evacuation decision-making of people living in flood-prone areas on a household level. Besides this, the aim of this research is also to identify challenges that departments are facing during floods and especially during the evacuation process. This research is limited to the factors which affect evacuation decisions. The risk analysis and vulnerability assessment was not done in this research. In Pakistan, as a developing country and a flood-prone country, there is a need for better disaster management so that losses can be reduced especially human losses. In this context, the current study aims to explore the factors which affect decisions to evacuate.

1.6 Conceptual Framework

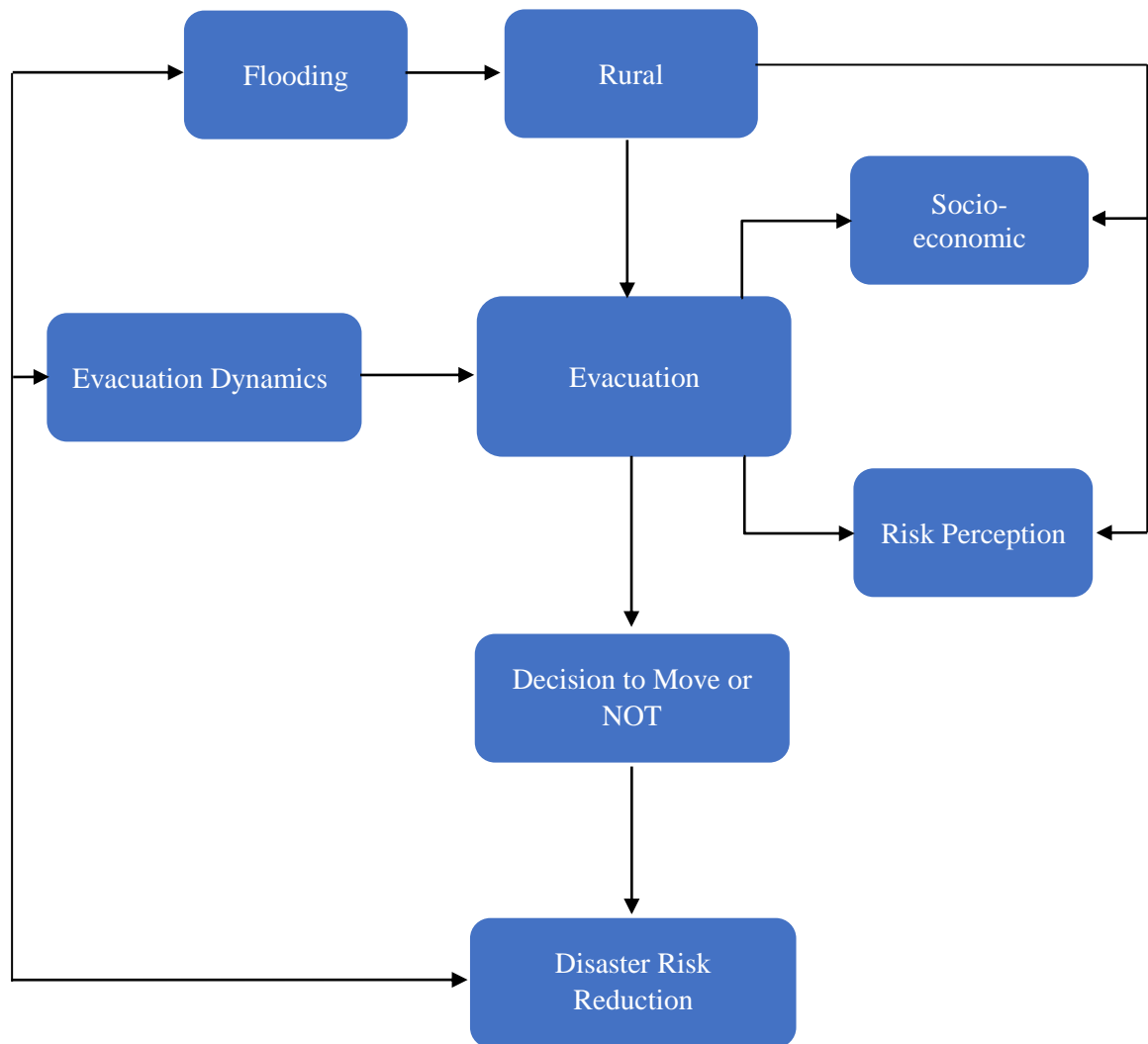


Figure A: Conceptual Framework

Chapter 2

Evacuation and Disaster Risk Reduction

2.1 Rural Vulnerability

Globally, over the past few decades, climate-related disasters risks have increased (Adelekan, 2011; CRED, 2005; Johnson, Johnson, & Sutherland, 2012). The change in extreme precipitation events due to volatility and climate change has increased the likelihood of flooding (Bradford et al., 2012; D. Liu & Li, 2016; D. Liu, Li, Shen, Xie, & Zhang, 2018; Schiermeier, 2011). (Milly, Wetherald, Dunne, & Delworth, 2002) point out that the projected strengthening of the universal water cycle based on climate change may increase the threat of river flooding due to heavy rainfall in the basin. Rapid unplanned urbanization, changes in vegetation cover, and mismanagement of river basins, especially in river floodplains, are important issues to consider. This is because this surface infiltration capacity is reduced, which increases runoff rates and worsens flooding from heavy rainfall. This has a major impact on the environment, the population, and the infrastructure of the affected areas (Adelekan, 2011). Thus, it is important to enhance preparedness and response capacities to reduce flood risks.

Rural communities are more vulnerable due to their socioeconomic, physical, and infrastructural conditions. Studies show that floods occur every three years, with extensive damage to homes, crops, and socio-economic growth of rural areas (Hashmi, Siddiqui, Ghumman, & Kamal, 2012). Over the years, floods have caused enormous loss of life and property, despite significant investments in river

management. Earlier researches on floods have focused primarily on their socio-economic implications (A. N. Khan, 2011), causes and magnitude (A. N. Khan, 2013), economic impacts (Looney, 2012), and structural measures (A. N. Khan, Khan, Qasim, & Khan, 2013). Few studies on the perception of people of evacuation and rural flood risk exist.

2.2 Concept of Evacuation

Evacuation is considered an essential part of the flood preparedness and response phase (Center & ESCAP, 2004). It is extensively used to prepare people for the risk of imminent danger (M. B. B. Lim, Lim, Piantanakulchai, & Uy, 2016; Taylor & Freeman, 2010). It is the process of detecting hazards, issuing alerts, preparing for evacuation, moving to shelters through the road network, and returning to households after a catastrophe (Lim Jr, Lim, & PIANTANAKULCHAI, 2013; M. B. B. Lim et al., 2016). So preventive evacuation is the best approach for using optimistic assumptions in defining risks and all operational means (M. B. B. Lim et al., 2016). Therefore, evacuation planning is essential for better effective response (Lumbroso, Stone, & Vinet, 2011).

Evacuation, a large-scale movement of population within a communal, is provisional and appears to address threats, damage, or disruption to the community (Quarantelli, 1985; Riad, Norris, & Ruback, 1999). Effective evacuation needs the participation of both the community and the individual (decision making). Community participation is essential for evacuation, but eventually, the individual is responsible for the decision, so the external social influence is only increased to some extent. They knew who was at the greatest risk of not evacuating and why is

an early intervention strategy that shows how these people can influence positive evacuation decisions and provides access to the resources they need (Xu et al., 2020).

The population evacuation in the face of imminent risk has been the subject of much research from various angles. Evacuation is the reaction of the population to the perceived danger in his instant environment and, by leaving the danger site, acts proactively to reduce the perceived risk of that danger. The media and civil servants are often the main sources of information for people seeking information when they decide to evacuate. Individuals are more likely to evacuate based on advice from authorities, friends, and family, as well as media reports. Those who have a more visual view of the damage caused by the hurricane are more likely to evacuate. Individuals with high levels of perceived risk are more likely to evacuate. Also, the perceived risk is the most important factor in evacuation behavior (Burnside, Miller, & Rivera, 2007).

Many researchers have found that rational preparedness for disaster prevention can efficiently diminish the loss of life and property of residents (Godschalk, Rose, Mittler, Porter, & West, 2009; Miceli, Sotgiu, & Settanni, 2008; Oloruntoba, Sridharan, & Davison, 2018; Paton, Bajek, Okada, & McIvor, 2010; Xu et al., 2020). The preparedness of the residents in the affected areas and their impelling factors are well studied (Bollin, Hidajat, & Birkmann, 2006) (Dash & Gladwin, 2007; Hasan, Ukkusuri, Gladwin, & Murray-Tuite, 2011; Kolen & Helsloot, 2014; Lazo, Waldman, Morrow, & Thacher, 2010). Most common factors include disaster risk perception of resident (Matyas et al., 2011; Siebeneck & Cova, 2012)

(Lovreglio, Ronchi, & Nilsson, 2016) (Lazo, Bostrom, Morss, Demuth, & Lazrus, 2015; Wilmot & Mei, 2004), disaster experiences (Bang, 2012; Lazo et al., 2015), personal and family social-economic characteristics (Dash & Gladwin, 2007; Lazo et al., 2015; Xu et al., 2017), and evacuation behavior and willingness. Various studies evaluated sources of information on disasters (Hong, Kim, & Xiong, 2019; Peng, Tan, Lin, & Xu, 2019; Steelman, McCaffrey, Velez, & Briefel, 2015; Xu et al., 2019); However, limited studies have investigated the correlation between the quality of information (credibility) and residents' evacuation willingness and behavior (Lindell, Lu, & Prater, 2005; D. Zhu, Xie, & Gan, 2011). Many studies have shown that effective dissemination of pre-disaster, intra-disaster, and post-disaster information (speed, channels, quality) changes residents' perception of disaster risk, thus influencing their decision-making (Brenkert-Smith, Dickinson, Champ, & Flores, 2013; Bunce, Partridge, & Davis, 2012). For example, effective information dissemination can support people to learn about disasters and escapes, thereby increasing their sense of responsibility and a culture of safety (Hong et al., 2019; Lee, 2011; Paek, Hilyard, Freimuth, Barge, & Mindlin, 2010; Xu et al., 2020; W. Zhu & Yao, 2018). Residents who have suffered a disaster can learn disaster prevention and mitigation skills through the disaster reporting process to prepare for future disasters (Hajito, Gesesew, Bayu, & Tsehay, 2015; Lindell & Perry, 2012; T. Liu & Jiao, 2018; Xu et al., 2020). Residents have access to multiple sources during a disaster threat. The quality of the information accessible may affect residents' evacuation motivation / behavioral decisions (Gladwin, 1997; Islam, Malak, & Islam, 2013; D. Zhu et al., 2011).

For effective communication of the risk of disasters, it is essential to understand the message that most credibly and influences the motivation/action choices of the displaced. Therefore, clarifying the correlation between the various sources and the quality of information, as well as the awareness of the risks of catastrophes by the residents and their willingness to evacuate, is very important to lessen the damage of life and ensure the safety of the assets of the residents (Xu et al., 2020).

2.3 Factors Affecting Evacuation

Knowledge of the risks specific to the factors defining evacuation decisions is vital to this understanding (Dash & Gladwin, 2007). Literature shows that risk perception plays a vital role in improving flood mitigation and preparedness (Kellens, Terpstra, & De Maeyer, 2013; Qasim, Khan, Shrestha, & Qasim, 2015). The perception of risk is linked to the characteristics of the hazards and environmental cues (Brommer & Senkbeil, 2010; Siebeneck & Cova, 2012). (M. B. Lim, LIM Jr, & PIANTANAKULCHAI, 2013) recommended that risk awareness, and ultimately contributing to evacuation decisions, should combine family characteristics and the ability to survive with flooding and risk factors.

These factors include age, sex, income, level of education, household size, number of children in the house, number of older inhabitants, race, social network, years of residence, and types include housing, purpose and perceived risks, economic, risk variables, the existence of pets in the house, duration of danger, and extent, the experience of danger or evacuation, knowledge of the danger, presence of warnings and evacuation notice (Bateman & Edwards, 2002; Dash & Gladwin, 2007;

Mccarty, 2009; Whitehead et al., 2000). According to the literature, perceptions of people about flood risk are strongly influenced by socioeconomic and demographic characteristics (Bradford et al., 2012; Bubeck, Botzen, & Aerts, 2012; Lin, Shaw, & Ho, 2008) (Pelling, 1997) and floods experience (Botzen, Aerts, & van den Bergh, 2009; Bradford et al., 2012; Ho, Shaw, Lin, & Chiu, 2008; Ludy & Kondolf, 2012; Miceli et al., 2008; Whitmarsh, 2008).

In some situations, the effects of these factors may discourage or motivate evacuation compliance. Kellens et al. reviewed around 60 articles associated with flood risk awareness. They said that most researchers used various types of questions or variables to measure different characteristics of flood risk awareness. He also concise five commonly used variables to measure perceived flood risk, which was awareness, cause, likelihood (or probability), affect (or fear, dread, concern), and impact (Kellens et al., 2013). Adelekan et al. investigated the relationship between perceived flood risk and socio-demographic characteristics of people affected by flood in Nigeria. It is also found from the literature that age significantly impacts perceived flood risk (Adelekan & Asiyebi, 2016). The risk perceptions of flood-prone residents of Khyber Pakhtunkhwa were investigated by Qasim and explored that risk perceptions were influenced by homeownership, education, distance from water sources, and flood experiences (Qasim et al., 2015).

(Dash & Gladwin, 2007) also did a thorough review of the key issues in making an evacuation decision. In their review, the results of three extensive research areas, including evacuation research, risk awareness, and warnings, examined the various

influencing factors that determine evacuation decisions. To understand risk perception and its impact on evacuation decisions, (Lindell & Hwang, 2008) explored the impact of environmental proximity, personal experience, and perceived risk and risk response in their research. The factors are evaluated according to the type of hazards, such as floods, hurricanes, and toxic chemicals.

The results from different studies show that gender, ethnicity, income, the experience of danger, proximity to danger, and risk evidence influence perceived risk. The studies also discovered that the effects of several factors are definite to the type of hazard. (Lindell & Hwang, 2008) stressed that it is crucial to consider the specific recipients and means of communication of alert messages. This helps increase the uptake of risk adjustments by families who are perceived to be at low risk. (Siebeneck & Cova, 2012) also found that the evacuation will be high if the risk awareness is high.

The risk perception is linked with environmental factors and risk factors based on previous evacuation experiences. A comprehensive review of (M. B. Lim et al., 2013) suggests that risk perception is a blend of an extensive range of factors gathered into factors related to family characteristics, abilities, and risks. To analyze evacuation decisions according to complex behavior, the perception of risk must be clarified by a set of factors, including socio-demographic, skill, and risk factors. Many factors influencing evacuation decisions can be recognized from an inclusive examination of evacuation behavior (Dash & Gladwin, 2007; M. B. Lim et al., 2013; Murray-Tuite & Wolshon, 2013).

2.4 International practices

Evacuation is typically used in emergencies and impending disasters. Evacuation is part of disaster readiness (Abarquez & Murshed, 2004) that is an approach to plan individuals under the threat of a looming hazard (Taylor & Freeman, 2010). Threatened individuals and households are uprooted from hazardous and moved to more secure spots. During any disaster response, evacuation ought to be directed precisely and quickly. It is an exceptionally challenging issue, including numerous social and management aspects (Saadatseresht, Mansourian, & Taleai, 2009). It comprises the anticipation of hazards, issuing a caution, arrangements for evacuation, moving to established shelters, and the reemergence of households after the disaster hits (Lim Jr et al., 2013). Evacuation is exceptionally complicated. Those who should evacuate often do not, and at least those who should not evacuate often do, at least according to the estimates of emergency managers. To understand people's evacuation decisions, it is essential to recognize why populations refuse to evacuate and their awareness of the risk (Cutter, Mitchell, & Scott, 2000; Riad et al., 1999).

Researches have shown various factors that affect evacuation rates, like the number of family members (Mccarty, 2009) and the number of adults (Bateman & Edwards, 2002). Families with children are more likely to evacuate than other families, (Lindell et al., 2005; Mccarty, 2009), but not always (Bateman & Edwards, 2002). Females were more likely to evacuate than males (Dash & Gladwin, 2007; Riad et al., 1999) (Bateman & Edwards, 2002; Mccarty, 2009; Whitehead et al., 2000). Most possible reasons include increased vulnerability

among women due to social inequalities, increased awareness about warnings due to their broader societal networks, and their perception of disasters as very dangerous (Fothergill, 1996). Again, not all studies have shown substantial differences between women and men (Zhang, Prater, & Lindell, 2004). Older people tend to have lower evacuation rates than younger adults (McCarty, 2009; Wilmot & Mei, 2004). On the other hand, people with physical disabilities and medical conditions limit the mobility of older people, and social isolation makes them less aware of the natural hazards. However, some studies have not shown a significant difference in evacuation rates by age (Zhang et al., 2004). Owned homes may be less likely to vacate than tenants because they are concerned about protecting their property from storm destruction and looting. Several researchers support this assumption (McCarty, 2009), but others have not (Zhang et al., 2004).

Higher-income and education levels may increase evacuation rates by providing the necessary resources for evacuation, gathering relevant information, and improving the ability to develop effective evacuation plans. However, the empirical evidence is weak, and most studies have also shown that sometimes income and education have very low or no impact on the evacuation rate of people (Bateman & Edwards, 2002; Whitehead et al., 2000). People who stayed are more likely than those who left to mention their emotional affection for their home or environment and close connection to their neighbors (McLennan, Elliott, Omodei, & Whittaker, 2013). Some research studies have concluded that families living near lakes and rivers near the coast are more likely to evacuate (Gladwin, 1997; Lindell et al., 2005; Wilmot & Mei, 2004). People living next to the coast may identify the risk

by expecting more severe impacts (Huang, Lindell, Prater, Wu, & Siebeneck, 2012; Mileti & Peek, 2000). Thus, a myriad of factors affects flood evacuation in different communities. It is imperative to identify these factors so that appropriate measures can be taken.

2.5 Evacuation in Pakistan Departments

Pakistan is exposed to a diversity of natural hazards (Ahmad, Kazmi, & Pervez, 2011; A. N. Khan, 2011, 2013). Natural hazards are increasing considerably in this century. An estimated 315 disasters happened in 2018, which affected around 68 million people (CRED, 2019). In 2009 Pakistan was at 12th position among countries that are most exposed (Nature, 2009). Floods are the most recurrent and damaging natural hazard in the country, often fatal (Azad, 2011; Sayed & González, 2014).

Unfortunately, in Pakistan, the departments are too backward in case of flood management and especially the evacuation process. Due to much regularity, the advancement and improvement of flood management are lacking behind. The shortage of food items and nonfood items like heavy machinery and dewatering machine boats, item, tents, mattresses, mosquito nets, plastic sheets, tarpaulin, kitchen sets, hygiene kits, water tanks (500 gallon each), rubber tubes, ladders (15 feet), life-saving jackets, search light, etc. Only department like Rescue 1122 provides their best, but they also have a shortage of different items. So there is a need for improvement in the departments responsible for flood management.

Chapter 3

Research Methodology

3.1 Research Design

This research is done to assess the readiness and willingness of people to evacuate in flood-prone areas and determine the various factors affecting people living in flood-prone areas to evacuate. This research is qualitative and quantitative in nature (mixed research method). The data used for this study was both primary and secondary. The data was collected through a questionnaire comprised of open-ended, closed-ended, and mixed questions. To fulfill these objectives a household survey was conducted from people living in flood-prone areas.

3.2 Study Area

Dera Ismail Khan, the district of Khyber Pakhtunkhwa (KPK) which is located in the south. The area of this district is 7,326 sqkm. The elevation is from sea level is 178 meters. It has five tehsils (D.I.Khan, Daraban, Paharpur, Paroa, and Kulachi). The maps of selected tehsils are shown in Fig.1—the total population of District D.I.Khan is 1,625,088, from which the population of rural D.I.Khan tehsil is 507,431, while the population of rural Paroa is 252,462. On the other hand, the population of rural Paharpur is 303,520 while the population of rural Daraban is 124,318, and the population of rural Kulachi is 77,139 (Statistics, 2017). As per the District Disaster Management Authority, the rural part is a highly flood-prone area. This region is prone to hydrological hazards such as riverine and flash floods.

Map of District D.I.Khan:

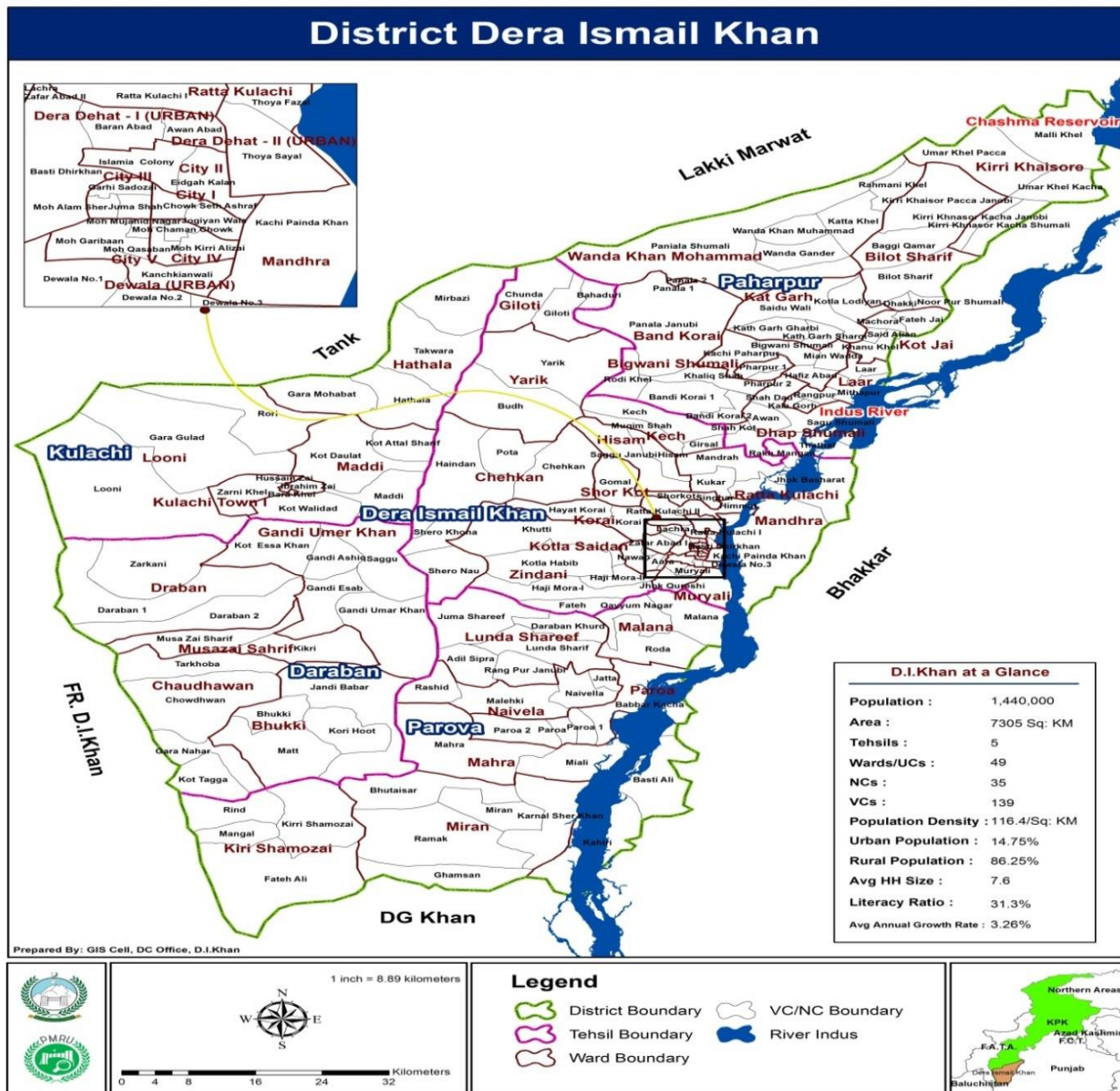


Figure 1 Map of District D.I.Khan

Tehsil Wise Map:

Map of Dera Ismail Khan Tehsil:

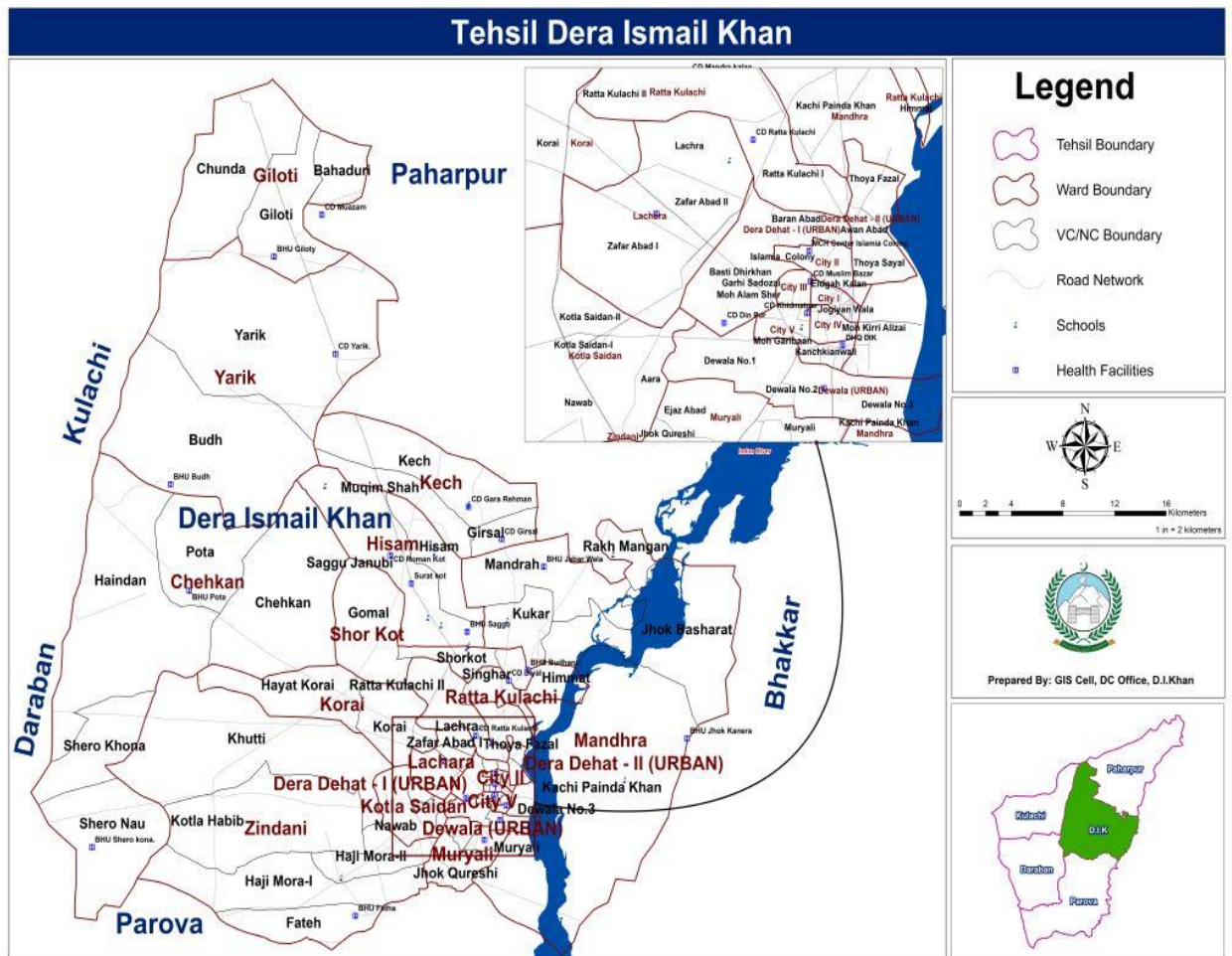


Figure 2 Map of Tehsil D.I.Khan

Map of Tehsil Daraban:

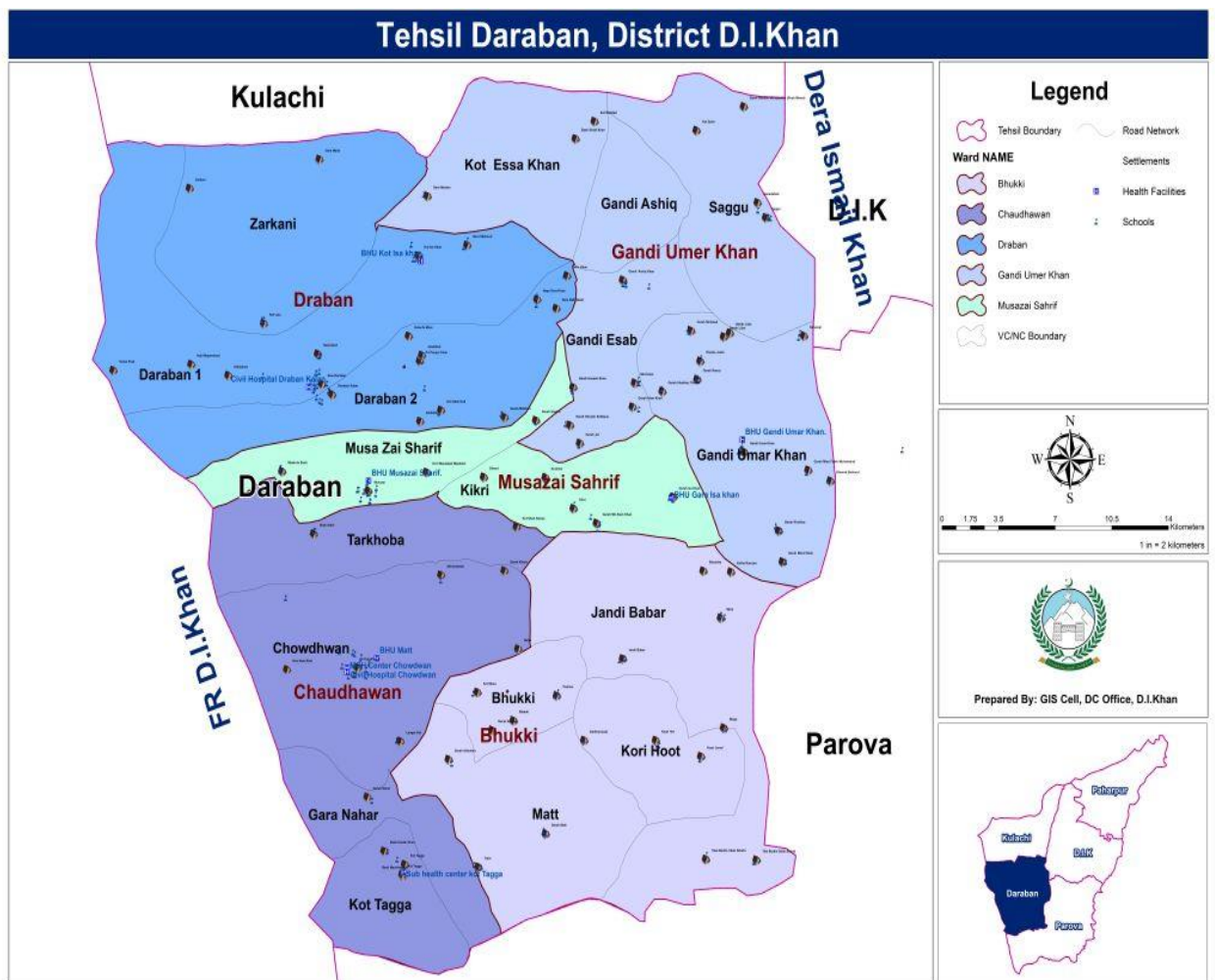


Figure 3 Map of Tehsil Daraban

Map of Tehsil Kulachi:

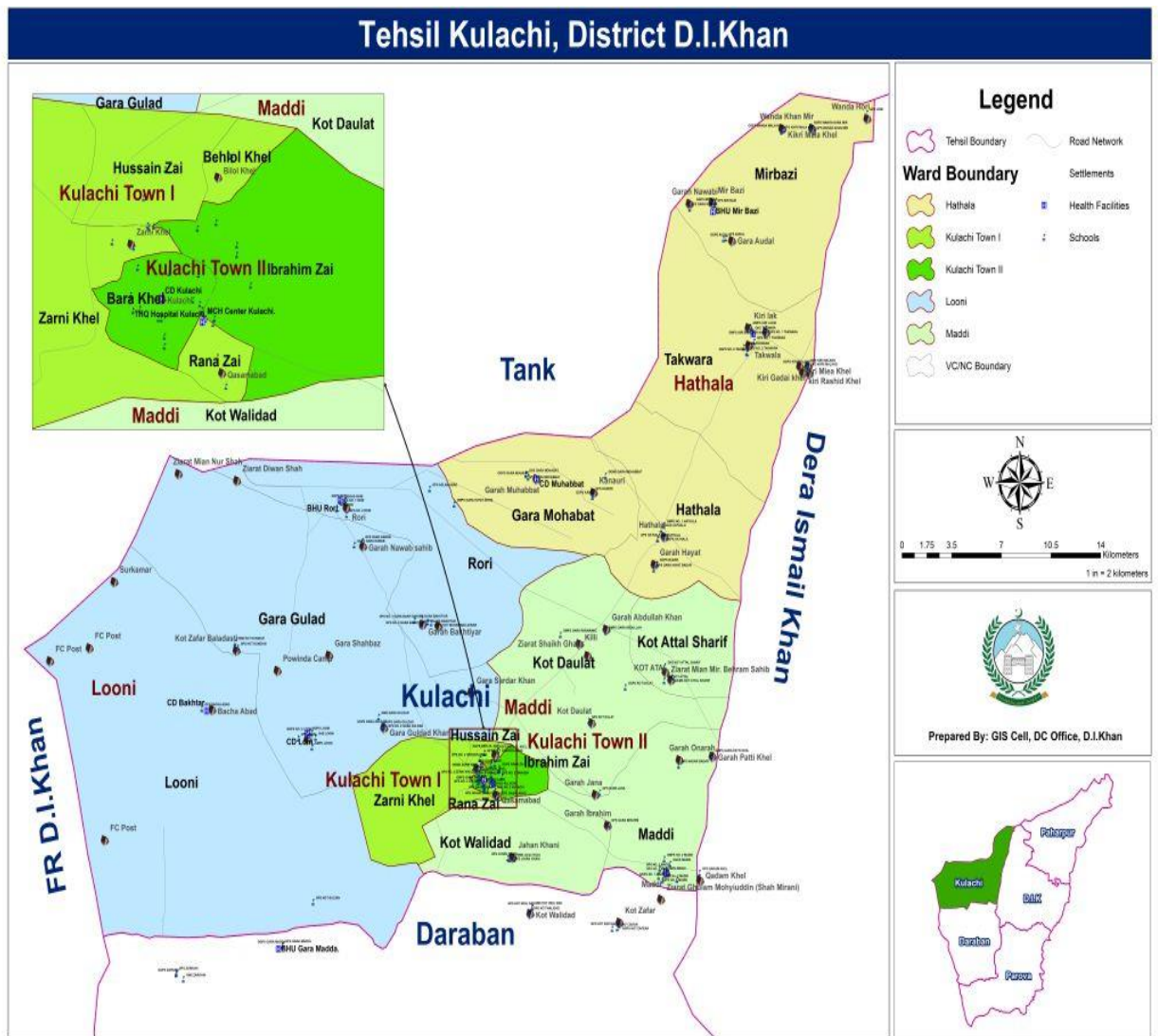


Figure 4 Map of Tehsil Kulachi

Map of Tehsil Paharpur:

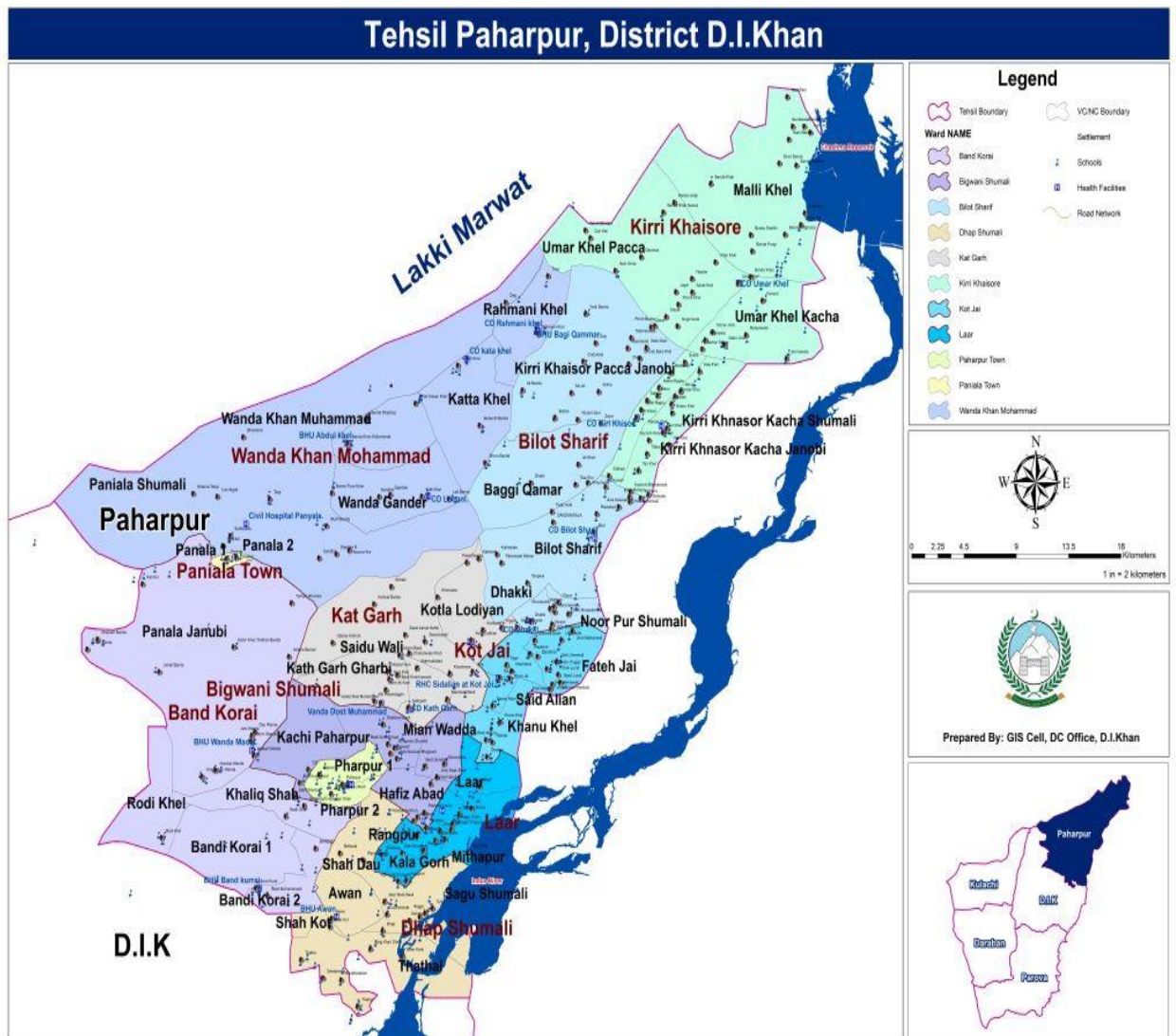


Figure 5 Map of Tehsil Paharpur

Map of Tehsil Parova:

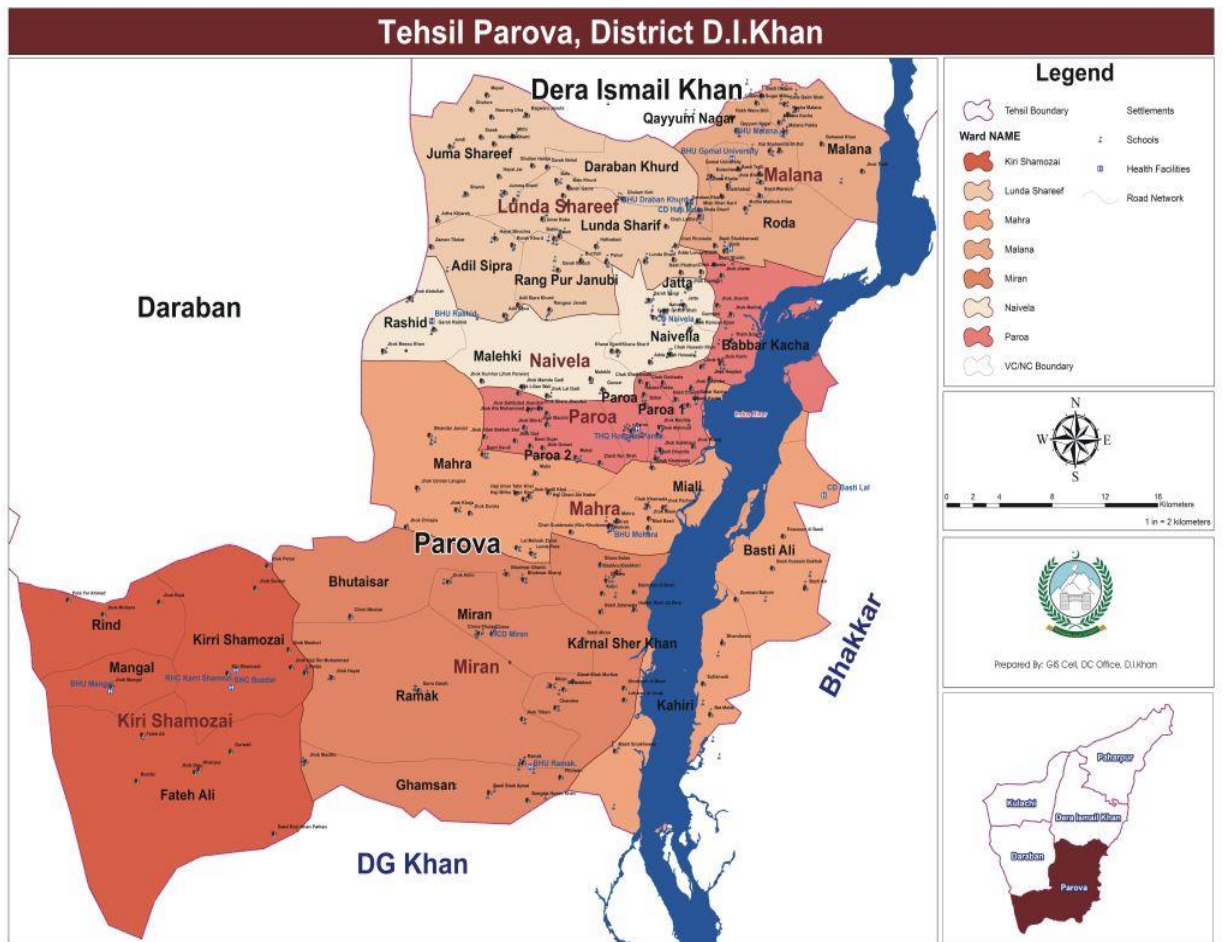


Figure 6 Map of Tehsil Parova

Seasonal Calendar:

Example:

Hazards and Activities		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hazards	Snow Fall													
	Landslide													
	Monsoon Rain Fall						Medium	High	High	Low				
	Riverbank soil erosion						Medium	Medium	Medium	Low				
	Water borne diseases						Medium	Medium	Medium	Medium				
	Heavy Rainfall	Medium	Medium				Medium	High	High	Low				
	GLOFs/Flash Floods							Medium	Medium					
	Riverine Floods/Urban Flooding							Medium	Medium					
	Drought													
	Fire Outbreaks													
Off – Farm Activities														
Earthquake	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	

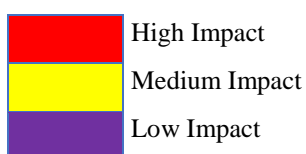


Figure 7 Seasonal Calendar of D.I.Khan

3.3 Sampling

This research used data collection from households from three tehsils of D.I.Khan. According to Census, the total number of rural households in D.I.Khan tehsil¹ was 57717, Paharpur tehsil was 39254, and Paroa tehsil was 29420. Yamane's formula,

¹ Sub-district in the local language

the sample size was determined. Yamane's sampling method was used to find a minimum number of samples required (D. Liu, Li, Fang, & Zhang, 2017; Yamane, 1967) Eq (1). By taking confidence interval 95%, $e = 0.05$, 384 samples were required. However, a total of 500 questionnaires were collected. After scrutiny, around 465 questionnaires were selected. The data was collected from areas that were affected by the 2010 floods.

Yamane's formula

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

Where,

N = population size

E = error margin

n = sample size

3.4 Data Collection and Questionnaire Design

The data collection was done from areas that were more affected by the 2010 flood. The sensitivity of areas was checked by the report of DDMA D.I.Khan. All respondents were males, as it is customary in Pakistani society that females don't respond to unknown people. A semi-structured questionnaire with mainly close-ended questions was constructed for the residents in the settlements.

The questionnaire was divided into three proportions in which the first part was socio-economic information such as age, gender, income, household size, occupation, female/male ratio, household having means of transportation, education level, marital status, and family type, etc. The second portion was

focused on determining the evacuation dynamics, which included the indicators, willingness to evacuate, the likelihood of evacuation, the time needed to evacuate(hours), bag pack for an emergency, household last time evacuation, number of persons evacuated last time in the household.

The third portion focused on flood risk perception, and was measured past flood experience (Franklin, King, Aitken, & Leggat, 2014; Kellens, Zaalberg, Neutens, Vanneuville, & De Maeyer, 2011; Lawrence, Quade, & Becker, 2014; Lindell et al., 2005; D. Liu et al., 2018; Nhuan, Tue, Hue, Quy, & Lieu, 2016; Pagneux, Gísladóttir, & Jónsdóttir, 2011; Peacock, Gladwin, & Morrow, 2012; Qasim et al., 2015; Rana & Routray, 2016; Raška, 2015; Trumbo, Meyer, Marlatt, Peek, & Morrissey, 2014), fear of floods (Adelekan & Asiyani, 2016; Armas, Ionescu, & Posner, 2015; Ho et al., 2008; Kellens et al., 2013; Kellens et al., 2011; D. Liu et al., 2018; Pagneux et al., 2011; Raaijmakers, Krywkow, & van der Veen, 2008; Rana & Routray, 2016), perceived chances of flood occurrence (Bosschaart, Kuiper, van der Schee, & Schoonenboom, 2013; Botzen et al., 2009; Ho et al., 2008; Kellens et al., 2013; Kellens et al., 2011; D. Liu et al., 2018; Rana & Routray, 2016), perceived danger to life and family (Adelekan & Asiyani, 2016; Armas et al., 2015; Bosschaart et al., 2013; Ho et al., 2008; Kellens et al., 2013; Kellens et al., 2011; Salvati et al., 2014), perceived capacity to deal, and trust in local government, disaster management plan and policies (Slovic, 1999; Sullivan-Wiley & Gianotti, 2017). All the indicators of flood risk perception were measured on a 1-5 Likert scale.

3.5 Indicators

The indicators were to be found keeping in view the abstract nature of concepts. To capture the multifariousness of issues that one study objective undertook, the indicator was found from the existing body of knowledge. The indicators were then clustered to form some broader categories. The process was done for indicators of all six aspects of the study that were: Social, Economic, Institutional, Infrastructural, Risk Perception, and Evacuation Dynamics as shown below in tables.

Social Indicators:

S. No.	Indicator	Classes	References
1	No of people with disabilities	>2 2-1 0	(Koshiba & Suzuki, 2018)
2	Families headed by an aged person	Yes/ No	(Cutter, Boruff, & Shirley, 2003; Drabek, 2012; McGuire, Ford, & Okoro, 2007; Peacock et al., 2012; Peek-Asa, Ramirez, Seligson, & Shoaf, 2003; Rosenkoetter, Covan, Cobb, Bunting, & Weinrich, 2007; White, Fox, Rooney, & Cahill, 2007; Wilmot & Mei, 2004)
3	Household's strong ties with neighbors	Yes/ No	(Horney, MacDonald, Van Willigen, Berke, & Kaufman, 2010; Stein, Dueñas-Osorio, & Subramanian, 2010)
4	Household Size	<5 5-10 >10	(Armaş, 2012; Cutter et al., 2003; Flanagan Barry, Gregory Edward, Hallisey Elaine, & Heitgerd Janet, 2011; Flanagan, Gregory, Hallisey, Heitgerd, & Lewis, 2011; Kaźmierczak & Cavan, 2011; S. Khan, 2012; Rana & Routray, 2016; Willroth, Diez, & Arunotai, 2011; Yoon, 2012)
5	No of persons having driving skills in household	<1 1-2 2-3 3-4 >4	
6	Household evacuation based on neighbors and friends	Yes/ No	(Horney et al., 2010; Stein et al., 2010)
7	No of children in the household	<1 1-2 2-3	(Bateman & Edwards, 2002; Cutter et al., 2003; Lindell et al., 2005; Peacock et al., 2012)

S. No.	Indicator	Classes	References
		3-4 >4	
8	Male/Female ratio	<1 1-2 2-3 3-4 >4	(Armaş, 2012; Bateman & Edwards, 2002; Cutter et al., 2003; Cutter et al., 2000; Dash & Gladwin, 2007; Drabek, 2012; Lindell et al., 2005; Phung et al., 2016; Riad et al., 1999; Whitehead et al., 2000; Yoon, 2012)(43)(Rana & Routray, 2016)
9	No of older adults in the household	<1 1-2 2-3 3-4 >4	(Cutter et al., 2003; Drabek, 2012; McGuire et al., 2007; Peacock et al., 2012; Peek-Asa et al., 2003; Rosenkoetter et al., 2007; White et al., 2007; Wilmot & Mei, 2004)
11	Education level of household head's	College/ University, High, Middle, Primary, Not attended	(Ahsan & Warner, 2014; Gain, Mojtahed, Biscaro, Balbi, & Giupponi, 2015; Hahn, Riederer, & Foster, 2009; Nhuan et al., 2016; OCHA Regional Office for Asia and the Pacific (OCHA ROAP), 2013; Panthi et al., 2016; Rana & Routray, 2016; Toufique & Islam, 2014; Zhou, Liu, Wu, & Li, 2015)
13	Marital status	Married/wido wed/single	(Mccarty, 2009)
14	Family type	Joint Nucleus Single	(Flanagan Barry et al., 2011; Mccarty, 2009; Rana & Routray, 2016)
15	Member of Household with chronic illness	0 1 2 >2	(Ahsan & Warner, 2014; Balica, Wright, & van der Meulen, 2012; Birkmann et al., 2013; Flanagan et al., 2011; Kaźmierczak & Cavan, 2011; Panthi et al., 2016; Toufique & Islam, 2014)
16	Household living in community (years)	>50 50-40 30-40 20-30 10-20 <10	(Birkmann et al., 2013; Cutter et al., 2003; Rana & Routray, 2016; Walker et al., 2014)
17	Social isolation	Yes/ No	(Mccarty, 2009)
18	Household participation in community meetings	Yes/ No	(Flanagan et al., 2011; Nhuan et al., 2016)
19	Household having relatives outside the city	Yes/ No	(Boon, 2014; Rana & Routray, 2016; Wisner, Blaikie, Cannon, & Davis, 2004)
20	Household is given awareness to children	Yes/ No	
21	Household aware about EWS	Yes/ No	(Ahsan & Warner, 2014)
22	Household having first aid knowledge	Yes/ No	(Rana & Routray, 2016)
23	Involvement of community in disaster response	Very high High Medium	(Flanagan et al., 2011; Nhuan et al., 2016)

S. No.	Indicator	Classes	References
		Low Very low	

Economic Indicators:

S. No	Indicator	Classes	References
1	Due to personal belongings	Yes/ No	(Koshiba & Suzuki, 2018)
2	Occupation of household head	Trade and Commerce, Agriculture, Government Service, Daily wagers, Unemployed	(Rana & Routray, 2016)
3	Household income (in Rs. amount)	>60,000 40,000–60,000 20,000–39,999 10,000–19,999 <10,000	(Bateman & Edwards, 2002; Holand, Lujala, & Rød, 2011; S. Khan, 2012; McCaffrey, Wilson, & Konar, 2018; Peacock et al., 2012; Rana & Routray, 2016; Walker et al., 2014; Whitehead et al., 2000)
4	Household having means of Transportation	Yes/ No	(Bleau, Blangy, & Archambault, 2015; Flanagan et al., 2011; Kaźmierczak & Cavan, 2011; S. Khan, 2012; Mccarty, 2009; Rana & Routray, 2016)
5	Homeownership	Rented, Owned	(Cutter et al., 2003; S. Khan, 2012; Rana & Routray, 2016; Riad et al., 1999; Walker et al., 2014; Yoon, 2012; Zhang et al., 2004)
6	Household having animals	Yes/ No	(Mccarty, 2009)
7	Household having any type of Savings e.g (gold, silver)	Yes/ No	(Blaikie, Cannon, Davis, & Wisner, 2005; Browne & Hoyt, 2000)
8	Household having insurance (life, health)	Yes/ No	(Birkmann et al., 2013; Browne & Hoyt, 2000; Nhuan et al., 2016; Su et al., 2015)
9	Household holding building insurance	Yes/ No	(Birkmann et al., 2013; Browne & Hoyt, 2000; Nhuan et al., 2016; Su et al., 2015)
10	Households owning land/house outside the flood-prone community	Yes/ No	(Blaikie et al., 2005; Boon, 2014)
11	Households with family members employed outside flood-prone area	Yes/ No	(Hahn et al., 2009)
12	households monthly savings (in Rs. amount)	<10,000, 10,000-20,000, 21,000-30,000, 31,000-40,000, 41,000-50,000,	(Blaikie et al., 2005; Browne & Hoyt, 2000)

S. No	Indicator	Classes	References
		51,000-60,000, 61,000+	
13	Automobile ownership	Yes/ No	(Rana & Routray, 2016)
14	Households having multiple sources of livelihood options	>2 2 1	(Rana & Routray, 2016)
15	Number of earning members in the household	>2 2 1 0	(Rana & Routray, 2016)
16	Households having any family member Working outside flood-prone area	Yes/ No	

Infrastructure/Physical Indicators:

S. No	Indicator	Classes	References
1	Construction material of household	Pacca (brick, cemented), Katcha (mud), Reinforced	(Rana & Routray, 2016)
2	Households having mobile Phone	Yes/ No	(Rana & Routray, 2016)
3	Households having radio	Yes/ No	(Rana & Routray, 2016)
4	Households having telephone	Yes/ No	(Rana & Routray, 2016)
5	Households having TV	Yes/ No	(Bleau et al., 2015; S. Khan, 2012; OCHA Regional Office for Asia and the Pacific (OCHA ROAP), 2013; Panthi et al., 2016; Rana & Bhatti, 2018)
6	Households not getting electricity	Yes/ No	(Ahsan & Warner, 2014; Bleau et al., 2015; Islam et al., 2013; Rana & Routray, 2016; Toufique & Islam, 2014)
7	Household near to the river	Yes/ No	(Gladwin, 1997; Lindell et al., 2005; Wilmot & Mei, 2004)
8	Distance from road(in km)	>10 5-10 4-1 <1	
9	The construction material of the road	Pacca(asphaltic), Katcha	
10	Time to reach the road(in hours)	>1 1 <1	
11	Number of stories household have	Double Single	(Rana & Routray, 2016)
12	Building age	<5	(Rana & Routray, 2016)

S. No	Indicator	Classes	References
		06–10 11–20 >20	

Institutional Indicators:

S.no	Indicator	Classes	References
1	Household received Info. From officials	Yes/no	(McCaffrey et al., 2018) (Rana & Routray, 2016)
2	Assembly points by officials	Yes/no	
3	Where to GO..... Told by officials	Yes/no	
4	Number of Drills or awareness program attended by Household	<2 2 1 0	(Bollin et al., 2006; Fakhruddin & Chivakidakarn, 2014; Mwale, Adeloje, & Beevers, 2015; Nhuan et al., 2016)
5	Got emergency plans from Officials	Yes/ No	(Bollin et al., 2006; Mwale et al., 2015)
6	Public shelter	Yes/ No	

Risk Perception Indicators:

S. No	Indicator	Classes	References
1	Household attachment with the home	Yes/ No	(McCaffrey et al., 2018)
2	Household protecting their property	Yes/ No	(McCaffrey et al., 2018)
4	Household perceived risk level	High/low	(Vitek & Berta, 1982; Whitehead, 2003)
5	Household's experience with floods	Yes/ No	(Franklin et al., 2014; Lindell et al., 2005; Nhuan et al., 2016; Peacock et al., 2012; Riad et al., 1999)
6	Household awareness of evacuation	Very high High Medium Low Very low	(Koshiha & Suzuki, 2018)
7	Household's aware of emergency shelter	Very high High Medium Low Very low	(Blaikie et al., 2005; Hosseini, Hosseini, Izadkhah, Mansouri, & Shaw, 2014)
8	Household's awareness about evacuation routes	Very high High Medium Low Very low	(Blaikie et al., 2005; Hosseini et al., 2014)
9	Household have any Fear of flood	Very high High Medium Low Very low	(Rana & Routray, 2016)
10	Chances of flood occurrence	Very high	(Rana & Routray, 2016)

S. No	Indicator	Classes	References
		High Medium Low Very low	
11	Household Perceived danger to life and family	Very high High Medium Low Very low	(Rana & Routray, 2016)
12	Household Perceived capacity to deal	Very high High Medium Low Very low	(Rana & Routray, 2016)
13	Household Trust in local govt.	Very high High Medium Low Very low	(Rana & Routray, 2016)
14	Household Trust in Disaster management plan and policies	Very high High Medium Low Very low	(Slovic, 1999; Sullivan-Wiley & Gianotti, 2017)
17	Household's awareness about early warning system	Very high High Medium Low Very low	(Rana & Routray, 2016)
18	Knowledge about hazard	Yes No	

Evacuation Dynamics Indicators:

S. No	Indicator	Classes
1	Willingness to evacuate	Yes/No 1-5
2	time need to evacuate(Hours)	>2 2 1 <1
3	bag pack for emergency	Yes/no
4	I could ride it out	Yes/no
5	Household Last time evacuation	Yes/no
6	No of persons evacuated last time in the household	Yes/no

3.6 Data Analytical Methods

Risk perception indicators were mapped using a 1-5 Likert scale. Each scale was weighted according to the increase in risk perception. Strongly agree was weighted by (1), agree was weighted by (0.8), neutral by (0.6), disagree by (0.4), and strongly disagree by (0.2). These weights/scores are the composite index (CI) values for each family (equation (2)). Therefore, the flood risk perception index was calculated using equation (3).

$$CI = (W1 + W2 + W3 + \dots Wn) / n \quad (2)$$

$$\text{Overall Risk Perception} = \frac{\text{Fear} + \text{Awareness} + \text{Behavior} + \text{Trust}}{4} \quad (3)$$

Statistical Package for Social Sciences (SPSS) was used to enter data and perform statistical analyses. Chi-square tests were used to identify differences among the three communities. Pearson's correlation was used to establish the relationship between the likelihood of evacuation and risk perception index and its indicators. The correlation value can be in the range of -1 and 1. The sign of correlation shows the direction of the relationship, while the strength is denoted by numeric value means -1 to +1.

Finally, regression analysis was applied to identify the socioeconomic factors that influence willingness to evacuate in flood. The willingness to evacuate (yes or no) was taken as the dependent variable and socioeconomic variables, like age, income, household size, and distance from the river were taken as independent variables.

The fitness of the model was checked with the help of Hosmer and Lemeshow and omnibus tests.

Chapter 4

Socio-Economic Profile of Respondents

4.1 Age of the Respondents:

The age of the respondents plays a significant role in the reliability and validity of research data. The quality of research varies with the age of respondents, and the results obtained from data responded by aged respondents somewhat provide less precision than data obtained from young respondents.

The survey shows that in tehsil Paroa, 33.3% of respondents were 48+ age and 11.8% respondents were the age of less than 30 while in D.I.Khan tehsil majority of respondents fell between the 31-39 age group, and only 10.9 % were 48+ age on the other hand in Paharpur tehsil 40.8% respondents were in the age group of 31-39 while only 13.8% of respondents were less than 30 age as shown in Table 1.

Table 1 Age of Respondents

Age	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
<=30	12	11.8	62	29.4	21	13.8	44.387	0.000	95	20.4
31-39	23	22.5	80	37.9	62	40.8			165	35.48
40-47	33	32.4	46	21.8	43	28.3			122	26.23
48+	34	33.3	23	10.9	26	17.1			83	17.84
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

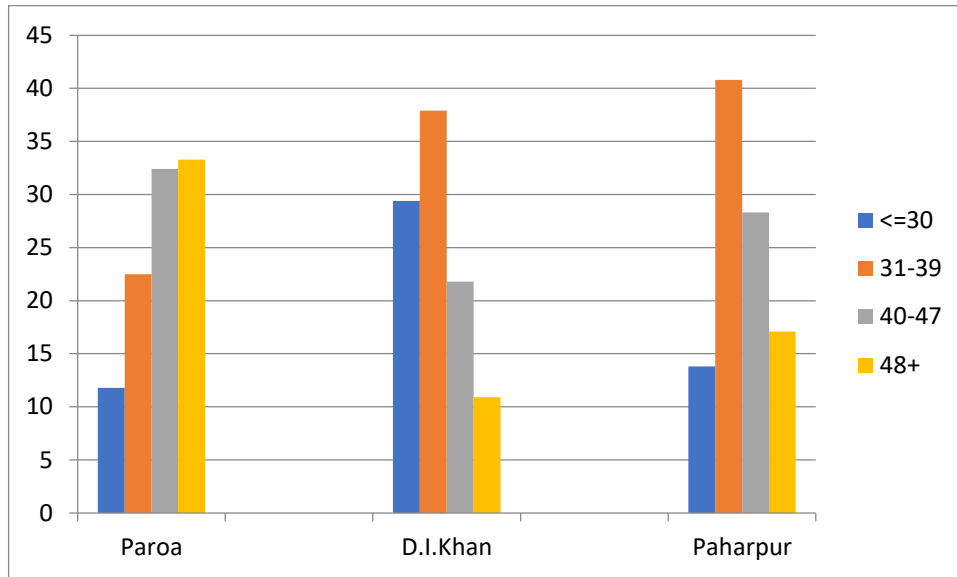


Figure 8 Age of respondents:

4.2 Gender:

Gender consideration is crucial in implementation research. Failing to do so, might neglect an important determinant of knowledge use, and it can reduce the effectiveness of the proposed interventions. This study is independent of gender biases, and households were interviewed based on who responded to the data collectors on the field.

4.3 Education:

Education plays a significant role in influencing the lifestyle, behavior, awareness, and attitude of the respondents. The education profile reveals the educational attainment of respondents. The Table 2 shows that in tehsil Paroa majority of the respondents were uneducated, which contributes only 70.6% and 10% were primary pass while in Tehsil D.I.Khan 97.6 % respondents were uneducated while 5% were primary pass, on the other hand in Tehsil Paharpur 85.5% of respondents were uneducated while only 7.2% respondents were middle pass.

Table 2 Education of Respondents

Education	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Uneducated	72	70.6	206	97.6	130	85.5	65.819	0.000	408	87.7
Primary	10	9.8	1	0.5	4	2.6			15	3.22
Middle	6	5.9	0	0	11	7.2			17	3.65
High	5	4.9	1	0.5	2	1.3			8	1.7
College	3	2.9	0	0	0	0			3	0.64
University	3	2.9	0	0	1	0.7			4	0.86
Madrasa	2	2.9	3	1.4	4	2.6			9	1.93
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

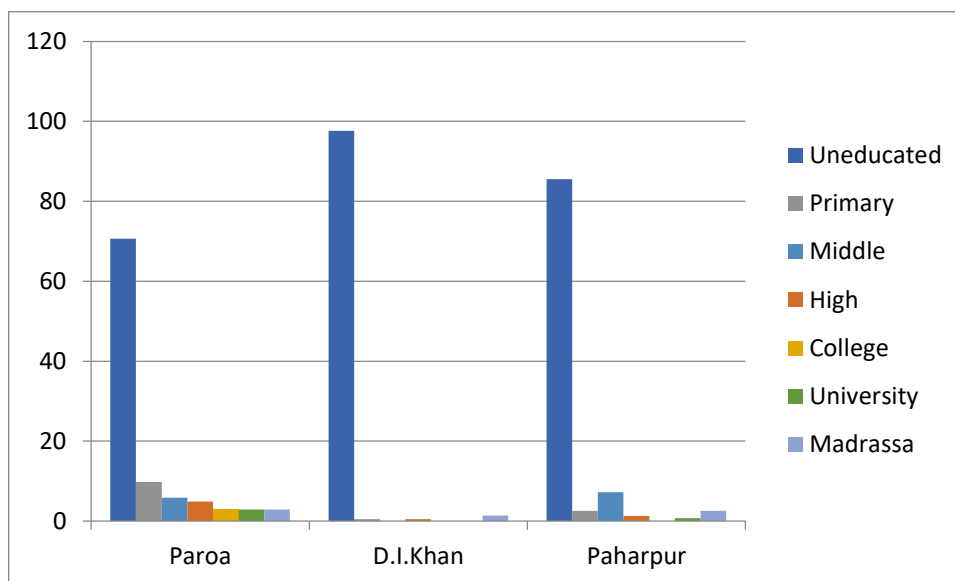


Figure 9 Educational Level of respondents

4.4 Income

The income of the respondents shows the financial status and their affordability. The household survey in Table 3 shows that 63.7% of respondents of Tehsil Paroa have less than 30000 incomes while only 4.9% of respondents have 48001+ incomes. If we see the table of Tehsil D.I.Khan survey 50.7% of respondents have

income between 30001-39000, while 9% respondents have income higher than 480001. On the other hand, if we see the table of a household survey of Tehsil Paharpur, 56.6% of respondents have income between 30001-39000 while only 3.9% of respondents have income higher than 48000.

Table 3 Income of Respondents

Income	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
<=30,000	65	63.7	20	9.5	34	22.4	118.064	0.000	119	25.5
30001-39000	20	19.6	107	50.7	86	56.6			213	45.8
39001-48000	12	11.8	65	30.8	26	17.1			103	22.15
480001+	5	4.9	19	9	6	3.9			30	6.45
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

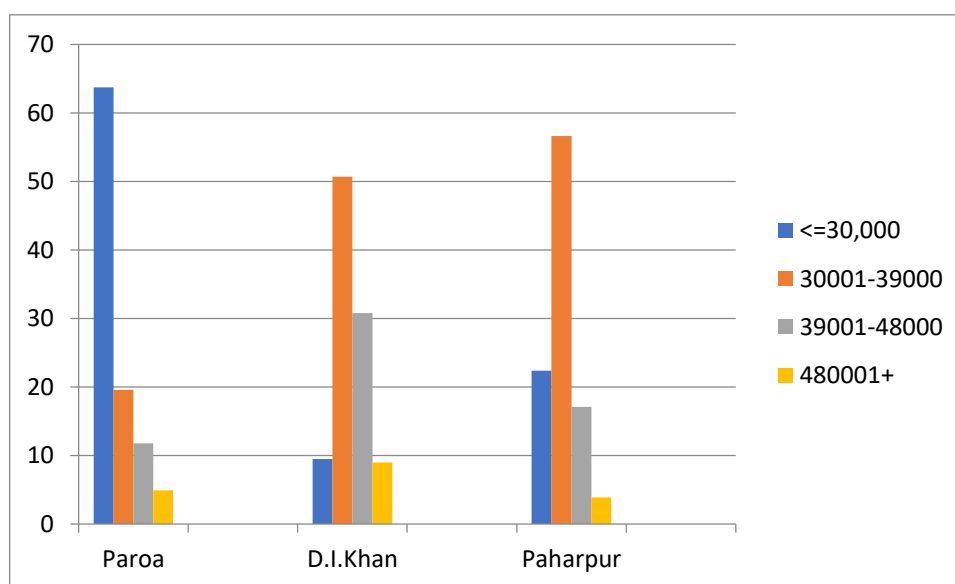


Figure 10 Income of respondents

4.5 Family Type:

Family type means the household joint or single. From the household survey, it can be seen that in Tehsil Paroa, 74.5% of respondents are living in a single type of family while others are living in the joint family system. While in Table 4 Tehsil D.I.Khan 84.4% of respondents are living in a single-family system. On the other hand, in Tehsil Paharpur, 81.6% of respondents live in a single-family system.

Table 4 Family Type of Respondents

Family Type	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Single	76	74.5	178	84.4	124	81.6	4.399	0.111	378	81.29
Joint	26	25.5	33	15.6	28	18.4			87	18.7
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

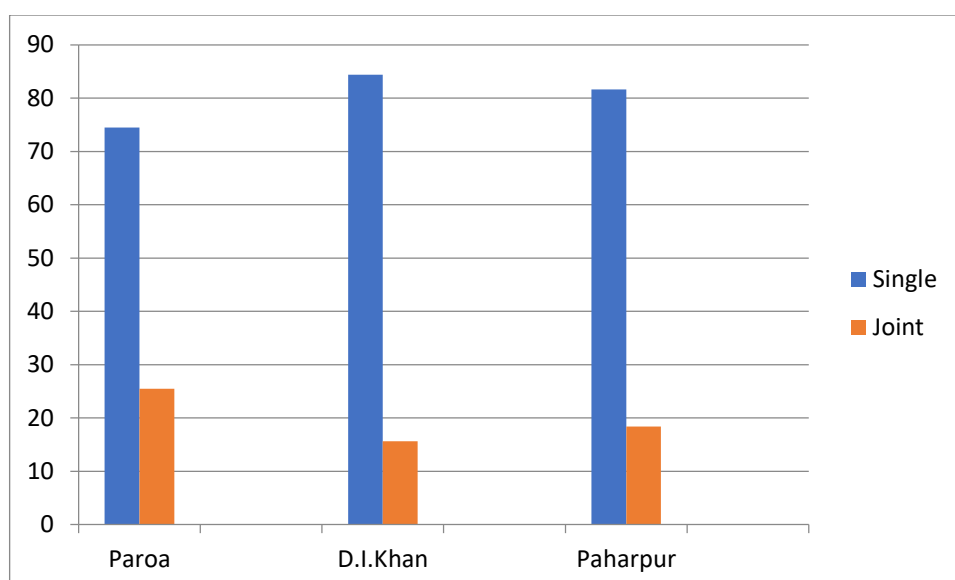


Figure 11 Family Type of respondents

4.6 Household size:

The household survey collected from Tehsil Paroa shows that 52% of respondents have 8-9 household sizes while 25.5% of respondents have 13+ household sizes. If we observe Tehsil D.I.Khan in Table 5, 50.7% respondents have a household size between 8-9 while 15.2% respondents have 13+ household size. On the other hand, if we see the table of Tehsil Paharpur survey, 51.3% of respondents have 8-9 household size while only 14.5% of respondents have household size higher than 13. According to the survey conducted in the field, every household was owned none of the houses were rented.

Table 5 Household size of Respondents

HOUSEHOLD size	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
<=7	9	8.8	24	11.4	20	13.2	9.115	0.167	53	11.39
08-09	53	52	107	50.7	78	51.3			238	51.18
10-12	14	13.7	48	22.7	32	21.1			94	20.21
13+	26	25.5	32	15.2	22	14.5			80	17.2
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

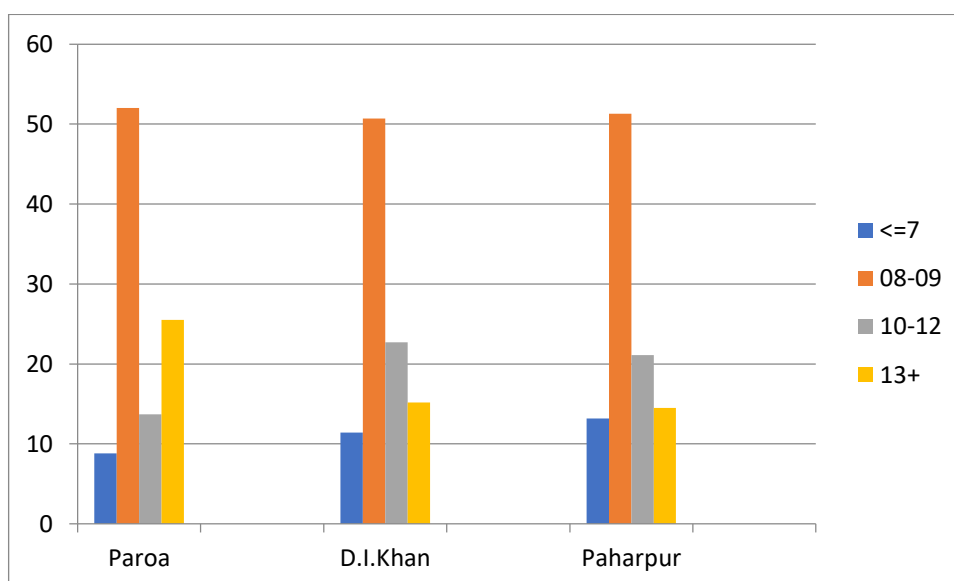


Figure 12 Household Size of respondents

4.7 Occupation:

The household survey from tehsil Paroa shows that 72.5% of respondents are doing agriculture as an occupation while 2.9% of respondents have government service.

If we see the Table 6 of tehsil D.I.Khan, 79.1% of respondents are in the agriculture field while 20.9% are daily wagers. On the other hand, in Tehsil Paharpur, 89.5% of respondents have an agriculture field, while 10.5% of respondents are daily wagers.

Table 6 Occupation of Respondents

Occupation	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P- Value	Freq	%
Agriculture	74	72.5	167	79.1	136	89.5	20.939	0.000	377	81.07
Govt. Service	3	2.9	0	0	0	0			3	0.64
Daily wager	25	24.5	44	20.9	16	10.5			85	18.27
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

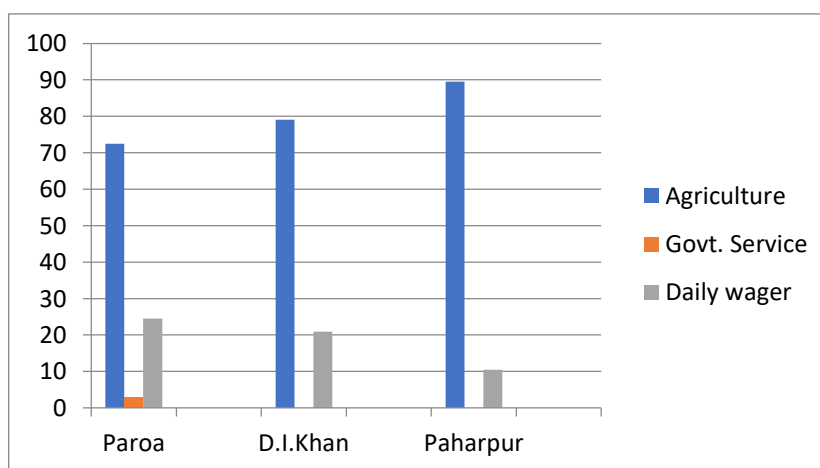


Figure 13 Occupation of respondents

4.8 Summary of the Chapter

The age of the respondents plays a significant part in the reliability and validity of research data (Hong et al., 2019). The sampled survey shows that in Paroa, 33.3% of respondents were 48+ age and 11.8% respondents were the age of less than 30. In D.I.Khan, the majority of respondents were among the 31-39 age group, and only 10.9 % were above 48. On the other hand, in Paharpur, 40.8% of respondents were in the age group of 31-39, while only 13.8% of respondents were less than 30 age. From the chi-square test, it can be seen that the data is statistically significant as $p < 0.05$. As is customary in Pakistani society, all respondents were males. The survey showed that 52% of Paroa respondents had 8-9 household sizes while 25.5% of respondents had 13+ household sizes. In D.I.Khan, 50.7% respondents had a household size between 8-9, while 15.2% respondents have 13+ household size. On the other hand, in Paharpur, 51.3% of respondents had 8-9 household size.

The income of the respondents shows the financial status and their affordability. The survey showed that 63.7% of respondents of Paroa had less than 30,000 PKR, while only 4.9% of respondents had more than 48,000 PKR. In D.I.Khan survey 50.7% of respondents had income between 30,001-39,000 PKR, while 9% respondents had an income higher than 48,000 PKR. Similarly, in Paharpur, 56.6% of respondents had income between 30,001-39,000, while only 3.9% of respondents had an income higher than 48,000. A significant difference in income groups was also observed among the three rural communities.

Education plays an important role in influencing the lifestyle, behavior, awareness, and attitude of the respondents. The education profile reveals the educational attainment of respondents. The survey shows that in the majority of the respondents, all three rural communities are uneducated. In Paroa, D.I.Khan, and Paharpur, about 70.6%, 97.6%, and 85.5% of respondents were uneducated. This is an alarming situation that can adversely affect disaster preparedness and evacuation measures. Most of the respondents in all three communities were employed in the agricultural sector.

Chapter 5

Evacuation Dynamics and Perceptions

5.1 Evacuation Dynamics

5.1.1 Willingness to Evacuate

The willingness of respondents to evacuate is the most important criterion to evaluate disaster preparedness. From the data collected, it can be observed that from all three rural communities, the majority of the respondents were willing to evacuate in case of a flood as shown in Table 7.

Table 7 Willingness to Evacuate

Willingness to evacuate	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Yes	90	88.2	157	74.4	117	77	7.959	0.019	364	78.27
No	12	11.8	54	25.6	35	23			101	21.72
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

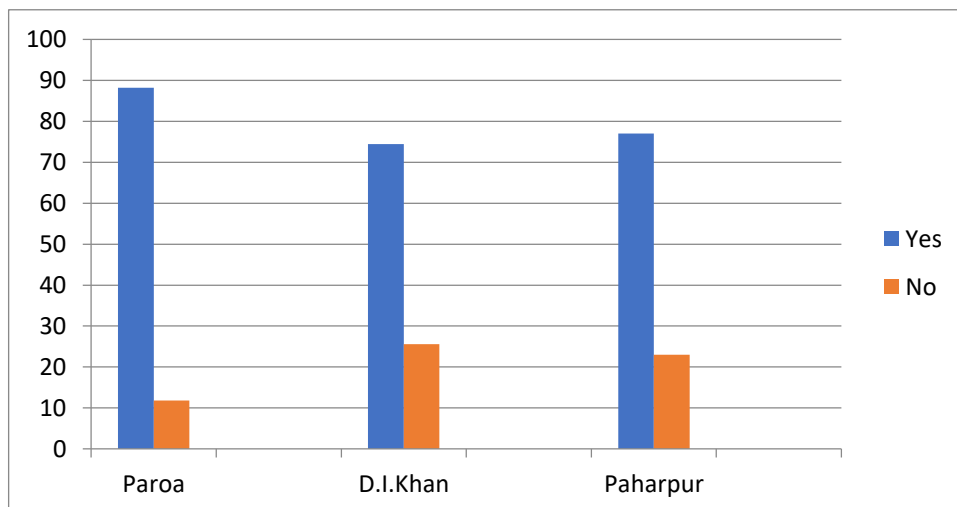


Figure 14 Willingness to Evacuate

5.1.2 Likelihood of Evacuation

From data collected through the survey, it is observed that most of the people were willing to evacuate. In Paroa, 45% of respondents were showing less chance of evacuation but in the case of D.I.Khan and Paharpur had high chances of evacuation in respondents, i.e., 70% and 79%, respectively as shown in Table 8. From the result of Pearson chi-square, it can be seen that the results are statistically significant as $p < 0.05$.

Table 8 Likelihood of Evacuation

Willingness to evacuate	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Low	46	45.1	63	29.9	32	21.1	19.386	0.001	141	30.3
Medium	24	23.5	73	34.6	67	44.1			164	35.3
High	32	31.4	75	35.5	53	34.9			160	34.4
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

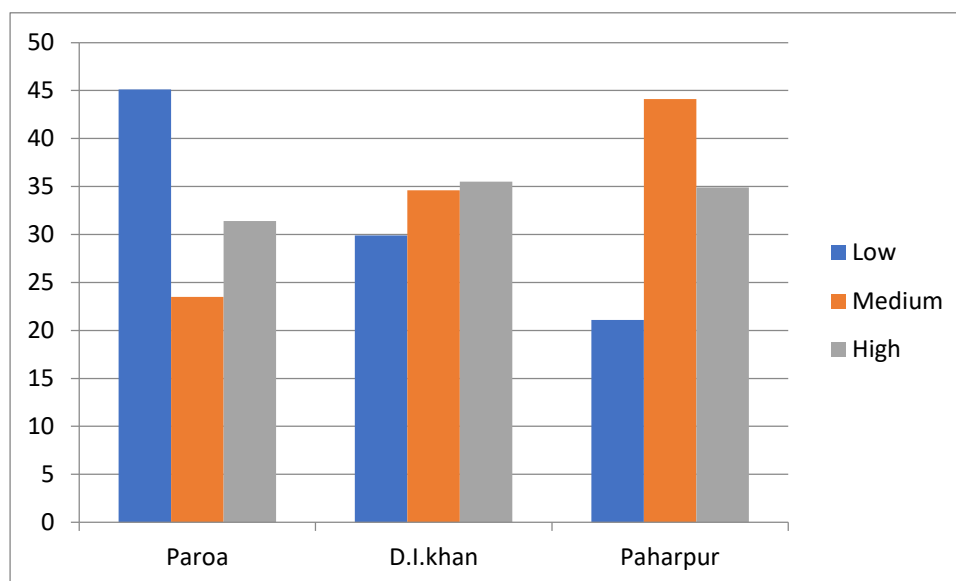


Figure 15 Likelihood of Evacuation

5.1.3 No of Person Evacuated Last Time in the Household

From the results of the household survey, it is concluded that most of the respondents didn't evacuate the last time when the flood came. In Table 9 it can be observed that Paroa, 58% of respondents didn't evacuate. On the other hand, in D.I.Khan 100% of respondents didn't evacuate, while from Paharpur 80% of people didn't evacuate last time.

Table 9 No of Person Evacuated Last Time

Person evacuated last time	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
0	59	57.8	211	100	122	80.3	95.118	0.000	392	84.30
ALL	43	42.2	0	0	30	19.7			73	15.69
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

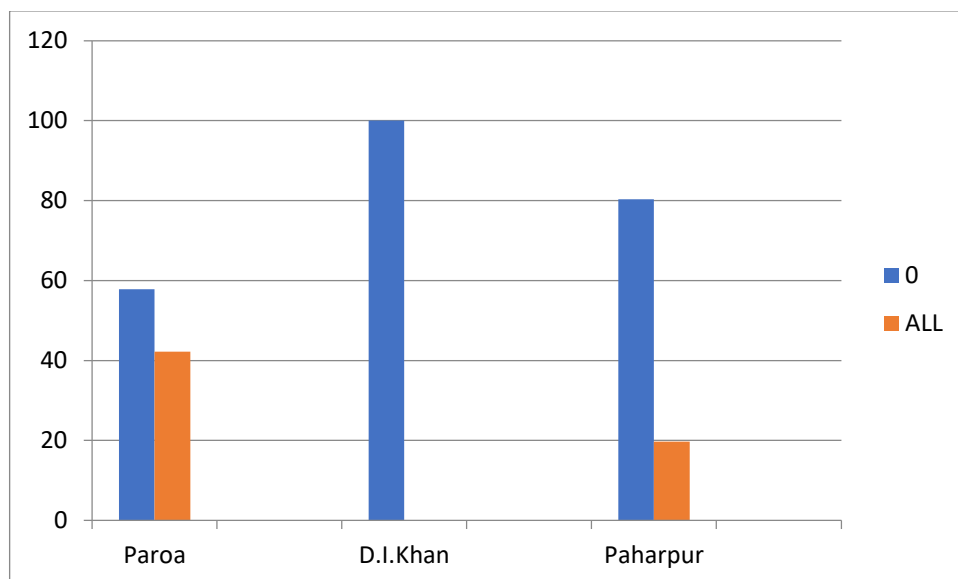


Figure 16 No of Person Evacuated Last Time

5.1.4 Time Need to Evacuate (Hours)

From the data of how much time people need to evacuate, it is concluded that in Paroa, 61% of respondents need 1-5 hours to evacuate while the remaining 38% of respondents need 6-10 hours to evacuate. On the other hand, from the survey of D.I.Khan, it can be observed that 66% of respondents need 1-5 hours to evacuate while 33 % need 6-10 hours to evacuate while in Paharpur 51% respondents need 1-5 hours as shown in Table 10 while other 48% need 6-10 hours to evacuate.

Table 10 Time Needed to Evacuate

The time needed to evacuate	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
1-5	63	61.8	141	66.8	78	51.3	8.973	0.011	282	60.64
6-10	39	38.2	70	33.2	74	48.7			183	39.35
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

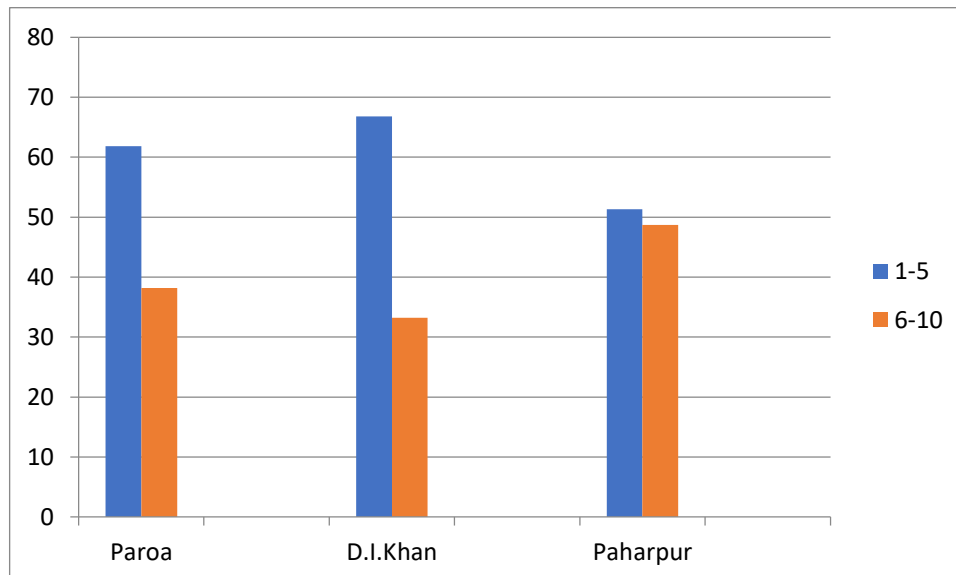


Figure 17 Time Needed to Evacuate

5.1.5 Household Last Time Evacuation

The very important question in this survey is whether the household evacuated during the last flood or not. The survey shows that in Paroa, 58% of respondents said they didn't evacuate. On the other hand, in D.I.Khan 100% people said they didn't evacuate, while in Paharpur, 80 % of people didn't evacuate as shown in Table 11.

Table 11 Household Last Time Evacuation

Evacuated last time	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Yes	43	42.2	0	0	30	19.7	95.118	0.000	73	15.69
No	59	57.8	211	100	122	80.3			392	84.30
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

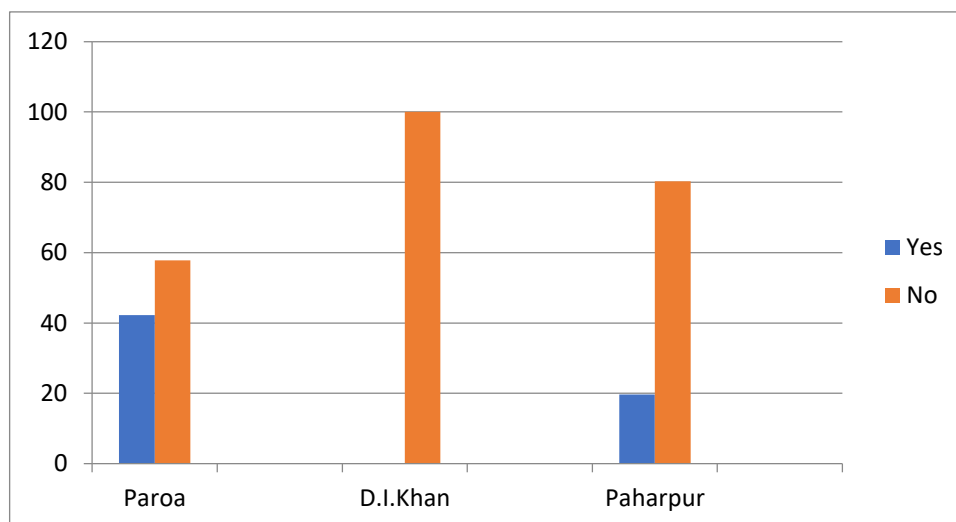


Figure 18 Household Last Time Evacuation

5.1.6 I could ride it out

The district-wise survey shows that all respondents of each tehsil think that they could ride it out as shown in Table 12.

Table 12 I Could Ride it Out

Ride out of the flood	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Yes	102	100	211	100	152	100	NA	NA	465	100
No	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.7 Bag Pack for Emergency

From the household survey shown in Table 13, it is concluded that there is no bag pack available in the house of respondents. This is a very alarming situation for their lives.

Table 13 Bag Pack for Emergency

Bag pack in House	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Yes	0	0	0	0	0	0	NA	NA	0	0
No	102	100	211	100	152	100			465	100
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.8 Household Given Awareness to Children

The household survey also includes the question of whether the household has given awareness to children about the flood or not. The survey results compiled in Table 14 show that there is very little awareness given to the children. In Paroa, 26% of respondents gave very low awareness, and 36% gave medium awareness. On the other hand, 70% of respondents gave low awareness to the children, while in Paharpur, 50% of children have low awareness while 34% have very low awareness.

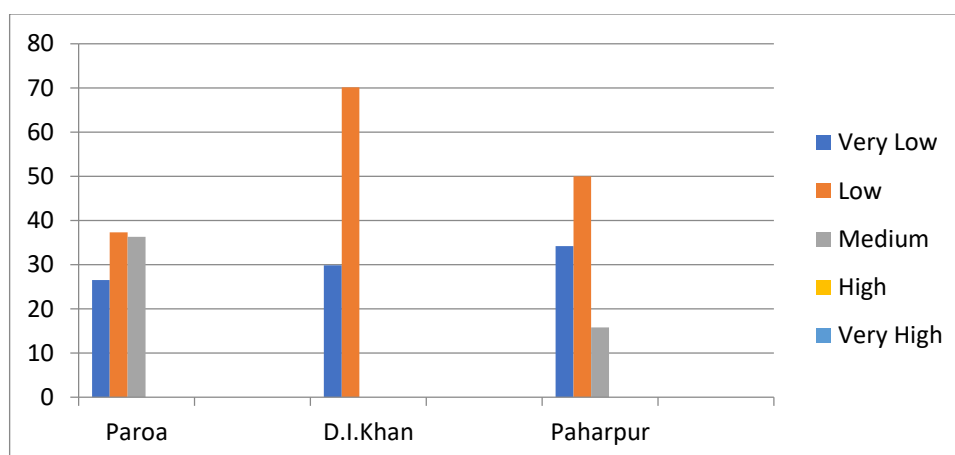


Figure 19 Awareness in Children

Table 14 Awareness in Children

Household Children Awareness	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Very Low	27	26.5	63	29.9	52	34.2	86.267	0.000	142	30.53
Low	38	37.3	148	70.1	76	50			262	56.34
Medium	37	36.3	0	0	24	15.8			61	13.11
High	0	0	0	0	0	0			0	0

Very High	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.9 Household Aware about EWS

In case of any disaster, EWS plays a very important role, especially in floods it plays a major role. The data collected in tehsils of D.I.Khan shows that there was no EWS awareness in the household as shown in Table 15.

Table 15 Awareness about EWS

Household knowledge about EWS	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Low	102	100	211	100	152	100	NA	NA	465	100
High	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.10 Household Evacuation Based on Neighbors and Friends

The major part of the evacuation process is whether a household's evacuation is dependent on neighbors or not. The survey compiled in Table 16 shows that the evacuation decision of all respondents is dependent upon the decisions of their neighbors and friends.

Table 16 Evacuation Based on Neighbors and Friends

Evacuation Upon Relatives	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Yes	102	100	211	100	152	100	NA	NA	465	100
No	0	0	0	0	0	0			0	0

Total	102	100	211	100	152	100			465	100
-------	-----	-----	-----	-----	-----	-----	--	--	-----	-----

Source: Field Survey, 2020

5.1.11 Reason did not evacuate

The most frequently asked question from affected in case of any disaster is that why they didn't evacuate. The survey results in Table 17 show that in Paroa, most of the people didn't evacuate because of their belongings. On the other hand, in the case of D.I.Khan 40% of people said that they didn't evacuate because their neighbors were not evacuating, while 38% of respondents said that they could not leave their homes alone. In the case of Paharpur, 30% of respondents didn't evacuate because of their neighbors, while 25% of respondents said because their friends were not evacuating so they didn't evacuate too.

Table 17 Reason Didn't Evacuate

Reason Didn't Evacuate	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Bcz of Neighbours	16	15.7	85	40.3	46	30.3	75.880	0.000	147	31.6
Bcz of Frnds	13	12.7	45	21.3	39	25.7			97	20.9
Bcz of Belongings	17	16.7	0	0	7	4.6			24	5.2
Cant leave my home alone	13	12.7	81	38.4	28	18.4			122	26.2
total	59	57.8	0	0	120	78.9			390	83.9
Missing	43	42.2	0	0	32	21.1			75	16.1
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

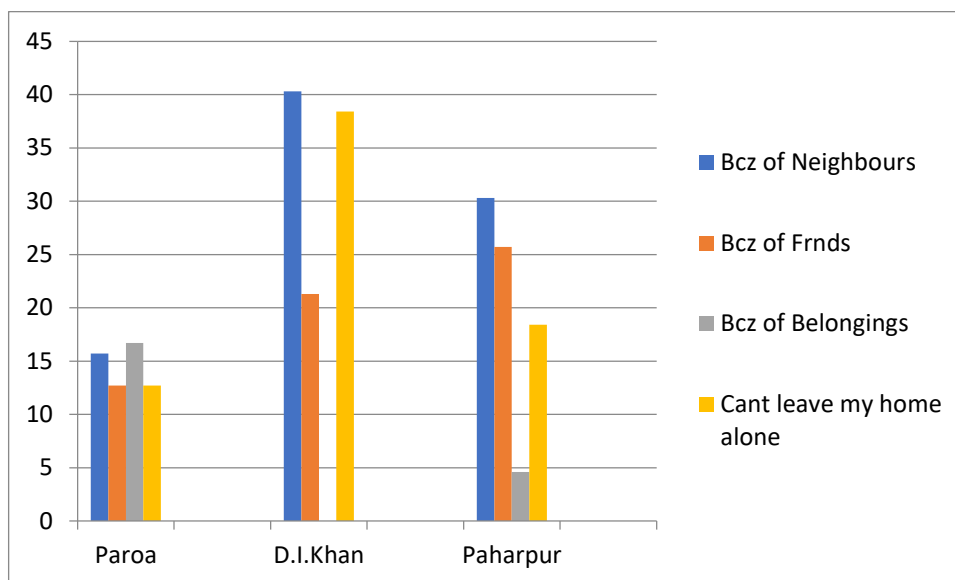


Figure 20 Reason Didn't Evacuate

5.1.12 Household having means of Transportation

Transportation plays a very important role in everyday life, but in case of any disaster, it becomes very helpful. The survey shows that in the case of Paroa 66% of respondents have 1 vehicle in their house, but 24% of respondents have no vehicle ownership. In the case of D.I.Khan 70% of respondents have 1 vehicle while 30% of respondents have no vehicle ownership. In the case of Paharpur, 68% of respondents have only 1 vehicle in their house, while 30% have no vehicle, and only 1 % of respondents have two vehicles as shown in Table 18.

Table 18 Transportation

No of Vehicle in house	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
0	25	24.5	63	29.9	46	30.3	26.100	0.001	134	28.81
1	68	66.7	147	69.7	104	68.4			319	68.60
2	8	7.8	0	0	2	1.3			10	2.15
2+	1	1.0	0	0	0	0			1	0.21
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

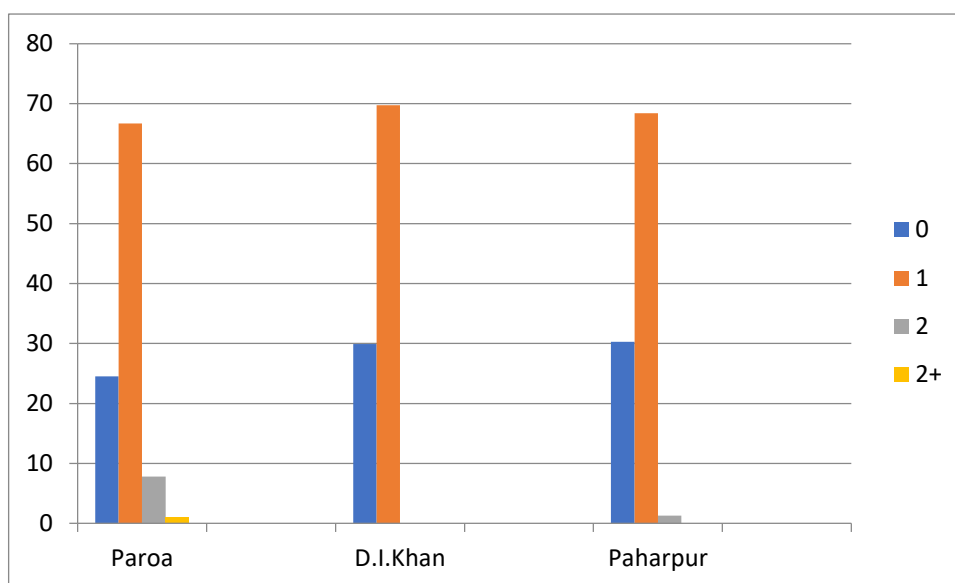


Figure 21 Transportation

5.1.13 Household Received Info. From Officials

The major and important question is whether households get any information about the disaster from officials or not. The survey compiled in Table 19 shows that the respondents of all Tehsils did not receive any information from officials about the flood.

Table 19 Info. From Officials

Got Info From Officials Last time	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
No	102	100	211	100	152	100	NA	NA	465	100
Yes	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.14 Assembly Points by Officials Last Time

Assembly points are very necessary for the situation of any disaster, which should be provided by the officials so that people can gather there and can be helped as soon as possible. The survey from three tehsils shows that there was no assembly point provided by officials as shown in Table 20. That was a very alarming and dangerous situation for flood-prone areas.

Table 20 Assembly points by officials last time

Assembly Points by Officials	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
No	102	100	211	100	152	100	NA	NA	465	100
Yes	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.15 Assembly Points by Officials this Time

The survey also includes the question that officials told people of flood-prone areas about assembly points this time or for the future. The results of the survey show that there is no information provided to people about assembly point till now as shown in Table 21.

Table 21 Assembly Points by Officials this Time

Assembly Point By Officials For Future	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
No	102	100	211	100	152	100	NA	NA	465	100
Yes	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.16 Where to GO..... Told by officials

The survey from three selected tehsils compiled in table 22 shows that there was nothing told to people of flood-prone areas about where they should go when a disaster occurs.

Table 22 Where to GO..... Told by officials

Where to go Last time	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
No	102	100	211	100	152	100	NA	NA	465	100
Yes	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.17 Frequency of Public Awareness Programs/Drills Attended by

Household Members (in Number)

In case of any disaster, awareness programs and drills are very important for every citizen. But in the case of flood-prone areas, its importance becomes double. The survey results in Table 23 show that no one from three selected tehsils attended any type of drills or awareness program.

Table 23 Frequency of Public Awareness Programs

Awareness Programs Attended	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
No	102	100	211	100	152	100	NA	NA	465	100
Yes	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.18 Availability and Circulation of Emergency Plans to Households

One of the most important for people living in flood-prone areas is the availability of emergency plans. The survey collected from selected three flood-prone tehsils shows the unavailability of emergency plans and not even provided by the concerned officials as shown in Table 24.

Table 24 Availability and Circulation of Emergency Plans

Emergency Plans to Community	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
No	102	100	211	100	152	100	NA	NA	465	100
Yes	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.1.19 Public Shelter

The shelter is essential for people living in flood-prone areas. The survey done from rural areas selected from three tehsils shows that there was no public shelter provided by officials to the people of flood-prone areas as shown in Table 25.

Table 25 Public Shelter

Public Shelter Last time by Officials	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
No	102	100	211	100	152	100	NA	NA	465	100
Yes	0	0	0	0	0	0			0	0
Total	102	100	211	100	152	100			465	100

Source: Field Survey, 2020

5.2 Perceptions Descriptive Statistics and Index

5.2.1 Household Have any Fear of Flood

From the Table 26, it can be observed that 80% of people of Paroa said that they have a medium level of fear of flood while about 50% of people of Paharpur said that they feel medium-level fear of flood. On the other hand, 90% of people of D.I.Khan said that they are feeling a high level of fear from the flood. So, it can be observed that only in the case of D.I.Khan people are too much afraid of a flood. From the result of Pearson chi-square, it can be seen that the results are statistically significant as $p < 0.05$.

Table 26 Fear of Flood

Household have any fear of flood	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Medium	81	79.4	19	9.0	76	50.0	175.531	0.000	176	37.84
High	21	20.6	90	42.7	21	13.8			132	28.38
Very High	0	0	102	48.3	55	36.2			157	33.76
Mean		3.21		4.39		3.86				
Std Dev.		0.406		0.649		0.921				
Total	102	100	211	100	152	100				

Source: Field Survey, 2020

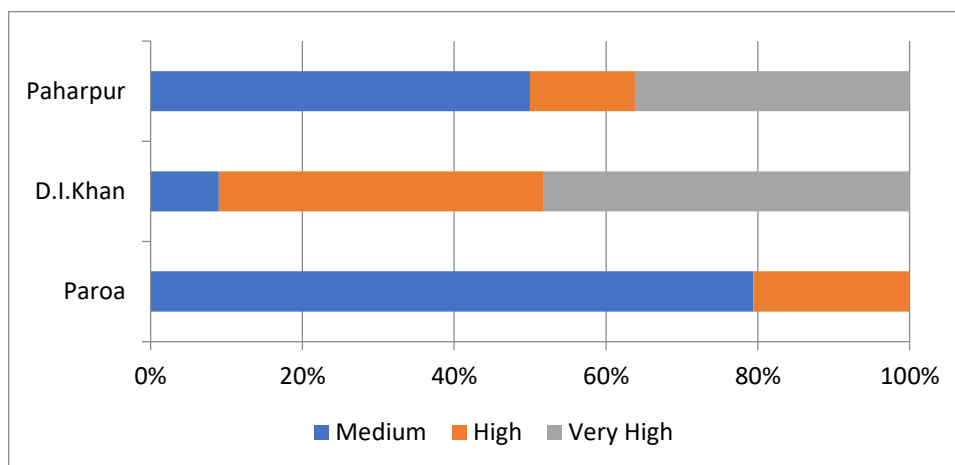


Figure 22 Fear of Flood

5.2.2 Chances of Flood Occurrence

When the respondents of flood-prone areas were asked what they think about the future flood occurrence, 72% of people of Paroa think that it is a very high chance of future flood occurrence while 64% of people of D.I.Khan thinks that it is a high chance of future flood occurrence. On the other hand, 50% of people of Paharpur think that it is a medium chance of future flood occurrence, while the remaining 50% contribute toward a high and very high chance of flood occurrence. From the result of Pearson chi-square, it can be seen from Table 27 that the results are statistically significant as $p < 0.05$.

Table 27 Chances of Future Flood Occurrence

Future Flood Occurrence	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Medium	3	2.9	13	6.2	76	50.0	202.097	0.000	92	19.78
High	25	24.5	136	64.5	21	13.8			182	39.13
Very High	74	72.5	62	29.4	55	36.2			191	41.07
Mean		4.70		4.23		3.86				
Std Dev		0.523		0.550		0.921				
Total	102	100	211	100	152	100				

Source: Field Survey, 2020

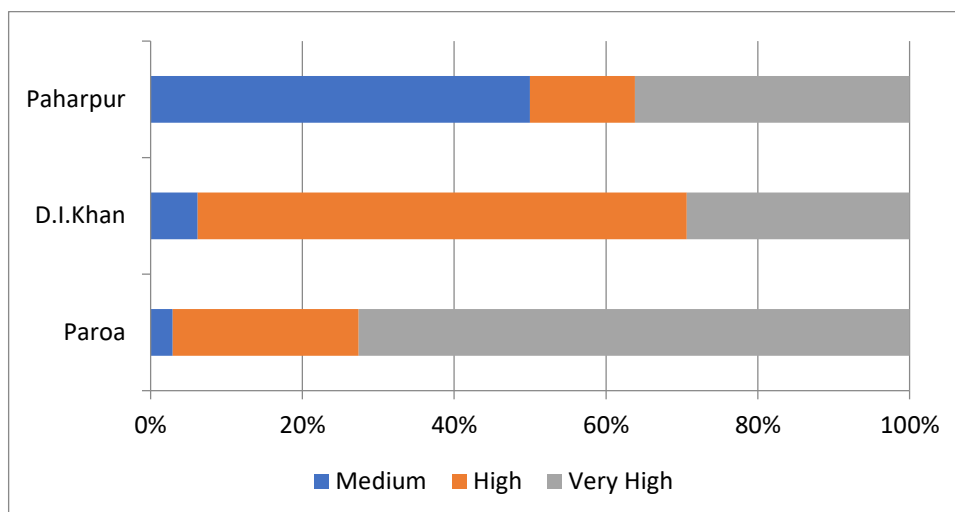


Figure 23 Chances of Future Flood Occurrence

5.2.3 Household Perceived Danger to Life and Family

In the case of perception of people about the danger to their life, 58% of people of Paroa perceived that they have a high level of danger to their life while rest of people perceived medium level of danger to their lives. In the case of D.I.Khan 70% of people perceived danger to their lives. On the other hand, in Paharpur, 60% of respondents perceived that they have a medium level of danger to their lives as shown in Table 28. From the result of Pearson chi-square, it can be seen that the results are statistically significant as $p < 0.05$.

Table 28 Perceived Danger to Life and Family

Perceived Danger to life	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Medium	42	41.2	6	2.8	92	60.5	150.220	0.000	140	30.10
High	23	22.5	57	27.0	21	13.8			101	21.72
Very High	37	36.3	148	70.1	39	25.7			224	48.17
Mean		3.95		4.67		3.65				
Std Dev		0.883		0.528		0.863				
Total	102	100	211	100	152	100				

Source: Field Survey, 2020

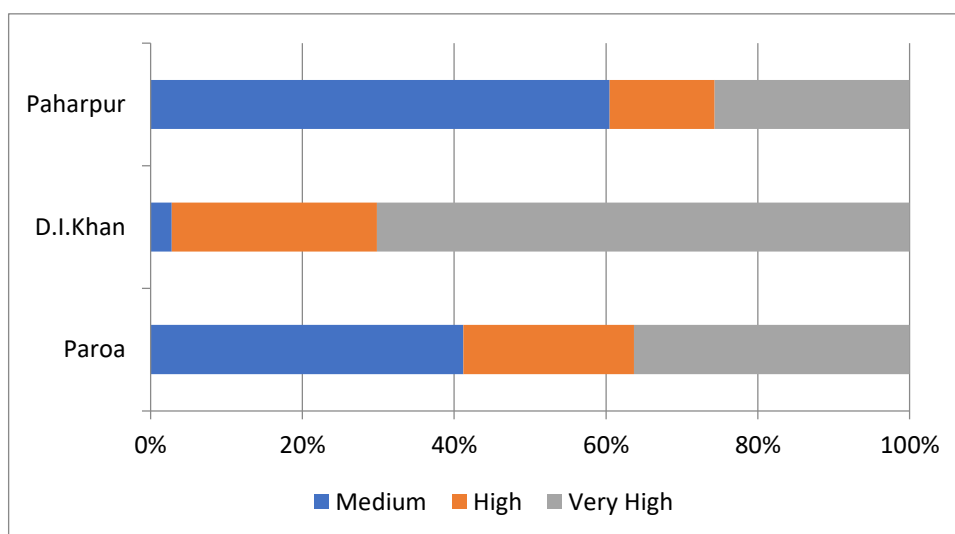


Figure 24 Perceived Danger to Life and Family

5.2.4 Household Perceived Capacity not to Deal

In the case of perception of respondents about the capacity not to deal with the flood, 70-80% from each tehsils perceived that they do not have very good perceptions and they cannot deal with it. From the result of Pearson chi-square in Table 29, it can be seen that the results are statistically significant as $p < 0.05$.

Table 29 Perceived Capacity not to Deal

Perceived Capacity not to Deal	Paroa (n=102)		D.I.Khan (n=211)		Paharpur (n=152)		Chi Square Test		Total	
	Freq	%	Freq	%	Freq	%	χ^2	P-Value	Freq	%
Low	11	10.8	17	48.3	39	25.7	54.972	0.000	67	14.40
Medium	72	70.6	181	11.4	113	74.3			366	78.70
High	18	17.6	13	16.1	0	0			31	6.67
Very High	1	1.0	0	0	0	0			1	0.21
Mean		2.0882		1.98		3.34				
Std Dev		0.565		0.377		0.438				
Total	102	100	211	100	152	100				

Source: Field Survey, 2020

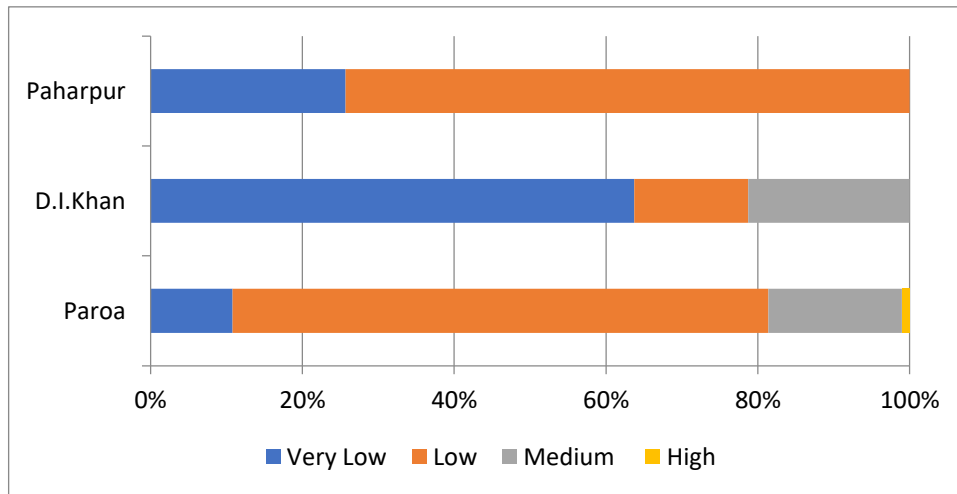


Figure 25 Perceived capacity not to deal

5.3 Relationship between flood risk perception and the likelihood of evacuation

Pearson correlation among the likelihood of evacuation and risk perception variables is applied to the sample. From the result of the relationship between the likelihood of evacuation and perceived danger to life, ($r = 0.119^*$, $p = 0.010$) as p is less than 0.05 so there is a statistically significant relation it means that people will evacuate if they have perceived danger to their life. In the case of the relation between fear of flood and likelihood of evacuation ($r = 0.143$, $p = 0.002$), as p is less than 0.05, so statistically significant relationship is observed. So, it can be concluded that people who are afraid of the flood may have greater chances to evacuate in flood. In case of perceived capacity not to deal and the likelihood of evacuation ($r = 0.241$, $p = 0.000$) as shown in Table 30, we can observe that people who think they cannot deal with floods may be willing to evacuate. On the other hand, if we observe the results of future flood occurrence and the likelihood of

evacuation ($r = -0.059$, $p = 0.203$), it can be seen that people who think that flood will come in the future are may not be willing to evacuate because they may be prepared in case of flood or due to too much experience with flood they become used to it. In the case of the overall risk perception index ($r = 0.154$, $p = 0.001$) as $p < 0.05$, it can be concluded that people who have better perceptions will be ready to evacuate. Although the correlation does not predict the evacuation behavior, it can reveal underlying factors that may affect perceptions and likelihood of evacuation.

Table 30 Pearson's correlation between flood risk perception and the likelihood of evacuation

	Likelihood of evacuation	Perceived danger to life	Future flood occurrence	Afraid of flood	Perceived capacity not to deal	RPI
Likelihood of evacuation	1					
Perceived danger to life	0.119*	1				
Future flood occurrence	-0.059	0.411**	1			
Afraid of flood	0.143**	0.609**	0.204**	1		
Perceived capacity to deal	0.241**	-0.058	-0.228**	-0.200**	1	
RPI	0.154**	0.880**	0.621**	0.759**	0.038	1

*. *Level of significance at 0.05 (2-tailed).*

**.*Level of significance at 0.01 (2-tailed).*

5.4 Factors affecting willingness to evacuate

Binary logistic regression is applied to check which socio-economic factors are affecting the willingness of people to evacuate. From the results in the Table 31, it can be seen that the overall model is statistically significant with the help of the

omnibus test ($\chi^2 = 33.81, p < 0.05$). The values of the Hosmer and Lemeshow test, i.e., $\chi^2 = 10.511, p > 0.05$, show that the model is perfectly fit. A non-significant chi-square shows the fitness of the model. The logistic regression model is statistically significant ($p < 0.05$) in case of age of respondents but it is affecting negatively ($\beta = -0.572, p < 0.05$). It means that people of more age will not evacuate. It is evident from the study that older people will be less willing to evacuate (Zhang et al., 2004). If the effect of household size on willingness to evacuate is observed, it is not statistically significant ($\beta = -0.104, p > 0.05$), so it can be concluded that higher household size residents will not evacuate (Qasim et al., 2015) also reported that higher household size residents would not be willing to evacuate. In the case of income ($\beta = -0.234, p > 0.05$) it can be concluded that people with higher income will not be ready to evacuate because they can afford pre-disaster strategies, and they will opt for it. Kellen et al. reviewed many studies on flood risk perception, so they concluded that income is often negatively correlated with risk perception, although it is often not statistically significant (Ho et al., 2008; Kellens et al., 2013; Ling, Tamura, Yasuhara, Ajima, & Van Trinh, 2015; Qasim et al., 2015). On the other hand, in the case of distance from the river to the household ($\beta = 0.766, p < 0.05$), it can be seen that it is affecting willingness to evacuate positively and significantly. So, with the increase in distance from the river, respondents were more willing to evacuate. This is because people living near the river will know about flood and take time. However, people living far from the river cannot have time to time information, so due to fear of flood, they will more willing to evacuate, unlike people living near the river.

Table 31 Factors affecting willingness to evacuate

Socio-economic Variables	β	Sig.	Hosmer and Lemeshow Test	Omnibus Test of Model Coefficient
Age	-0.572	0.000	$\chi^2 = 10.511$ p- value = 0.231	$\chi^2 = 33.819$ p- value = 0.000
Household size	-0.104	0.611		
Income	-0.234	0.147		
Distance from River	0.766	0.000		

Dependent variable: *Willingness to evacuate*

Chapter 6

Institutional Challenges in Evacuation

DDMA

District Disaster Management Authority is an authority that runs under the National disaster management authority. Their aim is disaster management and taking all measures to reduce the losses in case of any disaster. For research, a survey was also conducted from institutes and departments related to the disasters. After the survey, various challenges were observed which these departments are facing during their rescues.

The main and most important challenge is that department is facing a shortage of food items and non-food items. There were only 170 mattresses, and the department is running the whole district, which is very less and can be very harmful in case of any disaster. Secondly, there was no availability of hygiene kits which plays a very important role in any disaster. Life jackets, which are very in case of floods, were not available in their warehouses. Also, there was no availability of water tanks that could be used after the disaster. On the other hand, if we talk about heavy machinery and dewatering machines there was no machinery available in their warehouses. Still, they use the machinery of other departments like TMAs and WASA. Awareness and training programs are also not arranged in these tehsils, which are very important in the preparedness part of a disaster.

Rescue 1122

Rescue 1122 is the very best emergency service in Pakistan, and they are also providing their best services in D.I.Khan. If the nonfood items of rescue 1122 are observed, they have plenty of items and machines compared to other departments, but these are less for such a large and flood-prone district. The main issue this department was facing in past incidents is trust. People living in flood-prone areas do not trust them and trust plays a very important and main role in evacuation and every phase of a disaster.

According to the officer, they face various hurdles in disasters, like people do not leave their homes due to their belongings, especially their cattle. It became very difficult for officials to be aware they left their homes because their lives were much more important than their belongings. During catastrophic situations, people become very confused, and they become separated from each other. As a result, sometimes, they fight with each other during emergency response. So this can be improved by conducting training and awareness programs in the rural communities.

Red Cross

Pakistan red crescent society is one of the best organizations working in Pakistan, which takes action in response to any disaster and ensures humanitarian protection. As this types of organization plays an important role in flood-like disasters, so it was the best option to interview them and ask them the challenges which they face. According to the officer, the main problem of people living in flood-prone is that they are used to it, so they do not evacuate easily. They think that they will be safe

from the flood, but unfortunately, they face negative consequences after that. The problem is they do not trust us and do not rely on our early warnings.

On the other hand, most people do not get information about the disaster in time because they do not use social media; internet and some of them even do not have any communication system like mobile phone and telephone, etc. so there should be some emergency alarm system in rural and backward areas. The other problem is that some people rely on immediate evacuation even they receive an early warning through anyone, but they do not evacuate. They think that they could ride it out, but they could not.

TMA

Tehsil Municipal Administration also plays an important role in emergencies. This is a department that is always connected to the people in hard times and also in good times because their involvement is on a local basis and daily basis, so they know the psychology of people. But they also face many hurdles during the emergency because of the nature of this situation. First of all, people do not evacuate early, and when they want to evacuate it becomes very late, and it becomes very difficult for us. Because people got a panic attack, they ruined all the emergency responses by spreading this panic attack to others. So there should be some awareness and training programs through which they can be taught about evacuation procedures and protocols. The main and most important change which is department faces is the shortage of non-food items, heavy machinery, and dewatering machines. Another important issue is the early warning system. There is no early warning system in rural communities, and people with no cell phones

cannot receive early warnings from respective departments. So there should be an emergency alarm system through which people can be informed.

Chapter 7

Conclusion and Recommendations

Evacuation plays a very important role in floods. It is the most challenging process in any disaster. Evacuation is mostly used in catastrophic situations to reduce life losses. So, it is very important to educate flood-prone people about the process of evacuation. This research identifies factors that affect the willingness of people to evacuate during floods in rural areas of Pakistan. Evacuation plays an important role in any disaster, and this study also establishes a relationship between risk perception and the willingness of people to evacuate in flood.

Results have found that most respondents were willing to evacuate in the future, even those who did not evacuate in the past. Interestingly, people living near the river were still not willing to evacuate. Perceived fear and threat to life were high among the flood-prone communities, influencing evacuation decisions. Relatively, people living near the river had lower flood risk perceptions. Age and hazard proximity was found to be an important factor that influences the decision to evacuate. However, age negatively influenced willingness to evacuate, whereas the distance to the river positively influenced it. Older people were unwilling to evacuate due to their health and mobility issues, as the government had limited resources to carry out their needs during an evacuation. Similarly, people living near the rivers chose to stay there because of the sense of place, hence the lower risk perception. Interviews also revealed that people hesitate to evacuate as they do not want to leave their belongings and livestock unattended.

This study has its limitations. Firstly, almost all respondents were men, which is common in household surveys in Pakistan. Predicting evacuation is very

complicated, often influenced by numerous known and unknown factors. It is very tricky to predict a respondent's behavior and judgment following evacuation orders. Similarly, risk perception alone cannot fully determine the actual protective actions taken by the individuals. Further research is needed to measure the role of institutional and societal factors on evacuation decisions, like trust in government, risk communication strategies, and media. The factors identified in this study might not hold true for urban flooding or related disasters. It is also advocated to study gendered influences on evacuation decision making future studies. The relationship and connection between risk perception and risk communication must also be examined empirically.

This study finds a need to raise risk perception for successful evacuation decision-making. The government should launch awareness programs and evacuation drills. The location of shelter and assembly places must be shared with the local people. This study provides basic indicators that allow the measurement of evacuation decisions in case of a flood. However, these indicators can be modified according to other natural hazards to measure the level of evacuation preparedness. This study helps disaster managers and local governments develop actions related to disaster risk mitigation options. Keeping in view these challenges, understanding the factors affecting evacuation needs to be improved to build community resilience and reduce flood and climate risks.

References

- Abarquez, I., & Murshed, Z. (2004). *Field Practitioners' Handbook: Asian Disaster Preparedness Center Bangkok*.
- Adelekan, I. O. (2011). Vulnerability assessment of an urban flood in Nigeria: Abeokuta flood 2007. *Natural Hazards*, 56(1), 215-231.
- Adelekan, I. O., & Asiyebi, A. P. (2016). Flood risk perception in flood-affected communities in Lagos, Nigeria. *Natural Hazards*, 80(1), 445-469.
- Ahmad, F., Kazmi, S. F., & Pervez, T. (2011). Human response to hydro-meteorological disasters: A case study of the 2010 flash floods in Pakistan. *Journal of Geography and Regional Planning*, 4(9), 518-524.
- Ahsan, M. N., & Warner, J. (2014). The socioeconomic vulnerability index: A pragmatic approach for assessing climate change led risks—A case study in the south-western coastal Bangladesh. *International Journal of Disaster Risk Reduction*, 8, 32-49.
- Armaş, I. (2012). Multi-criteria vulnerability analysis to earthquake hazard of Bucharest, Romania. *Natural hazards*, 63(2), 1129-1156.
- Armas, I., Ionescu, R., & Posner, C. N. (2015). Flood risk perception along the Lower Danube river, Romania. *Natural Hazards*, 79(3), 1913-1931.
- Azad, A. (2011). *Ready or Not: Pakistan's resilience to disasters one year on from the floods* (Vol. 150): Oxfam.
- Balica, S. F., Wright, N. G., & van der Meulen, F. (2012). A flood vulnerability index for coastal cities and its use in assessing climate change impacts. *Natural hazards*, 64(1), 73-105.
- Bang, H. N. (2012). Disaster management in Cameroon: the Lake Nyos disaster experience. *Disaster Prevention and Management: An International Journal*.
- Bateman, J. M., & Edwards, B. (2002). Gender and evacuation: A closer look at why women are more likely to evacuate for hurricanes. *Natural Hazards Review*, 3(3), 107-117.
- Birkmann, J., Cardona, O. D., Carreño, M. L., Barbat, A. H., Pelling, M., Schneiderbauer, S., . . . Zeil, P. (2013). Framing vulnerability, risk and societal responses: the MOVE framework. *Natural hazards*, 67(2), 193-211.
- Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (2005). *At risk: natural hazards, people's vulnerability and disasters*: Routledge.
- Bleau, S., Blangy, S., & Archambault, M. (2015). Adapting nature-based seasonal activities in Quebec (Canada) to climate change. *Handbook of Climate Change Adaptation*, 93-121.
- Bollin, C., Hidajat, R., & Birkmann, J. (2006). Community-based risk index: Pilot implementation in Indonesia. *Measuring vulnerability to natural hazards: Towards disaster resilient societies*, 271-289.
- Boon, H. J. (2014). Disaster resilience in a flood-impacted rural Australian town. *Natural hazards*, 71(1), 683-701.
- Bosschaart, A., Kuiper, W., van der Schee, J., & Schoonenboom, J. (2013). The role of knowledge in students' flood-risk perception. *Natural hazards*, 69(3), 1661-1680.

- Botzen, W. J., Aerts, J., & van den Bergh, J. C. (2009). Dependence of flood risk perceptions on socioeconomic and objective risk factors. *Water resources research*, 45(10).
- Bradford, R., O'Sullivan, J. J., Van der Craats, I., Krywkow, J., Rotko, P., Aaltonen, J., . . . Schelfaut, K. (2012). Risk perception—issues for flood management in Europe. *Natural hazards and earth system sciences*, 12(7), 2299-2309.
- Brenkert-Smith, H., Dickinson, K. L., Champ, P. A., & Flores, N. (2013). Social amplification of wildfire risk: the role of social interactions and information sources. *Risk Analysis*, 33(5), 800-817.
- Brommer, D. M., & Senkbeil, J. C. (2010). Pre-landfall evacuee perception of the meteorological hazards associated with Hurricane Gustav. *Natural hazards*, 55(2), 353-369.
- Browne, M. J., & Hoyt, R. E. (2000). The demand for flood insurance: empirical evidence. *Journal of risk and uncertainty*, 20(3), 291-306.
- Bubeck, P., Botzen, W. J. W., & Aerts, J. C. (2012). A review of risk perceptions and other factors that influence flood mitigation behavior. *Risk Analysis: An International Journal*, 32(9), 1481-1495.
- Bunce, S., Partridge, H., & Davis, K. (2012). Exploring information experience using social media during the 2011 Queensland floods: a pilot study. *The Australian Library Journal*, 61(1), 34-45.
- Burnside, R., Miller, D. S., & Rivera, J. D. (2007). The impact of information and risk perception on the hurricane evacuation decision-making of greater New Orleans residents. *Sociological Spectrum*, 27(6), 727-740.
- Center, A. D. P., & ESCAP, U. (2004). Community-based disaster risk management: field practitioners' handbook.
- CRED. (2005). EM-DAT, The international disasters database. WHO collaborating centre for research on the epidemiology of disasters. Universite' Catholique de Louvain. <http://www.em-dat.net/>.
- CRED. (2019). Natural Disasters 2018. *Centre for Research on the Epidemiology of Disasters*.
- Cutter, S. L., Boruff, B. J., & Shirley, W. L. (2003). Social vulnerability to environmental hazards. *Social science quarterly*, 84(2), 242-261.
- Cutter, S. L., Mitchell, J. T., & Scott, M. S. (2000). Revealing the vulnerability of people and places: a case study of Georgetown County, South Carolina. *Annals of the association of American Geographers*, 90(4), 713-737.
- Dasgupta, P., Morton, John, Dodman, David, Karapinar, Barış, Meza, Francisco, Rivera-Ferre, Marta G., Toure Sarr, Aissa and Vincent, Katharine E. (2014). Rural areas. In: Field, C and Barros, V, (eds.) *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. Cambridge University Press, Cambridge and New York, pp. 613-657. ISBN 978-1-107-64165-5.
- Dash, N., & Gladwin, H. (2007). Evacuation decision making and behavioral responses: Individual and household. *Natural hazards review*, 8(3), 69-77.
- DAT, E. (2016). Disaster country profiles: Pakistan. EM-DAT: The International Disaster Database.
- Drabek, T. E. (2012). *Human system responses to disaster: An inventory of sociological findings*: Springer Science & Business Media.

- Fakhruddin, S., & Chivakidakarn, Y. (2014). A case study for early warning and disaster management in Thailand. *International journal of disaster risk reduction*, 9, 159-180.
- Flanagan Barry, E., Gregory Edward, W., Hallisey Elaine, J., & Heitgerd Janet, L. (2011). Lewis Brian. *A Social Vulnerability Index for Disaster Management. Magazine Security and Emergency Management*, 8(1), 1-24.
- Flanagan, B. E., Gregory, E. W., Hallisey, E. J., Heitgerd, J. L., & Lewis, B. (2011). A social vulnerability index for disaster management. *Journal of homeland security and emergency management*, 8(1).
- Fothergill, A. (1996). Gender, risk, and disaster. *International journal of mass emergencies and disasters*, 14(1), 33-56.
- Franklin, R. C., King, J. C., Aitken, P. J., & Leggat, P. A. (2014). “Washed away”—assessing community perceptions of flooding and prevention strategies: a North Queensland example. *Natural hazards*, 73(3), 1977-1998.
- Gain, A. K., Mojtahed, V., Biscaro, C., Balbi, S., & Giupponi, C. (2015). An integrated approach of flood risk assessment in the eastern part of Dhaka City. *Natural Hazards*, 79(3), 1499-1530.
- Gladwin, H. (1997). Warning and evacuation: A night for hard houses. *Hurricane Andrew: Ethnicity, gender and the sociology of disasters*, 52-74.
- Godschalk, D. R., Rose, A., Mittler, E., Porter, K., & West, C. T. (2009). Estimating the value of foresight: aggregate analysis of natural hazard mitigation benefits and costs. *Journal of Environmental Planning and Management*, 52(6), 739-756.
- Hahn, M. B., Riederer, A. M., & Foster, S. O. (2009). The Livelihood Vulnerability Index: A pragmatic approach to assessing risks from climate variability and change—A case study in Mozambique. *Global Environmental Change*, 19(1), 74-88.
- Hajito, K. W., Gesesew, H. A., Bayu, N. B., & Tsehay, Y. E. (2015). Community awareness and perception on hazards in Southwest Ethiopia: a cross-sectional study. *International journal of disaster risk reduction*, 13, 350-357.
- Hasan, S., Ukkusuri, S., Gladwin, H., & Murray-Tuite, P. (2011). Behavioral model to understand household-level hurricane evacuation decision making. *Journal of Transportation Engineering*, 137(5), 341-348.
- Hashmi, H. N., Siddiqui, Q. T. M., Ghumman, A. R., & Kamal, M. A. (2012). A critical analysis of 2010 floods in Pakistan. *African Journal of Agricultural Research*, 7(7), 1054-1067.
- Ho, M. C., Shaw, D., Lin, S., & Chiu, Y. C. (2008). How do disaster characteristics influence risk perception? *Risk Analysis: An International Journal*, 28(3), 635-643.
- Holand, I. S., Lujala, P., & Rød, J. K. (2011). Social vulnerability assessment for Norway: A quantitative approach. *Norsk Geografisk Tidsskrift-Norwegian Journal of Geography*, 65(1), 1-17.
- Hong, Y., Kim, J.-S., & Xiong, L. (2019). Media exposure and individuals' emergency preparedness behaviors for coping with natural and human-made disasters. *Journal of Environmental Psychology*, 63, 82-91.

- Horney, J. A., MacDonald, P. D., Van Willigen, M., Berke, P. R., & Kaufman, J. S. (2010). Individual actual or perceived property flood risk: Did it predict evacuation from Hurricane Isabel in North Carolina, 2003? *Risk Analysis: An International Journal*, 30(3), 501-511.
- Hosseini, K. A., Hosseini, M., Izadkhah, Y. O., Mansouri, B., & Shaw, T. (2014). Main challenges on community-based approaches in earthquake risk reduction: case study of Tehran, Iran. *International journal of disaster risk reduction*, 8, 114-124.
- Huang, S.-K., Lindell, M. K., Prater, C. S., Wu, H.-C., & Siebeneck, L. K. (2012). Household evacuation decision making in response to Hurricane Ike. *Natural Hazards Review*, 13(4), 283-296.
- Islam, M. N., Malak, M. A., & Islam, M. N. (2013). Community-based disaster risk and vulnerability models of a coastal municipality in Bangladesh. *Natural hazards*, 69(3), 2083-2103.
- Johnson, P. F., Johnson, C., & Sutherland, C. (2012). Stay or go? Human behavior and decision making in bushfires and other emergencies. *Fire technology*, 48(1), 137-153.
- Każmierczak, A., & Cavan, G. (2011). Surface water flooding risk to urban communities: Analysis of vulnerability, hazard and exposure. *Landscape and Urban Planning*, 103(2), 185-197.
- Kellens, W., Terpstra, T., & De Maeyer, P. (2013). Perception and communication of flood risks: a systematic review of empirical research. *Risk Analysis: An International Journal*, 33(1), 24-49.
- Kellens, W., Zaalberg, R., Neutens, T., Vanneuville, W., & De Maeyer, P. (2011). An analysis of the public perception of flood risk on the Belgian coast. *Risk Analysis: An International Journal*, 31(7), 1055-1068.
- Khan, A. N. (2011). Analysis of flood causes and associated socio-economic damages in the Hindukush region. *Natural hazards*, 59(3), 1239.
- Khan, A. N. (2013). Analysis of 2010-flood causes, nature and magnitude in the Khyber Pakhtunkhwa, Pakistan. *Natural hazards*, 66(2), 887-904.
- Khan, A. N., Khan, B., Qasim, S., & Khan, S. N. (2013). Causes, Effects and Remedies: A Case Study of Rural Flooding in District Charsadda, Pakistan. *Journal of Managerial Sciences*, 7(1).
- Khan, S. (2012). Vulnerability assessments and their planning implications: a case study of the Hutt Valley, New Zealand. *Natural Hazards*, 64(2), 1587-1607.
- Khyber, P. D. M. A., & Pakhtunkhwa, P. (2012). Monsoon Contingency Plan
- Kolen, B., & Helsloot, I. (2014). Decision-making and evacuation planning for flood risk management in the Netherlands. *Disasters*, 38(3), 610-635.
- Koshiba, Y., & Suzuki, Y. (2018). Factors affecting post-evacuation behaviors following an earthquake: A questionnaire-based survey. *International journal of disaster risk reduction*, 31, 548-554.
- Kreft, S., Eckstein D, Dorsch L and Fischer L. (2015). Global Climate Risk Index 2016: (Who Suffers Most From Extreme Weather Events? Weather-Related Loss Events in 2014 and 1995 to 2014. Germanwatch Nord-Süd Initiative e.V, Bonn.).

- Lawrence, J., Quade, D., & Becker, J. (2014). Integrating the effects of flood experience on risk perception with responses to changing climate risk. *Natural Hazards*, 74(3), 1773-1794.
- Lazo, J. K., Bostrom, A., Morss, R. E., Demuth, J. L., & Lazrus, H. (2015). Factors affecting hurricane evacuation intentions. *Risk analysis*, 35(10), 1837-1857.
- Lazo, J. K., Waldman, D. M., Morrow, B. H., & Thacher, J. A. (2010). Household evacuation decision making and the benefits of improved hurricane forecasting: Developing a framework for assessment. *Weather and Forecasting*, 25(1), 207-219.
- Lee, K. (2011). The role of media exposure, social exposure and biospheric value orientation in the environmental attitude-intention-behavior model in adolescents. *Journal of environmental psychology*, 31(4), 301-308.
- Lim Jr, H., Lim, M. B., & PIANTANAKULCHAI, M. (2013). A review of recent studies on flood evacuation planning. *Journal of the Eastern Asia Society for Transportation Studies*, 10, 147-162.
- Lim, M. B., LIM Jr, H., & PIANTANAKULCHAI, M. (2013). Factors affecting flood evacuation decision and its implication to transportation planning. *Journal of the Eastern Asia Society for Transportation Studies*, 10, 163-177.
- Lim, M. B. B., Lim, H. R., Piantanakulchai, M., & Uy, F. A. (2016). A household-level flood evacuation decision model in Quezon City, Philippines. *Natural Hazards*, 80(3), 1539-1561.
- Lin, S., Shaw, D., & Ho, M.-C. (2008). Why are flood and landslide victims less willing to take mitigation measures than the public? *Natural Hazards*, 44(2), 305-314.
- Lindell, M. K., & Hwang, S. N. (2008). Households' perceived personal risk and responses in a multihazard environment. *Risk Analysis: An International Journal*, 28(2), 539-556.
- Lindell, M. K., Lu, J.-C., & Prater, C. S. (2005). Household decision making and evacuation in response to Hurricane Lili. *Natural Hazards Review*, 6(4), 171-179.
- Lindell, M. K., & Perry, R. W. (2012). The protective action decision model: theoretical modifications and additional evidence. *Risk Analysis: An International Journal*, 32(4), 616-632.
- Ling, F. H., Tamura, M., Yasuhara, K., Ajima, K., & Van Trinh, C. (2015). Reducing flood risks in rural households: Survey of perception and adaptation in the Mekong delta. *Climatic change*, 132(2), 209-222.
- Liu, D., & Li, Y. (2016). Social vulnerability of rural households to flood hazards in western mountainous regions of Henan province, China. *Natural Hazards and Earth System Sciences*, 16(5), 1123-1134.
- Liu, D., Li, Y., Fang, S., & Zhang, Y. (2017). Influencing factors for emergency evacuation capability of rural households to flood hazards in western mountainous regions of Henan province, China. *International journal of disaster risk reduction*, 21, 187-195.
- Liu, D., Li, Y., Shen, X., Xie, Y., & Zhang, Y. (2018). Flood risk perception of rural households in western mountainous regions of Henan Province, China. *International journal of disaster risk reduction*, 27, 155-160.

- Liu, T., & Jiao, H. (2018). How does information affect fire risk reduction behaviors? Mediating effects of cognitive processes and subjective knowledge. *Natural hazards*, 90(3), 1461-1483.
- Looney, R. (2012). Economic impacts of the floods in Pakistan. *Contemporary south asia*, 20(2), 225-241.
- Lovreglio, R., Ronchi, E., & Nilsson, D. (2016). An Evacuation Decision Model based on perceived risk, social influence and behavioural uncertainty. *Simulation Modelling Practice and Theory*, 66, 226-242.
- Ludy, J., & Kondolf, G. M. (2012). Flood risk perception in lands “protected” by 100-year levees. *Natural hazards*, 61(2), 829-842.
- Lumbroso, D., Stone, K., & Vinet, F. (2011). An assessment of flood emergency plans in England and Wales, France and the Netherlands. *Natural Hazards*, 58(1), 341-363.
- Matyas, C., Srinivasan, S., Cahyanto, I., Thapa, B., Pennington-Gray, L., & Villegas, J. (2011). Risk perception and evacuation decisions of Florida tourists under hurricane threats: A stated preference analysis. *Natural hazards*, 59(2), 871-890.
- McCaffrey, S., Wilson, R., & Konar, A. (2018). Should I stay or should I go now? Or should I wait and see? Influences on wildfire evacuation decisions. *Risk analysis*, 38(7), 1390-1404.
- Mccarty, S. K. S. A. C. (2009). Fleeing The Storm(S): An Examination Of Evacuation Behavior During Florida’s 2004 Hurricane Season*.
- McGuire, L. C., Ford, E. S., & Okoro, C. A. (2007). Natural disasters and older US adults with disabilities: implications for evacuation. *Disasters*, 31(1), 49-56.
- McLennan, J., Elliott, G., Omodei, M., & Whittaker, J. (2013). Household safety-related decisions, plans, actions and outcomes during the 7 February 2009 Victorian (Australia) wildfires. *Fire Safety Journal*, 61, 175-184.
- Mehmood, M., & Yaseen, M. (2018). Impacts of 2010 Flood and GIS Mapping (A Case Study of UC Shore Kot) DI Khan, KP Province Pakistan. *Nat Resour*, 2(3), 000130.
- Miceli, R., Sotgiu, I., & Settanni, M. (2008). Disaster preparedness and perception of flood risk: A study in an alpine valley in Italy. *Journal of environmental psychology*, 28(2), 164-173.
- Mileti, D. S., & Peek, L. (2000). The social psychology of public response to warnings of a nuclear power plant accident. *Journal of hazardous materials*, 75(2-3), 181-194.
- Milly, P. C. D., Wetherald, R. T., Dunne, K., & Delworth, T. L. (2002). Increasing risk of great floods in a changing climate. *Nature*, 415(6871), 514-517.
- Murray-Tuite, P., & Wolshon, B. (2013). Evacuation transportation modeling: An overview of research, development, and practice. *Transportation Research Part C: Emerging Technologies*, 27, 25-45.
- Mwale, F., Adeloye, A., & Beevers, L. (2015). Quantifying vulnerability of rural communities to flooding in SSA: a contemporary disaster management perspective applied to the Lower Shire Valley, Malawi. *International journal of disaster risk reduction*, 12, 172-187.
- Nature, I. U. f. C. o. (2009). Climate Change An Economic Threat, Say Experts. About IUCN Pakistan.

- Nhuan, M. T., Tue, N. T., Hue, N. T. H., Quy, T. D., & Lieu, T. M. (2016). An indicator-based approach to quantifying the adaptive capacity of urban households: The case of Da Nang city, Central Vietnam. *Urban Climate*, *15*, 60-69.
- OCHA Regional Office for Asia and the Pacific (OCHA ROAP), B. (2013). *UNOCHA 2013 global focus model*: OCHA Regional Office for Asia and the Pacific (OCHA ROAP), Bangkok
- Oloruntoba, R., Sridharan, R., & Davison, G. (2018). A proposed framework of key activities and processes in the preparedness and recovery phases of disaster management. *Disasters*, *42*(3), 541-570.
- Paek, H.-J., Hilyard, K., Freimuth, V., Barge, J. K., & Mindlin, M. (2010). Theory-based approaches to understanding public emergency preparedness: implications for effective health and risk communication. *Journal of health communication*, *15*(4), 428-444.
- Pagneux, E., Gísladóttir, G., & Jónsdóttir, S. (2011). Public perception of flood hazard and flood risk in Iceland: a case study in a watershed prone to ice-jam floods. *Natural hazards*, *58*(1), 269-287.
- Panthi, J., Aryal, S., Dahal, P., Bhandari, P., Krakauer, N. Y., & Pandey, V. P. (2016). Livelihood vulnerability approach to assessing climate change impacts on mixed agro-livestock smallholders around the Gandaki River Basin in Nepal. *Regional environmental change*, *16*(4), 1121-1132.
- Paton, D., Bajek, R., Okada, N., & McIvor, D. (2010). Predicting community earthquake preparedness: a cross-cultural comparison of Japan and New Zealand. *Natural hazards*, *54*(3), 765-781.
- Peacock, W. G., Gladwin, H., & Morrow, B. H. (2012). *Hurricane Andrew: Ethnicity, gender and the sociology of disasters*: Routledge.
- Peek-Asa, C., Ramirez, M., Seligson, H., & Shoaf, K. (2003). Seismic, structural, and individual factors associated with earthquake related injury. *Injury prevention*, *9*(1), 62-66.
- Pelling, M. (1997). What determines vulnerability to floods; a case study in Georgetown, Guyana. *Environment and Urbanization*, *9*(1), 203-226.
- Peng, L., Tan, J., Lin, L., & Xu, D. (2019). Understanding sustainable disaster mitigation of stakeholder engagement: Risk perception, trust in public institutions, and disaster insurance. *Sustainable Development*, *27*(5), 885-897.
- Phung, D., Rutherford, S., Dwirahmadi, F., Chu, C., Do, C. M., Nguyen, T., & Duong, N. C. (2016). The spatial distribution of vulnerability to the health impacts of flooding in the Mekong Delta, Vietnam. *International journal of biometeorology*, *60*(6), 857-865.
- Qasim, S., Khan, A. N., Shrestha, R. P., & Qasim, M. (2015). Risk perception of the people in the flood prone Khyber Pukhthunkhwa province of Pakistan. *International Journal of Disaster Risk Reduction*, *14*, 373-378.
- Quarantelli, E. L. (1985). Social support systems: Some behavioral patterns in the context of mass evacuation activities. *Disasters and mental health: Selected contemporary perspectives*, *178*, 122-136.

- Raaijmakers, R., Krywkow, J., & van der Veen, A. (2008). Flood risk perceptions and spatial multi-criteria analysis: an exploratory research for hazard mitigation. *Natural hazards*, 46(3), 307-322.
- Rana, I. A., & Bhatti, S. S. (2018). Lahore, Pakistan–Urbanization challenges and opportunities. *Cities*, 72, 348-355.
- Rana, I. A., & Routray, J. K. (2016). Actual vis-à-vis perceived risk of flood prone urban communities in Pakistan. *International Journal of Disaster Risk Reduction*, 19, 366-378.
- Raška, P. (2015). Flood risk perception in Central-Eastern European members states of the EU: a review. *Natural Hazards*, 79(3), 2163-2179.
- Riad, J. K., Norris, F. H., & Ruback, R. B. (1999). Predicting evacuation in two major disasters: Risk perception, social influence, and access to resources 1. *Journal of Applied Social Psychology*, 29(5), 918-934.
- Rosenkoetter, M. M., Covan, E. K., Cobb, B. K., Bunting, S., & Weinrich, M. (2007). Perceptions of older adults regarding evacuation in the event of a natural disaster. *Public Health Nursing*, 24(2), 160-168.
- Saadatseresht, M., Mansourian, A., & Taleai, M. (2009). Evacuation planning using multiobjective evolutionary optimization approach. *European journal of operational research*, 198(1), 305-314.
- Salvati, P., Bianchi, C., Fiorucci, F., Giostrella, P., Marchesini, I., & Guzzetti, F. (2014). Perception of flood and landslide risk in Italy: a preliminary analysis. *Natural Hazards and Earth System Sciences*, 14(9), 2589-2603.
- Sayed, S. A., & González, P. A. (2014). Flood disaster profile of Pakistan: A review. *Science Journal of Public Health*, 2(3), 144-149.
- Schiermeier, Q. (2011). Increased flood risk linked to global warming: Nature Publishing Group.
- Siebeneck, L. K., & Cova, T. J. (2012). Spatial and temporal variation in evacuee risk perception throughout the evacuation and return-entry process. *Risk Analysis: An International Journal*, 32(9), 1468-1480.
- Slovic, P. (1999). Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk analysis*, 19(4), 689-701.
- Statistics, P. B. o. AREA, POPULATION, DENSITY AND URBAN/RURAL PROPORTION BY ADMN. UNITS.
- Statistics, P. B. o. (2017). census report of Pakistan 2017.
- Steelman, T. A., McCaffrey, S. M., Velez, A.-L. K., & Briefel, J. A. (2015). What information do people use, trust, and find useful during a disaster? Evidence from five large wildfires. *Natural Hazards*, 76(1), 615-634.
- Stein, R. M., Dueñas-Osorio, L., & Subramanian, D. (2010). Who evacuates when hurricanes approach? The role of risk, information, and location. *Social Science Quarterly*, 91(3), 816-834.
- Su, S., Pi, J., Wan, C., Li, H., Xiao, R., & Li, B. (2015). Categorizing social vulnerability patterns in Chinese coastal cities. *Ocean & Coastal Management*, 116, 1-8.
- Sullivan-Wiley, K. A., & Gianotti, A. G. S. (2017). Risk perception in a multi-hazard environment. *World Development*, 97, 138-152.
- Taylor, M. A., & Freeman, S. K. (2010). A review of planning and operational models used for emergency evacuation situations in Australia. *Procedia Engineering*, 3, 3-14.

- Toufique, K. A., & Islam, A. (2014). Assessing risks from climate variability and change for disaster-prone zones in Bangladesh. *International Journal of Disaster Risk Reduction*, *10*, 236-249.
- Trumbo, C., Meyer, M. A., Marlatt, H., Peek, L., & Morrissey, B. (2014). An assessment of change in risk perception and optimistic bias for hurricanes among Gulf Coast residents. *Risk analysis*, *34*(6), 1013-1024.
- Vitek, J. D., & Berta, S. M. (1982). Improving perception of and response to natural hazards: the need for local education. *Journal of Geography*, *81*(6), 225-228.
- Walker, B. B., Taylor-Noonan, C., Tabbernor, A., Bal, H., Bradley, D., Schuurman, N., & Clague, J. J. (2014). A multi-criteria evaluation model of earthquake vulnerability in Victoria, British Columbia. *Natural hazards*, *74*(2), 1209-1222.
- Wallemacq, P. H., Rowena (2018). Economic losses, poverty & disasters: 1998-2017.
- White, G. W., Fox, M. H., Rooney, C., & Cahill, A. (2007). *Assessing the impact of Hurricane Katrina on persons with disabilities: Research and Training Center on Independent Living*, University of Kansas.
- Whitehead, J. C. (2003). One million dollars per mile? The opportunity costs of hurricane evacuation. *Ocean & coastal management*, *46*(11-12), 1069-1083.
- Whitehead, J. C., Edwards, B., Van Willigen, M., Maiolo, J. R., Wilson, K., & Smith, K. T. (2000). Heading for higher ground: factors affecting real and hypothetical hurricane evacuation behavior. *Global Environmental Change Part B: Environmental Hazards*, *2*(4), 133-142.
- Whitmarsh, L. (2008). Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. *Journal of risk research*, *11*(3), 351-374.
- Willroth, P., Diez, J. R., & Arunotai, N. (2011). Modelling the economic vulnerability of households in the Phang-Nga Province (Thailand) to natural disasters. *Natural hazards*, *58*(2), 753-769.
- Wilmot, C. G., & Mei, B. (2004). Comparison of alternative trip generation models for hurricane evacuation. *Natural hazards review*, *5*(4), 170-178.
- Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). The challenge of disasters and our approach. *At risk: Natural hazards, people's vulnerability and disasters*. 2nd ed. London: Routledge, 3-48.
- Xu, D., Peng, L., Liu, S., Su, C., Wang, X., & Chen, T. (2017). Influences of sense of place on farming households' relocation willingness in areas threatened by geological disasters: Evidence from China. *International Journal of Disaster Risk Science*, *8*(1), 16-32.
- Xu, D., Yong, Z., Deng, X., Liu, Y., Huang, K., Zhou, W., & Ma, Z. (2019). Financial preparation, disaster experience, and disaster risk perception of rural households in earthquake-stricken areas: Evidence from the Wenchuan and Lushan earthquakes in China's Sichuan Province. *International journal of environmental research and public health*, *16*(18), 3345.

- Xu, D., Zhou, W., Deng, X., Ma, Z., Yong, Z., & Qin, C. (2020). Information credibility, disaster risk perception and evacuation willingness of rural households in China. *Natural Hazards*, 103(3), 2865-2882.
- Yamane, T. (1967). *Statistics: an introductory analysis*, 2nd edn, Harper and Row, New York.
- Yoon, D. (2012). Assessment of social vulnerability to natural disasters: a comparative study. *Natural Hazards*, 63(2), 823-843.
- Zhang, Y., Prater, C. S., & Lindell, M. K. (2004). Risk area accuracy and evacuation from Hurricane Bret. *Natural Hazards Review*, 5(3), 115-120.
- Zhou, Y., Liu, Y., Wu, W., & Li, N. (2015). Integrated risk assessment of multi-hazards in China. *Natural hazards*, 78(1), 257-280.
- Zhu, D., Xie, X., & Gan, Y. (2011). Information source and valence: How information credibility influences earthquake risk perception. *Journal of Environmental Psychology*, 31(2), 129-136.
- Zhu, W., & Yao, N. (2018). Public risk perception and intention to take actions on city smog in China. *Human and Ecological Risk Assessment: An International Journal*.

Household Survey Questionnaire

Research Topic: Evacuation decision making and behavior in flood prone rural area: A case study of D.I.Khan

The purpose of this questionnaire is to check evacuation decision making and behavior of people living in flood prone area. This research is being conducted in Urban and Regional Planning Department, SCEE, NUST. The information collected will be used for research purpose only and all answers you provide will be kept in the strictest confidentiality.

General Information About Area

Village:	
Union Council	
Tehsil:	
District:	

Household Information:

1. Age:		2. Gender:	M <input type="checkbox"/>	F <input type="checkbox"/>	3. Income(PKR):		5. Family Type:	Single <input type="checkbox"/>	Joint <input type="checkbox"/>		
6. Marital Status:	Single <input type="checkbox"/>	Married <input type="checkbox"/>	Widowed <input type="checkbox"/>	7. No. of Male:		8. No. of Children:		9. No. of Elders:		10. No. of Female:	
11. Education Level:	Primary <input type="checkbox"/>	Middle <input type="checkbox"/>	High <input type="checkbox"/>	College <input type="checkbox"/>	University <input type="checkbox"/>	Madrasa <input type="checkbox"/>	Uneducated <input type="checkbox"/>	12. No. of people with disabilities:		13. No. of schools going children in a household:	
14. Is family headed by aged person?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	15. Is there any person suffering from Chronic Illness?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	16. From how many years household living in community?		17. House ownership status:	Rented <input type="checkbox"/>	Owned <input type="checkbox"/>	

18. Occupation:

Agriculture <input type="checkbox"/>	Trade and commerce <input type="checkbox"/>	Govt. Service <input type="checkbox"/>	Daily Wager <input type="checkbox"/>	Unemployed <input type="checkbox"/>
19. No. of earning sources:		20. No. of earners in house:		
21. What is your average monthly savings (in Rs. amount)?		22. Households with family member employed outside flood-prone area?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

23. Do you have any kind of saving ?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	24. Do you have any health insurance?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
25. Do you have any life insurance?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	26. Do you have any building insurance?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

27. What is the construction material of house?	Kacha <input type="checkbox"/>	Pacca <input type="checkbox"/>	
28. What is the height of building (number of stories)?		29. What is the age of building?	

30. Is there any animal in house?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	31. If yes then how much?		
Buffalo <input type="checkbox"/>	Cow <input type="checkbox"/>	Camel <input type="checkbox"/>	Sheep <input type="checkbox"/>	Goats <input type="checkbox"/>	Poultry <input type="checkbox"/>

32. Do you have any mean of transportation?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	33. Number of vehicles in a household:		
34. How many persons having driving skills in household?		35. Do you have mobile in house?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
36. Do you have electricity in house?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	37. Do you have TV in house?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
38. Do you have radio in house?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	39. Do you have telephone in house?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
40. Do you use social media?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	41. Do you have internet facility in house?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

42. Do you have any relative living outside the city?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	43. How often you visit your neighbors?	
44. Do you participate in community meetings?	Yes <input type="checkbox"/>	No <input type="checkbox"/>		

45. How much far your house located from road (Km)?		46. How much you take to reach the road (in hours)?	
47. What is the construction material of road?		48. What is the condition of road?	Excellent <input type="checkbox"/> Good <input type="checkbox"/> Poor <input type="checkbox"/>

49. Do you have any land/house outside the flood-prone community?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	50. Is your house near to river?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
51. What is your distance from river?		52. Do you think you could ride out floods?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	

53. Is there any first aid in house?	Yes <input type="checkbox"/> No <input type="checkbox"/>	54. If , Yes then any family member who have knowledge about first aid kit?	Yes <input type="checkbox"/> No <input type="checkbox"/>
55. Do you have any experience with floods?	Yes <input type="checkbox"/> No <input type="checkbox"/>	56. Are you willing to evacuate?	Yes <input type="checkbox"/> No <input type="checkbox"/>
57. How much time will you need to evacuate (Hours)?	<input type="text"/>	58. Do you have any bag pack ready for emergency?	Yes <input type="checkbox"/> No <input type="checkbox"/>
59. Did you evacuate Last time?	Yes <input type="checkbox"/> No <input type="checkbox"/>	60. How much persons evacuated last time in household?	<input type="text"/>
61. Upon whom Info. you evacuated last time	<input type="text"/>		
62. Did you receive any info. from officials?	Yes <input type="checkbox"/> No <input type="checkbox"/>	63. When did you receive early warning message?	Day <input type="checkbox"/> Night <input type="checkbox"/>
64. Where to GO..... Told by officials?(Last time)	Yes <input type="checkbox"/> No <input type="checkbox"/>	65. Where to GO..... Told by officials?(This time)	Yes <input type="checkbox"/> No <input type="checkbox"/>
66. How much prior to flood did you receive warning(in Hours)?	<input type="text"/>	67. How many floods you experienced?	<input type="text"/>
68. Who gave you early warning message last time?	<input type="text"/>		

69. Who do you trust most in case of early warning message?					
Masjid Imam	Govt. Officials	Army	Social Media	Councilor	Friends/Neighbours
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
70. Which medium of delivering message you trust more?			Verbal	Face to face	TV
			<input type="text"/>	<input type="text"/>	Mobile
					<input type="checkbox"/>

71. Is there any assembly point provided by officials last time?	Yes <input type="checkbox"/> No <input type="checkbox"/>	72. How much far was the public shelter provided(in Km)?	<input type="text"/>
73. Is there any public shelter provided by officials last time?	Yes <input type="checkbox"/> No <input type="checkbox"/>	74. Is there any assembly point provided by officials for future?	Yes <input type="checkbox"/> No <input type="checkbox"/>
75. Do you know Govt. has made schools as a assembly point?	Yes <input type="checkbox"/> No <input type="checkbox"/>		

76. Availability and circulation of emergency plans to households?	Yes <input type="checkbox"/> No <input type="checkbox"/>	77. Frequency of public awareness programs/drills attended by HH member (in number)?	<input type="text"/>
78. Will your evacuation depend on neighbors and friends decisions?	Yes <input type="checkbox"/> No <input type="checkbox"/>		

79. Do you feel socially isolated	Yes <input type="checkbox"/> No <input type="checkbox"/>	80. If No, what was the reason you didn't evacuate	<input type="text"/>

What is your.....?	Very Low	Low	Medium	High	Very High
	1	2	3	4	5
81. Awareness about evacuation protocols?					
82. Awareness about emergency shelter?					
83. Awareness about evacuation routes?					
84. Awareness given to children?					
85. Trust in EWS					
86. Knowledge about EWS?					
87. Household trust in disaster management plan and policies?					
88. Household's level of understanding of national warning system?					
89. Household perceived capacity to deal?					
90. Household perceived danger to life and family?					
91. Strength of community cooperation in disaster response?					

92. What is the level of future flood occurrence?					
93. How much are you afraid of Flood?					
94. Knowledge about search and Rescue protocol					
95. Household perceived danger to relatives, friends and community					
96. Trust in disaster managemnt institute					
97. Household percieved adaptability of lifestyle					
98. Knowledge about evacuation protocol					
99. Trust in local govt.?					

Checklist for equipment							
Equipment Name	Yes	No	Quantity	Equipment Name	Yes	No	Quantity
Emergency lighting				Stored drinking water			
Temporary Shelter				Blankets			
Emergency Generators				Rainsuits			
Thick Rope				Nonperishable food			
Portable pumps and hoses				Headlamps			
Cash or traveler's checks				first aid boxes			
Prescription medications				Cots & Beds			
Saws and chain saws				stretcher			
Whistle to signal for help				Hip Boots & Waders			
Emergency telephone list(s)				ladders			
Extra batteries							
Cell phone with chargers and a backup battery				Infant formula, bottles, diapers, wipes, diaper rash cream			
Non-prescription medications such as pain relievers, anti-diarrhea medication, antacids				Insecticides & Repellents			

100. Respondent Suggestions For Improving Evacuation If any?

101. General Suggestions on Flood Risk Management/Response

Institutional Survey Questionnaire

Research Topic: Evacuation decision making and behavior in flood prone rural area: A case study of D.I.Khan

The purpose of this questionnaire is to check evacuation decision making and behavior of people living in flood prone area. This research is being conducted in Urban and Regional Planning Department, SCEE, NUST. The information collected will be used for research purpose only and all answers you provide will be kept in the strictest confidentiality.

General Information about officer

Organization	
Designation	
Experience	
Age	
Qualification	

Aim of Organization

1. Did you give any message to them last time?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
2. Did they believe and act on your message?	<input type="text"/>
3. Did you provide assembly point to them last time?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>

4. Did you provide emergency shelters to them?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
5. How much far you provided shelter to them from site?	<input type="text"/>

6. Did you give any food to them?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>

7. Who else provide them food?	<input type="text"/>
--------------------------------	----------------------

8. Who else provide them shelter?	<input type="text"/>
-----------------------------------	----------------------

9. Do people participate in community or disaster related meetings?	Yes <input type="checkbox"/>	10. If yes then how much?
	No <input type="checkbox"/>	
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

11. Did you provide any evacuation route to them last time?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
12. What is the condition about evacuation routes	
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

13. Did you provide emergency plans to households?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>

14. Do you have any task force for evacuation?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>

15. Do you pay special attention to vulnerable groups (women, children, PWDs, sick, old)?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>

16. Do you have any special equipments for vulnerable group?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>

17. Did you publish any message on social media or on tv?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>

18. Do people trust you?	Yes <input type="checkbox"/>	19. If yes then how much?
	No <input type="checkbox"/>	
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

