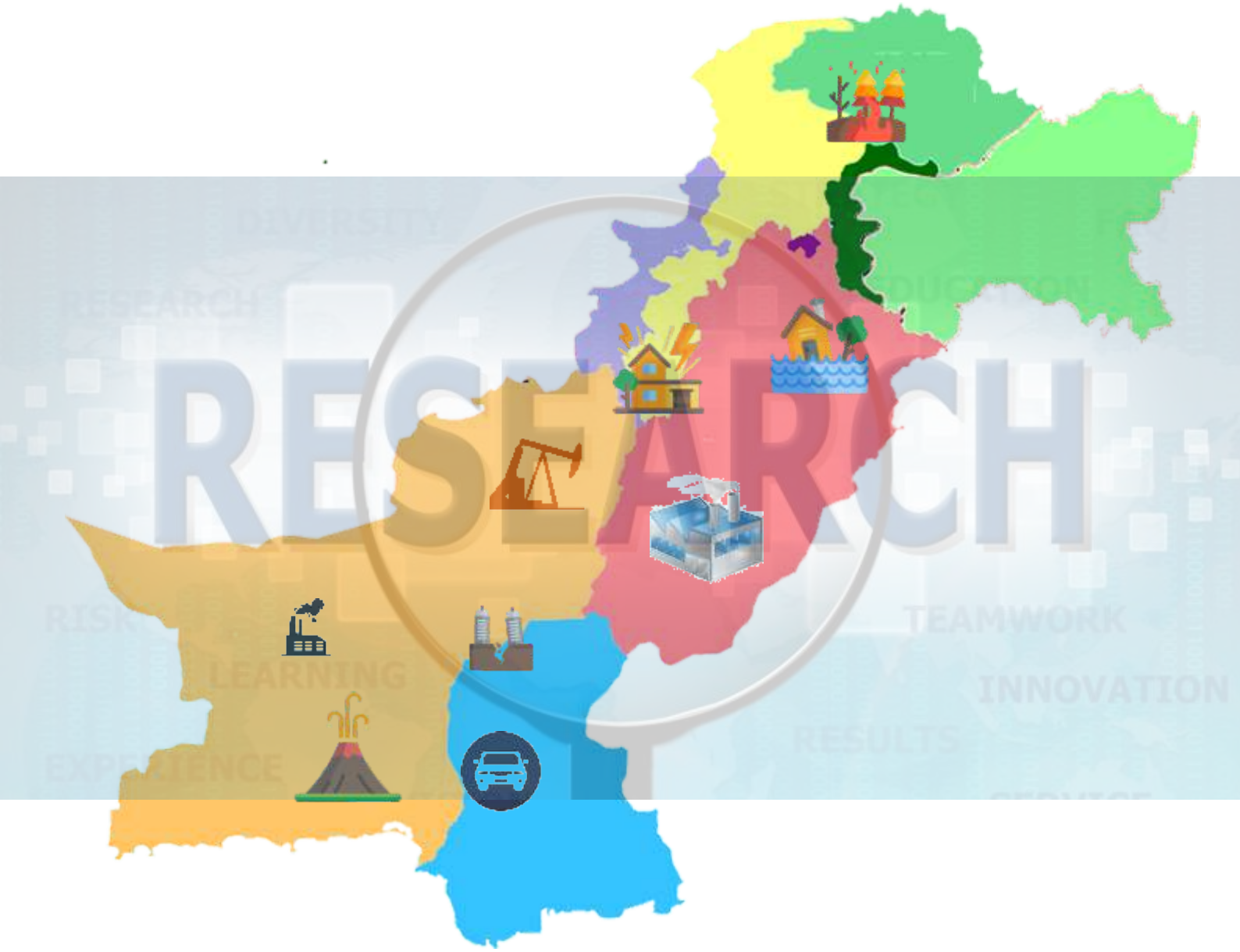
Research work by Students of
Center for Disaster Preparedness and Management (CDPM)
University of Peshawar



Supported By

Pakistan Resilience Partnership

Asian Disaster Preparedness Centre (ADPC) with support from Bill and Melinda Gates Foundation (BMGF) is implementing the program 'Strengthening Capacity of Government, Local Humanitarian Organizations and the Private Sector on Preparedness for Response in Asia' in 6 South and South-East Asian countries namely- Nepal, Pakistan, Sri Lanka, Cambodia, Philippines and Myanmar.

The program utilizes a unique networked approach by creating the **Asian Preparedness Partnership (APP)** - a multi-stakeholder regional partnership through the program. APP strives to improve inter-organizational coordination and dialogue between Governments, Local Humanitarian Organization networks and Private Sector networks for enhancing capacities through partnerships, knowledge resources, training and networking opportunities. The program's goal is to strengthen the emergency response capacities in these countries to better prepare for, respond to, and recover from disasters.

With the creation of national partnerships in the program countries and commencement of planned activities, it would be imperative to highlight the value addition of this collaborative approach in the overall humanitarian architecture of each project country. As part of this strategy, communications and outreach can play a critical role in the dissemination of work undertaken to improve and strengthen coordination mechanisms and emergency response capacities of our key stakeholders.

Partnership with Academia

Academic research plays a vital role in development of a country. This is equally true for disaster management. The research brings new dimensions and learnings which helps to improve the established systems. NHN with the support of ADPC has initiated a program of supporting university student in their research on DRR related subjects. This support aims to encourage students to take up research on topics related to national priority. As a pilot project 9 research thesis of 17 students from Center of Disaster Preparedness and Management, University of Peshawar were supported in their M.Sc. research. The students developed research papers on subjects relating to assessments of industrial and natural hazards, mediation of technology in DRR and deforestation cause and its effects. The students and the University management highly appreciated the support which has encouraged students to contribute to Resilience building of Pakistan.









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CAUSES OF URBAN FLASH FLOOD:

A CASE STUDY OF DARAKSHAN COLONY UNION COUNCIL 23 PESHAWAR CITY, PAKISTAN

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ABSTRACT

Urban flooding is a recurrent phenomenon that threatens the live and properties of the people of Peshawar. Heavy rainfall in the rainy season, generate flood in the city of Peshawar. The situation is further aggravated when certain anthropogenic factors are involved. The intensity of urban floods in the area has increased after the 2010 floods. The current study is conducted to identify the causes of urban flash floods in Darakshan colony UC-23 Peshawar city.

The main aim of the research is to learn about the causes of urban flash floods. Systematic method was used to gather information for the purpose of making research study. To obtain the aim of the study, both types of data were collected. The data was collected through field observation, questionnaires, interviews, FGD, published material of relevant government's depts and through the internet.

The outcome of the study reveal that many of the people in the area know about flood and think that there area is prone to flood. Flood occurs nearly every year in the study area, mostly in monsoon season. The major cause of urban flooding in the area is problems in the drainage system. The other causes include lack of awareness in people. The natural cause of the urban flash flood is the intense rainfall. The problem of urban flooding can be solved by reducing pollution in the local drains and over all area. Other solutions include awareness rising.

Therefore it is concluded that urban flooding is a severe issue in the area, which affects it's residential & commercial parts by overflowing of the water in the drains and sewerage system and the main natural cause is the monsoon rainfall.

CHAPTER-1

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Flooding in the urban areas is a major issue that is faced by many people in the world. Prolong heavy rainfalls are considered to be the main cause of these floods. Pakistan currently has a weak defense against environmental changes as its economy is totally dependent on agriculture & forestry (Farooqi et al., 2005).

Urban flooding is the inundation of land or property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers. Although sometimes triggered by events such as flash flooding or snowmelt, urban flooding is a condition, characterized by its repetitive and systemic impacts on communities that can happen regardless of whether or not affected communities are located within designated floodplains or near any body of water. Aside from potential overflow of rivers and lakes, snowmelt, storm water or water released from damaged water mains may accumulate on property and in public rights-of-way, seep through building walls and floors, or backup into buildings through sewer pipes, toilets and sinks. In urban areas, Flood effects can be exacerbated by existing paved streets and roads, which increase the speed of flowing water. The flood flow in urbanized areas constitutes a hazard to both the population and infrastructure. The peak discharge of a flood is influenced by many factors, including the intensity and duration of storms and snowmelt, the topography and geology of stream basins, vegetation, and the hydrologic conditions preceding storm and snowmelt events. Land use and other human activities also Influence the peak discharge of floods by modifying how rainfall and snowmelt are stored on and run off the land surface into streams. Dense networks of ditches and culverts in cities reduce the distance that runoff must travel overland or through subsurface flow paths to reach streams and rivers. Once water enters a drainage network, it flows faster than either overland or subsurface flow (Mukherjee, et al, 2016).

1.2 STUDY AREA

Peshawar is the largest and capital city of the Khyber Pukhtunkhwa. According to 2017 census the population of the city is 1970042 while the population of Peshawar district is 4269079. Most than half of city area is fertile and is suitable for cultivation. The main languages are Pashto and hindko. Islam is the major religion in the city. Peshawar is the oldest city in the South Asia. As well as its deep rooted urban history, Peshawar is characterized by its strong links with Afghanistan, sharing a largely permeable border with the neighbouring country, which has contributed to its cultural diversity, as well as adding an additional layer of complexity to its rapidly accelerating rate of urbanization. This makes Peshawar extremely vulnerable to riverine flooding (Govt of Pakistan, 2017).

Darakshan colony is located in UC 23 in Peshawar city. It shares its boundary with wazir bagh and beri bagh. There are 200 houses which are based on nearly 300 households. The main economic activities in the study area are commercial activities like shops, super stores; warehouses etc and some people are associated with government jobs. Mostly people are educated especially the young generation. Female members of the society are mostly uneducated. Some old people are also uneducated. The literacy ratio is about 65% in which the ratio of male is 60% and of the female is 5% only. There is no such health facility in the area except from a dispensary which is demolished by the authority recently. There are some manufacturing units in the study area which mainly consists of cloth factory, steel breaking and small scale industry. The male members of most the households are based in foreign countries especially in the Middle Eastern side. They work there as labours and support their family by sending money to them. The living standard of the people is good because most people work overseas and they earn good amount of money and have purchased different assets in the area. The population of the colony is nearly 2000.

1.3 RESEARCH PROBLEM

The study area is prone to urban flash floods. During the urban flash floods of the 2010, 2012, 2014 and 2015 water drains were filled with water and overflowed and all the water came to streets, roads, houses and even in the mosque, which cause great health and physical, environmental hazards. Till now none of the agency or organization has estimated the damages caused by these floods. The lack of awareness and mitigation measure further intensified the urban flooding condition.

1.4 PURPOSE OF THE STUDY

The purpose of the study is to provide base knowledge about the causes of urban flash floods to the line agencies and the local community which will increase their capacities in order to reduce the effects of the urban flash floods.

1.5 OBJECTIVES OF THE STUDY

The main objectives of the study are:-

1) To analyse the drainage and sewerage system in the study area.

2) To make inventory of the elements at risk to urban floods.

3) To study the natural & anthropogenic causes of urban floods.

1.6 URBAN FLOODS IN PESHAWAR

Urban flash floods are very common in Peshawar nowadays. The major urban floods in Peshawar were of 2010, 2012, 2014 and 2015. Urban flash floods are often from low to severe nature. In 2015 rainfall and winds stricken city of Peshawar causing the death of 44 people and hurting more than 200 people. The high percentage of death ratio is mainly due to the collapse of roofs and walls of houses. The depth of water was near to be 1m. In 2014, rainfall caused urban flash flood, which took the life of 16 people, including 9 children, and affecting 80 people. Mostly property and fields were destroyed (Siddiqui, 2014). In 2012, severe rainfall caused the overflow of the water in budhni nullah which ended in severe physical & economic losses.21mm of rainfall was observed in Peshawar city.

The 2010 flood caused great physical & economic losses in Peshawar city. Water overflowed in many places and caused severe damages to the infrastructure and property.

1.7 LAYOUT OF THE STUDY

The research study was conducted in Darakshan colony UC 23 of Town 1; district Peshawar. The population of the study area is nearly 2000. Urban flash flood is a frequent phenomenon in the study area. In the field primary data was collected through questionnaire, interviews and field observation all of the data was collected through these sources. Secondary data was collected from articles, research reports, journals, books, and internet and government offices. Based on the data the causes of urban flash floods and elements at risk were studied. From the list of the elements at risk, houses, schools, banks were studied. 70 samples were selected as sampling elements. Interviews were taken within the community to know about the causes of past flood. FGD was performed in community to know about the causes of the urban floods.

1.8 LIMITATIONS OF THE STUDY

The research was conducted successfully. There was no serious issue that affects the process. However, lacking maintenance and intentions of the local people make it very difficult to get secondary data for relevant topics.

CHAPTER-2

LITERATURE REVIEW

2.1 INTRODUCTION

Floods are the major disastrous events in the developing countries. Most of the third world countries don't have the coping capacity to deal with these events and phenomenon's. And in this chapter we will learn about the flood events that occur in the world and as well as in the study area. We will review the available literature related with floods and their causes and impacts. This chapter will give us a keen knowledge about the flood events in the world, related country and the study area. This chapter can be categorized into several parts. We will discuss in detail the literature of those parts.

2.2 FLOODS

In simple words flood is defined as the overflow of water. It is a temporary of practical or complete inundation of normal dry land areas from overflow of inland or tidal waters (Abbott, 2006). In 2009 November flooding affected the city of Jeddah in Saudi Arabia. In few hours, more than 90mm nearly twice the yearly average and the dominating rainfall recorded in Saudi Arabia in a decade. More than 100 lives were taken and losses were nearly US270 million dollars (Bloch, etal, 2011).

2.3 URBAN FLOODS

It is the inundation of land or property in a built environment especially in more densely populated areas which is often caused by severe and prolong rainfall. In this condition the holding capacity of the drainage system is very low and it could not store enough rainfall water which results in the overflow of water in the urban areas and cause urban flooding. The main examples of urban are the flood of Nimes (France) in 1992 and the flood of New Orleans (USA) of 2005.In 1998 Bangladesh faced one of the worst urban floods. Nearly two-third of the country was drowned under water and millions were affected. A total of 33 million were helpless of who 18 million needed food and health services (Ahmed, I, .1999).

2.4 FLOODS IN PAKISTAN

The floods are very common in the history of Pakistan. These floods caused from low to severe damages to the settlements, property and assets. The major and the disastrous flood in Pakistan history was of 2010 which destroyed most the Pakistan's economy. The main causes of severe floods in Pakistan are prolonging rainfall, snowmelt and poor drainage and sanitation system throughout the country. It is the amount of precipitation that changes a simple rainfall to extraordinary and life threatening situation. Rainfall chances to produce a flood is affected by factors such as prolong rainfall, size of the drainage basin, topography of the basin, urban use in the basin etc (Charles A. Doswell, 1996). The main period of extensive rainfall in Pakistan is in monsoon season. The main month of monsoon is August. Heavy rainfall occurred in the August 2013 which caused overflow of water in the upper catchments of river Indus and Kabul, northern sindh , Kashmir and north eastern Punjab. As a result of that river Indus attained high flood at chashma barrage. River Kabul also got medium flood level in nowshera, and river Ravi was in low flood situation at shahdara (Federal Flood Commission, 2013). Prolonged rain during the last 2 days revive the performance of agencies as the residents of the Peshawar city faced a number of problems due to blocked drains and standing rain water on roads and the streets(DAWN, 2002).

2.5 CAUSES OF URBAN FLOODS

The main causes of urban floods are prolong and severe rainfall for a long duration of time. Most of the time it is caused by blocked drains which results in overflow of water in the streets and roads causing flooding. Severe rainfall can cause flooding when the drainage system doesn't have the capacity to hold that water. Sometimes that water enters the sewage system in one area and resurfaces to others. This type of flood mainly occurs in Europe. However it is the same flood that affected parts of England in summer 2007. Effect of future urban growth on flood risk is influenced by policies of urban dwellers as they may or may not occupy areas which are prone to flooding or adopt effective urban planning and design (Bloch, etal, 2011).

Pakistan is highly prone and vulnerable to floods. Main causes of flood in Pakistan are heavy rainfall in the catchment areas, which sometimes results in flooding during the monsoon season (Hashmi, etal, 2011). Nearly 40% of the floods occurs due to natural hazards and nearly half of all the deaths occurred by natural disasters (Ohl and Tapsell, 2000; Jonkman and Vrijling, 2008). Global warming is a major cause of disaster including intense floods and storms in Pakistan (Hashmi, etal, 2011).

Shahi kattha is oldest sewage system of Peshawar. During the 2010 floods its flowing pathway was blocked due to by solid waste dumps inside the drains, presence of utility lines and encroachment. All these factors lead to overflowed of water which caused flooding (Navid, Salman, Gulfam, 2014). Some are lucky enough to have access to proper drainage and sanitation system in their neighbourhood can be safe during the monsoons, but there are millions other across the country

they should get ready to deal with urban flooding because by 2050 country population will increase from 207 million to 242million and nearly half of the people will be living in the urban areas. There is a rapid need for an improved urban infrastructure (DAWN, 2018). Solid waste stuck in drains causes' flood-like situation in several localities in Peshawar (DAWN, 2016).

2.6 IMPACTS OF URBAN FLOODS

Major elements are at risk due to urban flooding. Flood damage refers to all kinds of harm caused by flooding and it includes harmful impacts on humans, their health, their belongings, public infrastructure, and cultural heritage, ecological systems etc. The damage effect of floods can be further categorized into direct and indirect effects. Direct flood damage includes all varieties of harm which is related to physical contact of flood water to humans, property and environment for example damage to buildings, economic goods and livestock etc. Indirect damage includes those which occur as a consequence of the flood and the disruption of the economic and social activities for example the loss of economic production due to destroyed facilities, lack of energy etc (Frank Messner and Volker Meyer, 2006).

Impacts of the floods can be low to severe in nature. The intensity of floods is different across the world. The damage caused by urban floods are often more intense and costly. The impact of urban floods is greater in densely populated areas or those areas where urban settlements are in big number. The damages caused by these floods are severe in densely populated areas and the impacts on the societies are more. Direct impact from the urban flood represents the bigger risk to life and property. Indirect and long term effects including diseases, reduced nutrition, and education opportunities, and loss of livelihood, can also reduce community resilience and other goals, as does the need to cope with regular and minor flooding. These indirect impacts can be tough to identify immediately. However the poor and vulnerable often suffer the most from flood risk (Bloch, etal, 2011). One of the severe floods in Pakistan was in 2013. Another severe flood in Pakistan was in 2010. In that flood about 1800 people were killed and 21 million people was affected (The Express Tribune, 2013).

2.7 DRAINAGE AND SEWERAGE SYSTEM

Urban floods are major growing issue in developing countries. They cause damage to buildings, utility facilities, houses, transport system etc. Very prolong rainfall and its duration during the rainy season causes urban flooding. In this condition the surface run-off is increased causing local floods. The drainage system is the main cause of urban flooding in many cities due to its limited capacity. Local drainage doesn't have the capacity to store excess water during the urban flooding and it results in the overflow of water and high surface run-off. Local drainage capacity is mainly made up of a local storm water drainage system composed of drainpipes, main holes, minor channels and roadside ditches. This system is necessary to convey storm flows swiftly to the community primary drainage system such as the main river channel or the nearest large body of water (World Meteorological Organization, 2008).

In developing countries improper maintenance of the drainage channels, debris and solid waste disposal into drainage systems may stress the situation (World Meteorological Organization, 2008). The main cause of local flooding is due to prolong rainfall in many cities is the blocking of drainage facilities with garbage, cleaning and maintenance of drainage facilities is necessary to their operational reliability (T. Tingsanchali ,2012). The drainage system of the Peshawar city including study area is in very vulnerable condition. Often times these are filled with garbage or accumulated polythene bags which is a major reason for its blockage and overflow of water. A shopkeeper shahid mughal told DAWN that it is a serious problem, but government is paying no attention to it. He also said the existing 6 inch pipeline was laid about 25 year ago for a single resident which was being used by hundreds of residents of Darakshan colony and Zahidabad (DAWN, 2007).

CHAPTER-3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter different methods and techniques are presented which were used to study the causes of urban flash floods in the study area.

3.2 JUSTIFICATION OF THE STUDY

The study area is prone to urban flash floods. During the urban flash floods of the 2010, 2012, 2014 and 2015 water drains were filled with water and overflowed and all the water came to streets, roads, houses and even in the mosque, which cause great health and physical, environmental hazards. Till now none of the line agency or organization has estimated the damages caused by these floods. The lack of awareness and mitigation measure further intensified the urban flooding condition. The study of causes of the floods will provide us great knowledge about the vulnerable conditions of the urban areas especially the drainage and sewage systems of the study area. This study will provide us reasonable information about the causes and their impacts of the urban flash floods, which will be very informative for assessment of the problems in the study area. It will improve the level of awareness among people regarding the causes of urban floods. In the future this study will provide information about the vulnerable conditions of drainage and sewerage systems of the urban areas and how they become the causes of the urban flash floods.

3.3 METHODS AND DATA

The systematic method used to collect information and data for the purpose of making research study. The methodology includes publication research, interviews, and field observations and other research techniques. Sampling method was used in this research.

3.3.1 DATA COLLECTION

To obtain the purpose of the study, both primary and secondary data were collected. The primary data was collected from the field through field observation, questionnaires, interviews and FGD. Secondary data was collected from the published material of relevant governments departments and NGOs.

3.3.2 PRIMARY DATA COLLECTION

The primary data was collected directly from the community elders and other members. The main source of the data collection was through the questionnaire. The data was collected through 70 questionnaires which were filled from the local members of the study area. 50 were from households 20 were from commercial sector. The data obtained through questionnaire was to find the causes, perception and prevention of the urban flash floods in the study area.

Field observation was made to identify the causes and the impacts of the urban flash floods in the study area. The purpose of the field observation was to collect information about the problem of urban flash flood in the study area and take photos for the research study. A series of interviews were conducted with the local community members in order to judge the knowledge about the past urban flash floods and there causes & impacts on the study area.

One FGD was conducted in the study area. The purpose of that FGD was to know about the causes and impacts of urban flash flood in the study area and also to verify the field and questionnaire data. Some of the senior members of the area stated that the major cause of the urban flash flood in the area is pollution which mainly includes improper waste disposal in the drains and canals. The other causes are the lack of awareness in the people. One of the main causes of urban flash flood in the area is that the surrounding areas are elevated and this area lies below, because of which water takes much longer time to flow away. Some drains in the area were built to reduce the problem of urban flooding but somehow they are not functional. The impact of the urban flooding in the area is very low. Although there is no direct damage to livelihood but indirect losses include closer of business or no sales because of the water standing in the area make it very difficult.

3.3.3 SECONDARY DATA COLLECTION

Secondary data was collected from various sources. The information regarding the history of rainfall was collected from Pakistan meteorological department (PMD). The data about the population was collected from the Bureau of Statistics. Maps and the satellite images of the area were collected from the Google map and Google earth to study the physical layout of the study area.

In order to get more information data was collected from various reports, books, research articles, newspapers, internet and

other relevant government departments.

3.3.4 DATA ANALYSIS

Different steps were involved in the analysis of the data which are as follows.

1. First the study area was thoroughly observed by field observation.
2. All the drainage and sewerage pattern of the area was studied and how it was connected to the main drain shahi khatta.
3. The main drainage system shahi khatta of the Peshawar city was observed and studied.
4. Rainfall system of the Peshawar city was studied and its impacts on the study area were observed.
5. Elements at risk were identified which mainly included houses, shops and utility services etc.
6. History of the urban flash floods was studied.
7. Impacts of the urban flash floods on the study area were identified.
8. Causes of the urban flash floods were studied in detail and the causes of urban floods in the study area were identified.
9. Interviews and FGDs were conducted in the study area in order to know about the knowledge of the urban flash floods and its causes & impacts.
10. Perception of the local people about the urban flash floods was observed.

3.3.5 DATA PRESENTATION & INTERPRATATION

For the data presentation of both the primary and secondary data different software were used such as SPSS, Ms.Word and Ms.Excel. The data collected was then processed and analyzed through SPSS. After that the data was presented in cross tabulations, multiple bar graphs, bar graph, line graph and figures through Ms.Word.

3.4 UNIVERSE OF THE STUDY

Peshawar is the capital city of the KP. According to 2017 census the population of the city is 1970042 while the population of Peshawar district is 4269079(Govt of Pakistan, 2017). The main languages are Pashto and hindko. Islam is the dominant religion in the city. Peshawar currently enjoys the status of being the oldest living city in South Asia, boasting a recorded history that goes as far back as 539 BC. As well as its deep rooted urban history, Peshawar is characterized by its strong links with Afghanistan, sharing a largely permeable border with the neighbouring country, which has contributed to its cultural diversity, as well as adding an additional layer of complexity to its rapidly accelerating rate of urbanization.

Darakshan colony is located in UC 23 in Peshawar city. It shares its boundary with wazir bagh and beri bagh. There are 200 houses which are based on nearly 300 households. The main economic activities in the study area are commercial activities like shops, super stores; warehouses etc and some people are associated with government jobs. Mostly people are educated especially the young generation. Female members of the society are mostly uneducated. Some old people are also uneducated. The literacy ratio is about 65% in which the ratio of male is 60% and of the female is 5% only. There is no such health facility in the area except from a dispensary which is demolished by the authority recently. There are some manufacturing units in the study area which mainly consists of cloth factory, steel breaking and small scale industry. The male members of most the households are based in foreign countries especially in the Middle Eastern side. They work there as labours and support their family by sending money to them. The living standard of the people is good. The population of the colony is nearly 2000.

Looking to the nature of urban flash floods Darakshan colony UC-23 was selected as a sample area. Urban floods occurring in this area are fluvial in nature and also occur due to poor drainage and sanitation system. Based on exposure, the elements at risk, causes and impacts of urban floods were studied through interview and by field observation method. Based on sampling technique 70 samples was collected. 50 were from households 20 were from commercial sector. The data obtained through questionnaire was to find the causes, perception and prevention of the urban flash floods in the study area. Field observation was made to identify the causes and the impacts of the urban flash floods in the study area. The purpose of the field observation was to collect information about the problem of urban flash flood in the study area and take photos for the research study. A series of interviews were conducted with the local community members in order to judge the knowledge about the past urban flash floods and there causes & impacts on the study area. One FGD was conducted in the study area. The purpose of that FGD was to know about the causes and impacts of urban flash flood in the study area.

CHAPTER-4

DATA ANALYSIS

4.1 INTRODUCTION

Peshawar city is the capital of KP. The drainage and sewage system of the area is in poor condition. In case of raining the nallahs and sewerage line are filled up to 2-3 feet. The major reasons are narrow sewage line which is often blocked by polythene bags, solid waste material, dumps, garbage, and pieces of clothes. It creates hurdles for people to pass through that area. Shahi khatta is the main sewage line that is responsible for most of the urban drainage. This drainage line was constructed during maharaja ranjit Singh rule, when Peshawar population was not more than 60000. This drainage line is divided into two branches. The first branch starts from qissa khawani bazaar, passing through the areas of kohati gate, shoba bazaar, reeti bazaar, Fakirabad and stretches into budhni. The second branch passes through the inner parts of the city, particularly at jehangirpura and Muhammad Ali johar road, before joining the first branch at ring road. This drain is 10 km long and 8ft wide and is occupied by illegal constructions.

Darakshan colony is located in UC23. And shares its boundary with wazir bagh and beri bagh. The main flow of water is starting from river Kabul travelling through darakshan colony UC 23 and ending up in hazarkhawani branch canal. The major portion of the sewage is connected to that canal which is coming from river Kabul and ending in hazarkhawani branch canal. Most of the people have joined their sewage pipes with this canal. While some of the portion of sewage water is drain out through the main gutter outside the colony.

4.2 DRAINAGE AND SEWERAGE SYSTEM

Darakshan colony is located in UC23. And shares its boundary with wazir bagh and beri bagh. The main flow of water is starting from river Kabul travelling through darakshan colony UC 23 and ending up in hazarkhawani branch canal. The major portion of the sewage is connected to that canal which is coming from river Kabul and ending in hazarkhawani branch canal. Most of the people have joined their sewage pipes with this canal. While some of the portion of sewage water is drain out through the main gutter outside the colony. this drainage water pass through under the gunj gate and then from nishterabad and finally merges into hasthnagri main gutter, and then this sewage water is drained out in budhni nallah. In case of raining the nallahs and sewerage line are filled up to 2-3 feet. The major reasons are narrow sewage line which is often blocked by polythene bags, solid waste material, dumps, garbage, and pieces of clothes. It creates hurdles for people to pass through that area .mostly the containemanated water covers the road and pedestrians pathways. It's very hard to pass through that area especially during rainy season.Figure: 4. Canal systems of Peshawar

Source: Modified after Gov of KP, 2014

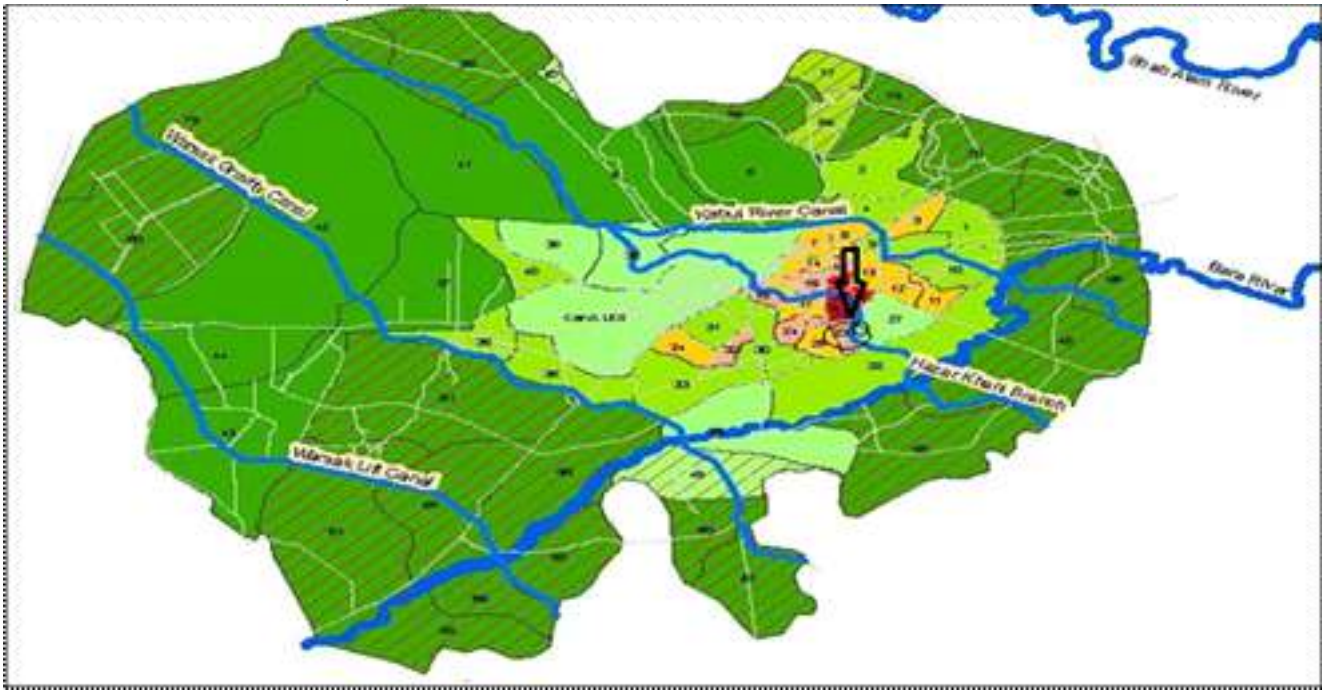


Figure: 4. Canal systems of Peshawar Source: Modified after Gov of KP, 2014

Figure: 4. Google maps, 2018

Figure: 4. Google maps

Figure: 4. Canal present in the study area Source: Field data, 2018

Figure: 4. Canal present in the study area Source: Field data, 2018

4.3 SHAHI KHATTA SYSTEM

It is the main sewage line that is responsible for most of the urban drainage. This drainage line was constructed during maharaja ranjit Singh rule, when Peshawar population was not more than 60000. This drainage line is divided into two branches. The first branch starts from qissa khawani bazaar, passing through the areas of kohati gate, shoba bazaar, reeti bazaar, Fakirabad and stretches into budhni. The second branch passes through the inner parts of the city, particularly at jehangirpura and Muhammad Ali johar road, before joining the first branch at ring road (imam, 2016). This drain is 10 km long and 8ft wide and is occupied by illegal constructions. Several shops, multi-storey plazas and houses have been constructed over it. Because of the bustling markets and mushrooming residences, all types of garbage has been dumped here. It has become nearly impossible to for the locals and the line agencies to clean it, unless theses illegal constructions are removed. With a dysfunctional and ancient drainage system like shahi khatta, the torrential rainfall just adds to the problem of the city residents. Overflowing gutters, flooding of transportation routes and closing down of commercial areas are just few of the main problems and are faced by the locals (khan H, 2013). The sewage water of the darakshan colony is passed through the gunj gate underground and then through nishterabad and gets united in the hasthnagri and Fakirabad area and then stretches into the budhni.

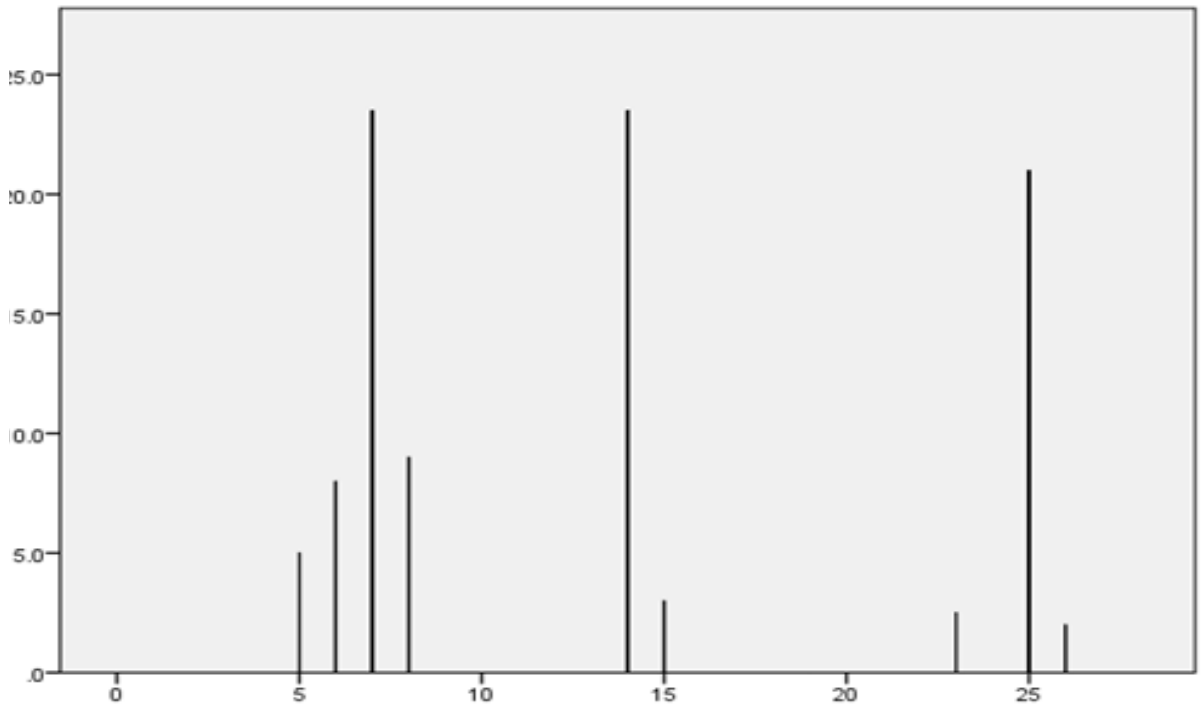
Figure: 4. Interrupted drainage system Source: Ghaffar Baig, 2013

Figure: 4. Shahi khatta Source: Express Tribune, 2013

4.4 RAINFALL SYSTEM

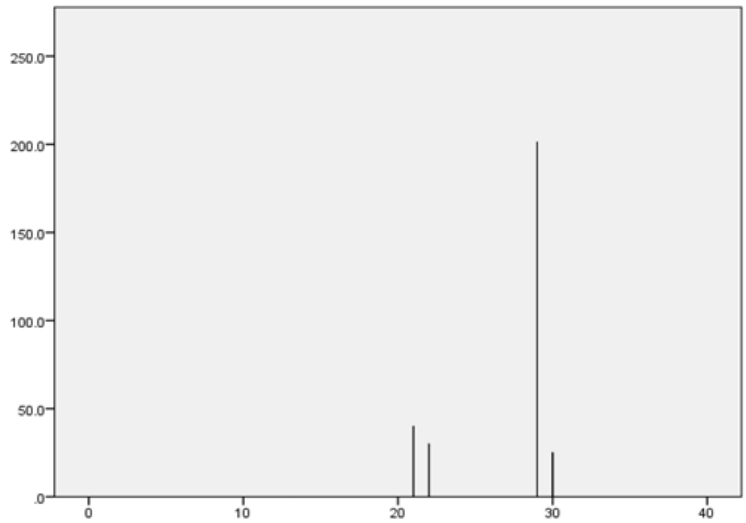
The major role in causing the urban flood is the extensive rainfall. In case of western depression these are the cyclones which originate in Mediterranean Sea, they travel across Afghanistan and Iran and then reach the western part of Pakistan. The moisture in the air is evaporated causing rainfall. Peshawar lies in western depression area. It has mild cold climate and Sub Mountains. In case of monsoon Peshawar is not situated in the monsoon region, unlike the other northern parts of Pakistan. But occasionally monsoon currents make it as far as Peshawar causing downpours. This can be witnessed in the erratic monsoon of 2015 when the monsoon moisture was going well into eastern Afghanistan. The winter rainfall due to western disturbances shows a higher record during the months of February and April. The highest winter rainfall has been recorded in March, while the highest summer rainfall in the month of August. The average winter rainfall is higher than that of the summer. Based on a 30-year record, the average 30-year annual precipitation has been recorded as 16 in. The humidity varies from 46% to 76% [Pakistan Meteorological Dept (PMD), 2017].

Figure: 4. Rainfall in Peshawar (February) 2010



Source: Pakistan meteorological dept (PMD) 2017

Figure: 4. Rainfall in Peshawar (July) 2010



Source: Pakistan meteorological dept (PMD) 2017

4.5 ELEMENTS AT RISK

In this chapter elements at risk are referred to those structures, due to their size, function and service area that have the potential to cause secondary disasters or affected by hydro-meteorological hazards. The facilities also included the institutions that are necessary for a community to perform their daily functions and are owned by respective union council, a town or the state/local government (Federal Emergency Management Agency [FEMA], 2018). The main purpose of the study is to identify the causes of urban floods in the area. Data was collected from both commercial and residential area. It includes houses, shops, small scale industries, and mosque and water sanitation facilities. The services available in the area are electricity, gas, roads, and education facilities.

4.5.1 HOUSES

As mention earlier Darakshan colony is selected to assess the causes of residential sector to urban flash floods. During observation, it was concluded that many of the houses in the area are in vulnerable condition. No mitigate point has been taken before construction. The area is congested at some places. All these issues combine to make the study area vulnerable to urban floods. Also there is no elevation and boundary of sewage line is equal to surface of the houses which is also vulnerable for flooding.

4.5.2 COMMERCIAL AND MANUFACTURING UNITS

The centre of the KP economy is the Peshawar district. The activities include shops, manufacturing zones and laboures. During observation it was concluded that the commercial units are situated in close proximity to the sewage line. There is no proper spot for disposing waste material. The drainage line is always filled with all the waste coming from the factories.

Figure: 4. Bank, Source: Field data, 2018

4.5.3 UTILITIES AND SERVICES

In study area facilities are roads, schools, mosques, electricity and gas services. During observation it was observed that the roads are moderately affected by flash floods. It also concluded that the disruption in services by these floods is for a few time. Transportation routes are congested and crowded. In case of emergency it will be very hard to evacuate.

Figure: 4. Mosque, Source: Field data, 2018

4.5.4 WATER AND SANITATION FACILITIES

Poor water & sanitation facilities were observed because of improper planning at the government stage. Urbanization increased the pressure on the sewerage system as it has not been upgraded. Water coming from the nearby areas increases the depth of the water in the monsoon season. Our area is a low lying area. Sewage lines are passed very close to the drainage line. This condition can increase the chance of urban flash flood.

Figure: 4. vulnerable condition of the sewage system, Source: Field data, 2018

4.6 HISTORY OF FLOODS

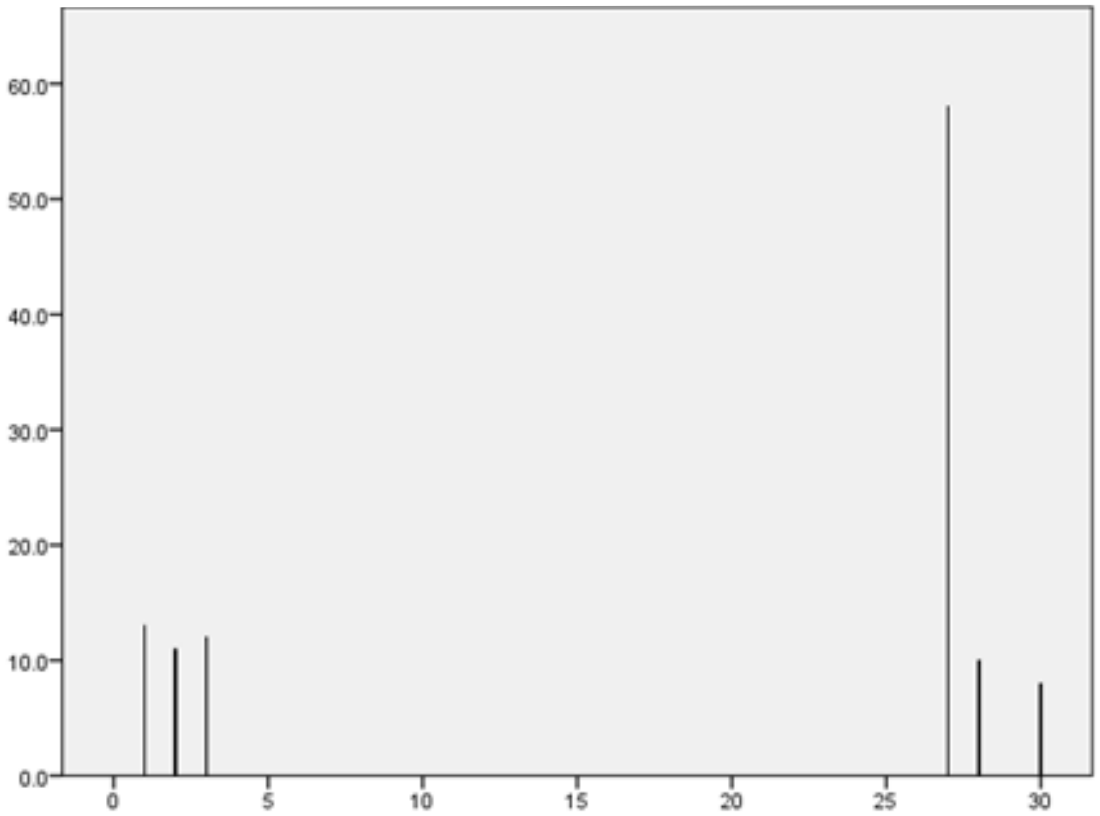
In the past few years urban flash floods were not as common as they today. Peshawar city is highly prone urban flash floods. All of these floods caused severe damage to the physical and economic infrastructure. Following literature describes the damages, extent and causes of urban flash floods in 2010. 2012, 2014 & 2015.

4.6.1 URBAN FLASH FLOOD 2015

Urban flash floods are often from low to severe nature. In April 2015 rainfall and strong winds struck Peshawar city causing the death of 44 people and injuring more than 200 people. The high number of death toll is mainly attributed to the collapse

of roofs and walls of houses. The depth of water was estimated to be 1m. The rainfall also resulted in the disruption of power supply and telecommunication lines (Australian Broadcasting Corporation [ABC], 2015). The flash flood resulted in washing away of significant number of houses and severe damage to the communication infrastructure. The residential sector was affected the most with the total of 48358 houses damaged.

Figure: 4. Rainfall in Peshawar (April) 2015



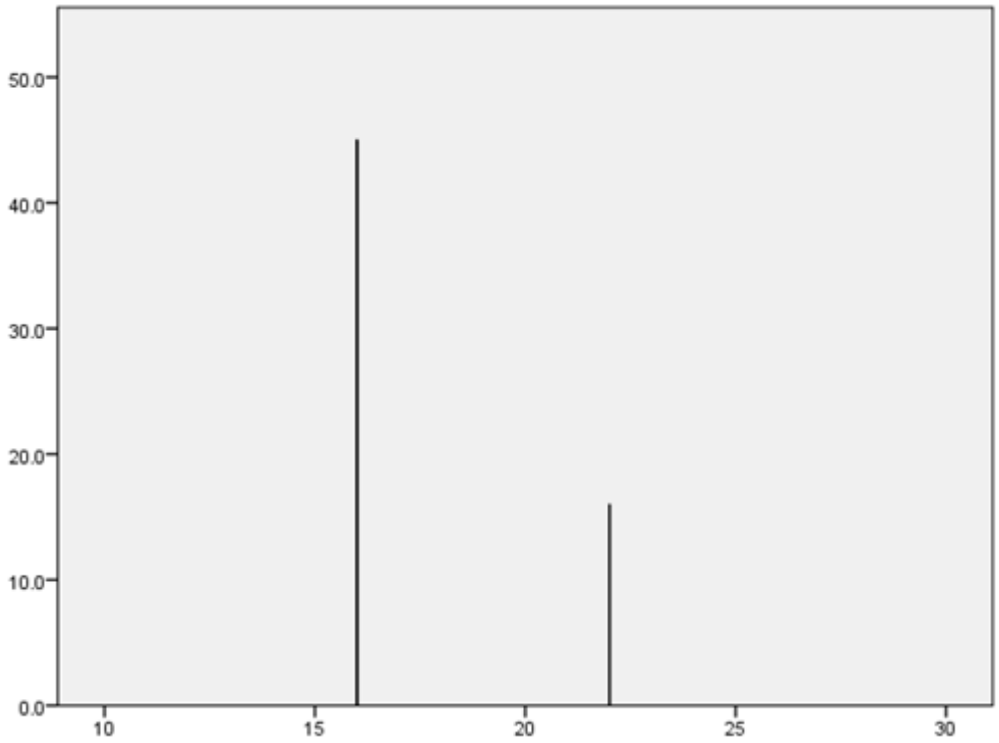
Source: Pakistan meteorological dept (PMD) 2017

Figure: 4. Inundated Area, Source: DAWN News, 2015

4.6.2 Urban flash flood 2014

In august 2014, heavy rainfall and storms generated urban flash flood, which resulted in death of 16 people, including 9 children, and injuring 80 people. Most of these deaths are attributed to the warping and caving in of the houses by torrential rainfall. This flood had a devastating effect on the property sector. 42mm of precipitation was recorded by the meteorological dept which caused massive traffic jams within the hour of occurrence resulting in heavy commercial losses (Siddiqui, 2014).

Figure: 4. Rainfall in Peshawar (August) 2014



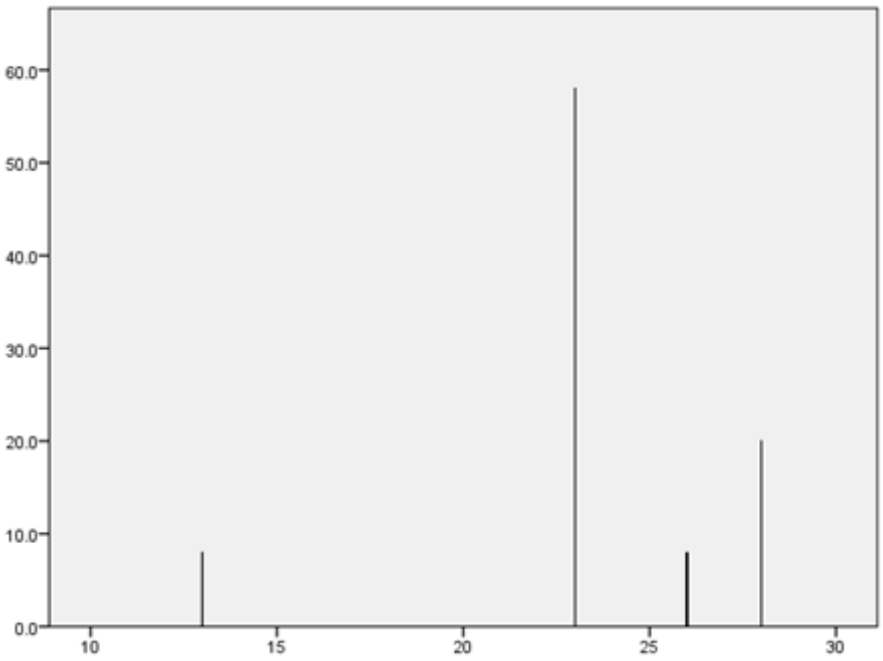
Source: Pakistan meteorological dept (PMD) 2017

Figure: 4. Flooded house, Source: DAWN News, 2014

4.6.3 Urban flash flood 2012

In august 2012, heavy rainfalls caused the overflow of the budhni nullah which resulted in heavy physical and economic losses. 21mm of rainfall was recorded in Peshawar. According to local people, the main cause of this flood was encroachment on both sides of the stream. Though the meteorological dept had predicted heavy rainfalls in the region, the local government failed to provide adequate warning to the local population. Also they did not respond to the situation. The flood resulted in heavy monetary losses. Massive traffic jams was observed on the charsadda road for 12 hrs (Bacha, 2012).

Figure: 4. Rainfall in Peshawar (August) 2012



Source: Pakistan meteorological dept (PMD) 2017

Figure: 4. Flooded Lake, Source: DAWN News, 2012

Figure: 4. Budhni Nallah,

Source: Majda Shabbir (IFRC), 2010

4.6.4 Urban flash flood 2010

The 2010 flood was the worst flood in Pakistan history. Nearly whole Pakistan was severely affected. It caused great physical and economic losses. In Peshawar water overflowed the bank of multiple waterways effecting roads, bridges leaving the affectees cut off from the outside world. It also caused a lot of hindrance in provision of relief by the line agencies. Over 200000 people of the total population were affected from this flood along with 34000 households (United Nations Development Programme, UNDP, 2010). According to the local community, the depth of the flood water ranged from 6-9 ft. In the months of February and July, 94.7mm and 294.1mm, respectively, of rainfall was recorded by the meteorological dept. the flood water damaged roads, households, commercial units and other facilities (World Food Programme, [WFP], 2010).

4.6.5 Impacts of urban flash floods in study area

In the urban flash flood of 2010, 2012, 2014, 2015 Darakshan colony was moderately affected. Flood water was standing at the height of 3-4 feet. There was a great problem for the local people to pass through the streets or the way to their homes. Transportation was severely affected. The standing flood water becomes a source for vector borne diseases. Mosquitoes were increased. All the flood water increased the level of sewage flow. Sewerage water broke into houses and mosques and it was very hard for them to get rid of that dirty water. All sewage water came into the washrooms and was creating terrible smell. The telecommunications and internet facilities were affected. The flood water remained for 6-8 days. Local people used buckets to throw water outside their houses. Most of the people complained that carpets were soaked were by flood water and creating smell. It was a great hurdle for people to evacuate.

Table: 4.1 Houses construction before flood and Extent of damages

	Fully damage	Partially damage	Minimal damage	No damage	Total
Kacha	3	12	7	10	32
Semi Pakka	2	13	6	10	31
Pakka	3	2	0	2	7
Total	8	27	13	22	70

Source: Field data, 2018

Table: 4.2 Frequency of flood and warning system

Frequency	Warning system / No	Total
Does not occur	1	1
During rainy season	52	52
Twice in a year	4	4
Every year	10	10
Once in a year	0	0
Other	3	3
Total	70	70

Source: Field data, 2018

4.7 CAUSES OF URBAN FLASH FLOODS

Urban Flash flooding results from relatively short, intense bursts of rainfall, often from severe thunderstorms. It can occur in almost all parts of Pakistan and poses the greatest threat of loss of life due to flooding. People are often swept away after entering floodwaters on foot or in vehicles. These floods can also result in significant property damage and major social disruption. They is a serious problem in urban areas where drainage systems are often unable to cope. Urban development in our towns and cities introduces hard surfaces such as roofs, roads, driveways and paths which stop rain soaking into the ground. This means more water runs off than would naturally occur. Although gutters, pipes and drains have been built to direct the water where we want it to go, the biggest storms have more water than pipes or gutters can carry. The extra water runs across the ground as overland flow, leading to greater runoff being generated, which can make rivers out of roadways, lakes out of car parks and deep pools out of underpasses. In case of the urban flash flood there are two main causes which can be natural and anthropogenic. The natural cause of urban flash flood in Peshawar is heavy rainfalls for prolonged periods, while the anthropogenic causes of these floods include poor drainage system , inadequate solid waste management , poor urban planning. Urban flooding occurs when water flows into an urban region faster than it can be absorbed into the soil or moved to and stored in a lake or reservoir. Common consequences of urban development include the removal of vegetation and an increase in impervious surfaces and drainage networks, all of which increase precipitation runoff into streams and rivers. This may result in more flooding. Urban planning explores design strategies that include storm water conveyance systems and other methods to prevent flooding. Urban flash Floods can be caused by a number of things, but is most often due to extremely heavy rainfall from thunderstorms. Flash Floods can occur due to Dam or Levee Breaks, and/or Mudslides (Debris Flow).

Table: 4.4 Causes of urban flash floods

Causes of flood	Improve drainage system	Reduce pollution	Awareness	Other
Intense rainfall	17	2	4	1
Problems in drainage system	20	12	4	0
pollution	0	0	0	0
urbanization	0	2	0	0
other	0	5	2	1

Source: Field data 2018

4.7.1 Perception about flood

In recent years, floods caused by heavy rain have caused major disasters in urban centers around the world. A lack of disaster preparedness in the study area has resulted in much damage in urban environment. These damages will have long-term repercussions for governance, communities and the natural environment. Heavy rainfall events are projected to become more intense and frequent due to climate change, and many recently affected areas may face more heavy rainfall and flooding in the future. Urban governance underpins the ability to manage disasters, through all phases of preparation, response and recovery. Local government officials, on the other hand, indicate the range of challenges, such as limited capacity for implementing policy, that limit the effectiveness of local government's ability to manage flood related risks. The data below is collected from questionnaires. It was then analyzed through SPSS. The data is presented in cross-tabulation and bar graph. The table illustrates the correlation between gender and exposure to flood. There were 60 male respondents, 55 of them think that their area is exposed to flood while 5 of them thinks that their area is not exposed to flood. The numbers of female respondents were 10 and all of them think that their area is exposed to urban flash floods. The bar graph shows the correlation between the education and perception (exposure,) of flood. The bar graph explains that all the 11 illiterate respondents replied that the study area is exposes to urban flash flood. There were total 25 respondents who has the

education level matric, among them, 21 thinks the study area is prone while the remaining 4 thinks that the study area is not prone to urban flash flood. All of the 31 respondents who have education level graduation think that the study area is exposed to urban flash floods. Total 3 respondents had education level master or above, 2 of them replied that the study area is exposed to urban flash flood while 1 replied with no.

Table: 4.5 Gender and Perception

Gender	Exposure to flood		Total
	Yes	No	
Male	55	5	60
Female	10	0	10
Total	65	5	70

Source: Field data, 2018

4.7.2 Natural causes

The urban flash floods in Peshawar are caused by heavy rainfall for prolonged and extended period of time. Climate change and global warming can also be the cause of urban flash floods. In case of western depression these are the cyclones which originate in Mediterranean Sea, they travel across Afghanistan and Iran and then reach the western part of Pakistan. The moisture in the air is evaporated causing rainfall. Peshawar lies in western depression area. It has mild cold climate and Sub Mountains. In case of monsoon Peshawar is not situated in the monsoon region, unlike the other northern parts of Pakistan. But occasionally monsoon currents make it as far as Peshawar causing downpours. This can be witnessed in the erratic monsoon of 2015 when the monsoon moisture was going well into eastern Afghanistan. The winter rainfall due to western disturbances shows a higher record during the months of February and April. The highest winter rainfall has been recorded in March, while the highest summer rainfall in the month of August. The average winter rainfall is higher than that of the summer. Based on a 30-year record, the average 30-year annual precipitation has been recorded as 400 millimeters (16 in). There are several ways through which we can tackle with urban flash floods. First of all the sewerage and sanitation system of the urban areas should be improved and the banks of the nearby canals should be increased in length. Garbage should not be dumped in the sewage lines and canals so that its pathway should flow freely. The depth of the sewage lines should be increased for excessive storage of water resulting from prolongs rainfalls.

Figure: 4. Flooded area, Source: Down to Earth, 2015

4.7.3 Anthropogenic causes

The most important anthropogenic causes of urban flash floods are poor drainage system, poor sewerage and sanitation system, encroachment, improper waste disposal and the vulnerable drain of shahi khatta.

Figure: 4. Poor drainage system, Source: Field data, 2018

A) Poor drainage system

In July 2015, urban flash flood occurred in Peshawar due to overflow of water from the local drainage system. 30mm of rainfall was recorded by the meteorological dept. Hundreds of families were affected by this flood (The News, 2015). The drainage system is in very vulnerable situation in the area. Most of the gutters are uncovered. A lack of gutters or having your downspouts disconnected from a proper drainage solution can dump lots of excess water into the soil surrounding your home. This excess moisture can cause clay soils to expand, often causing that part of your foundation to "heave" upward or settle. This can result in the same loss of support or stability of your foundation and leave cracks in your interior walls or exterior brick. Mostly drainage lines are filled with garbage and waste materials which often lead to flooding in the rainy season.

B) Poor Sewerage and sanitation system

Figure: 4. Poor sanitation system, Source: Field data, 2018

The drainage system in the urban areas is in very poor condition. Their condition is highly vulnerable. Most of the sewage lines and canals are broken, mostly people are not aware and they throw garbage in the sewage lines and in the canals. Due to which these canals and drainage lines are often blocked and is polluted. Majority of the people has attached there sewerage directly to canals which is resulting in the overflow of drainage water. During heavy rainfall the canals and sewage lines are overflowed and cause urban flash floods. The big example of the poor drainage and sanitation system is shahi khatta.

C) Shahi khatta

Figure: 4. Shahi Khatta drainage

Source: Shabbir Hussain Imam, 2015

It is the main sewage line that is responsible for most of the urban drainage. This drainage line was constructed during maharaja ranjit Singh rule, when Peshawar population was not more than 60000. This drain is 10 km long and 8ft wide and is occupied by illegal constructions. Several shops, multi-storey plazas and houses have been constructed over it. Because of the bustling markets and mushrooming residences, all types of garbage has been dumped here. It has become nearly impossible to for the locals and the line agencies to clean it, unless theses illegal constructions are removed. With a dysfunctional and ancient drainage system like shahi khatta, the torrential rainfall just adds to the problem of the city residents. Overflowing gutters, flooding of transportation routes and closing down of commercial areas are just few of the main problems and are faced by the locals (khan H, 2013). The major reasons for drainage failure are improper waste disposal, urbanization, encroachment and unawareness.

D) Encroachment

Encroachment has increased the chances of urban flooding in the area. Due to which many are facing problems related to sewerage and sanitation systems. Due to rapid urbanization the area has got congested. Encroachment is a major reason for improper sewage and sanitation system. Many of the drainage lines are overloaded and sometimes overflow in normal conditions.

Figure: 4. Encroachment, Source: Shabbir Hussain Imam, 2015

E) Improper waste disposal

There is a lack of proper waste disposal system in some part of the area. Most of them are unaware of their mistakes and they directly dump garbage in the drainage lines which leads to the blockage of flowing drain, which in results urban flooding. Majority of people have migrated from underdeveloped areas and are ignorant because they don't the proper way of waste disposal. Many people are selfish because they clean their streets, homes and throw the waste in the sewage lines which leads to urban flooding in the area during rainy season. Most of the gutters are uncovered which gives a chance to the people to throw their waste material directly in it. Majority people are morally degraded and they don't care about moral aspect and always make their sewage blocked by throwing polythene bags in it.

Figure: 4. Pile of garbage,

Source: Field data, 2018

F) Canals drainage

The Kabul river canal passes through the study area and ends in hazarkhawani branch canal. This wide canal is often filled with polythenebags, waste disposal, dead animals, pieces of clothes and the waste material from the factories. All these factors cause blockage in the flow of the canal which leads to urban flooding during monsoon season. Most of people have connected their sewerage disposal to this canal and all the containminated waste is accumulated here. This is making this canal smelly and full of waste. This canal flushes its water in the budhni nallah in the end. All the people who are polluting this canal are making their area vulnerable to urban floods. During rainy season it is often filled up to the top and like in 2010 caused flooding. Sometimes when the canal water flow is blocked it give birth to mosquitoes which is also a secondary hazard causing by this. The problem is about the low-lying places in some part of the area which is highly prone to urban flooding. During heavy rainfall when canal water causes flooding in these areas water at that time reaches the height from 2-4 feet. And it remains there often for 4-5 days.

Figure: 4. Canal drainage

Source: Field data, 2015

4.7.4 Conclusion

The drainage and sewage system of the area is in poor condition. In case of raining the nallahs and sewerage line are filled up to 2-3 feet. The major reasons are narrow sewage line which is often blocked by polythene bags, solid waste material, dumps, garbage, and pieces of clothes. It creates hurdles for people to pass through that area. Shahi khatta is the main sewage line that is responsible for most of the urban drainage. The main flow of water in the study area is starting from river Kabul canal and ending up in hazarkhawani branch canal. The major portion of the sewage is connected to that canal which is coming from river Kabul and ending in hazarkhawani branch canal. Most of the people have joined their sewage pipes with this canal. While some of the portion of sewage water is drain out through the main gutter outside the colony.

There are several ways to reduce these causes which should be proper waste disposal, sewage lines should be clean and covered condition of the water and sanitation system should be improved, and finally local people should be aware about their problems related with waste disposal sanitation. It was concluded from the above information that the causes of urban floods in the area can be concluded as severe and prolonged rainfall, climate change, poor drainage system, urbanization, encroachment and improper waste disposal.

CHAPTER-5

FINDINGS, CONCLUSIONS & RECOMMENDATIONS

5.1 INTRODUCTION

This is the last chapter of the report which provides a discussion on the findings of study, conclusion and the recommendations of the research study. This consists of three major parts which are findings, conclusion and recommendations. The recommendations are based on the research findings and the conclusion of the study which are outline below.

5.2 FINDINGS

Following are the major findings of the study:

1. Majority of the people in the area know about flood and think that there area is prone to flood.
2. Flood occurs nearly every year in the study area, mostly in monsoon season. Water standing on the roads and restricting the movement of the people, and transport of vehicles is a common issue.
3. The major cause of urban flooding in the area is problems in the drainage system. The other causes include lack of awareness in people.
4. The problems in the drainage system arise due to accumulation of polythene bags and also by damaged drains and canal banks.
5. The secondary cause of the urban flash flood in the study area is the elevation of the surrounded areas which make it a basin like structure.
6. The problem of urban flooding can be solved by reducing pollution in the local drains and over all area. Other solutions include awareness rising.
7. There is no flood response mechanism in the area when flooding occurs. However, WSSP work on unblocking of sewerage system when the flood water is rising.
8. Majority of the commercial activities are temporary closed due to flooding. It is because of the restriction of transport and movement due to water standing on the roads and streets as mentioned earlier.

5.3 CONCLUSION

Flooding in the urban area is a big issue nowadays which affects its residents by overflowing of the water. In most of the cases inundation of the water occurs. Nearly 90% of the people face problems in going to their shops and houses. Flood water remains for 3-4 days and its depth sometimes reaches to 4 feet. Effect of flood has been increased because of poor drainage and sewerage system and also the drains in the area don't have the capacity to hold enough water. 40 to 50 percent of the drains and canals are broken and are in very vulnerable condition in the area which affects nearly 2000 people during flooding by the overflowing of the drainage water. Other factors may include lack of awareness and poor urban planning. It can be concluded that the monsoon rainfall of the past years has caused urban flooding which has moderately affect the study area especially the housing and commercial sector. The damages of these floods were very low, no major damage was found. Although the causes of these floods was mainly dependent on the anthropogenic reasons. The main anthropogenic cause was poor drainage system which was often filled with polythene bags and other waste material. Damaged drains and canals banks were also a big cause of these urban floods. People are mostly unaware of the causes of these floods. Lack of proper waste disposal or throwing waste material directly in the drains is also a major contribution to increase the chance of urban flooding in the study area.

5.4 RECOMMENDATIONS

After compiling research report on the causes of urban flash floods some useful suggestions were found that can be helpful in minimizing and reducing the urban flash floods in Darakshan colony UC-23, Peshawar.

1. Drainage system in the area can be improved by reconstruction and repairing of the canals and drains in the study area.
2. Cleanliness and awareness campaigns can be arranged to spread awareness reducing the disposal of solid waste in the drains and canals.
3. The use of the polythene bags is the main reason for the blockage of the drainage systems. By reducing it flood can

be prevented in the area.

4. There is no warning system in the area. The installation of early warning system can reduce damages occurred as a result of urban flash flood.
5. Government should repair the banks of the canals and the drains.

CAUSES AND COUNSEQUENCES OF DEFORESTATION

A CASE STUDY OF SHISHI KOH VALLEY DISTRICT LOWER CHITRAL

Submitted By

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M.SC (Final)

Abstract

The study was conducted to find out the main causes and consequences of deforestation in Shishi Koh valley District Lower Chitral. Increase in over grazing, firewood collection from forests, and timber from forests, illicit cutting of wood causes deforestation in the sampled area.

The data was collected from randomly on the basis of sample fraction and the maximum respondents were taken from Pursad 3, Patigar 3,Shirati 15, Goreen 9, Thar 10,Bella 5, Kawsh 3,Birga 17, Kalas and Gosal 8,Madaklasht 27.

The data was analyzed to know the causes and consequences of deforestation ,which indicates that 59% respondents were of the view that local people are responsible for the causes and impacts of deforestation while 28% of the respondents viewed that lack of forestry department concentration causes deforestation while 13% of the respondents viewed that there are so many other factors which leads towards deforestation as for domestic uses, illicit cutting of woods and grazing of cattles over these forest lead towards deforestation in the sampled area. It shows that in all the above sector local people are more involved in deforestation.

The main reason for the causes and impacts of deforestation are the illegal use of forests as timber, huge amount of fuel wood collection from these forest due to non provision of alternate source of fuel wood, poor socio economic condition of local people, environmental harshness, (floods) and poor implementation of forests department concentration in the areas which are the main factors for the causes and consequences of deforestation.

The suggestions for the protection and Improvement of forests community has to play their role and responsibility for the care of forests by organizing community preservation organization in the areas so that they may own the forests to preserve it ,the forests departments have to be active and place a keen observation and check balance on the forests. There has to be provision of alternate source of fuel wood i.e,cheap/subsidize electricity, biogas plant etc and livelihood program through natural resources for the improvement of socio economic condition of local inhabitants, settlement of forest proper implementation of forest rules an application for improving forest management practices .

LIST OF ABBREVIATION

AKRSP:	Aga Khan Rural Support Programme
CADP:	Chitral Area Development Programme
ERP:	Environmental Rehabilitation Project
FAO:	Food and Agricultural Organization
FD:	Forest Department
FSP:	Forestry Sector projects
FSP	Forestry Sector Projects
FSR & DP:	Forestry Sector Research and Development Project
GIS:	Geographic Information System
ICIMOD:	International center for Integrated Mountain development
IRIN:	Integrated Regional Information Network
IUCN:	International Union for Conservation
NASSD:	Northern Area Strategy of Sustainable development
NIPA:	National Institute of Public Administration
NTFPs:	Non Timber Forest Produces
REDD:	Reducing Emission from Deforestation and Forest Degradation
VDC:	Village Development Committees

CHAPTER –1

INTRODUCTION

1.1 WORLD FOREST:

Forests are one of the most valuable professions of a nation. They are a priceless treasure because the sustain benefits they yield are tremendous. Degradation of forests has increased poverty, unemployment and migration to urban areas. (Sim.H.C et al 1977) Forest covers about 30% of the world's land area, just under 40 million km2. The worlds forest cover amounts to 3.9 billion hectares, of which 90% are natural forest and 5% are forest plantations 47 percent of the world's forest are in the tropics, 33 percent in the forest zone (far North), 11 percent in the temperate. The deliberate removal of forest is one of the most longstanding and significant ways in which human have modified the environment, whether achieved by fire or by cutting since the advent of civilization man has always given a step motherly treatment to the forest (Sheikh M.A & haeez. M, 1977).The world's natural forest is shrinking, and global climate changes are expected to have serious impacts on forests and agriculture systems. At the same time demands on forest and trees are increasing, with about 1.6 billion people replying heavily on forest resources for their livelihoods. (Food and Agriculture organization of United Nations) ,Worldwide we have cost between 9 million and 12 million has of forest per year from 1990 to 2000, at least one third, of people in the world depended on fire wood or charcoal as there principle source of heating and cooking fuel. Consequently fuel wood account for about half of all wood harvested worldwide. (Cunningham. W. Petal, 2005)

1.2 Deforestation rate in Pakistan:

Pakistan is an oblong stretch of land between Arabian Sea and Karakorum mountains laying diagonally between 24 N and 37 N latitudes and 61 E and 750 E longitudes and covers an area of 87.98 million hectares (wildlife of Pakistan 1999) Pakistan has 4.1 million hectares area covered by forests which is equivalent of total 5% of the total land area and it is very low as compared to other Asian countries. Of the 5% of the total landmass that has forest cover, 85 percent is public forest which includes 40% Coniferous and Scrub forests on the northern hills and mountains. The balance is made up of irrigated plantations and reversion forests along major rivers on the Indus delta and trees planted on firmed lands. Total forest area in Punjab, Khyber Pakhtunkhwa, Sindh and Baluchistan is 0.48, 1.33, 0.48 and 1.36 hectors respectively. The value addition in forestry sector witnessed decline of 5.7% as against of 33.2% last year. This is the third year in a row when forestry is depicting negative growth.

A comparison of forest resources of Pakistan with other countries is given in the following table, (Pakistan economic survey, 2005-2006).

Table: 1.2 Forest Resources in the world:

S.NO	Country\Area	Land area	Total forest (ha)	% of land area	Forest plantation (ha)
1	Angola	124670	69756	56.6	141
2	Reo of Congo	226705	135207	59.6	97
3	Kenya	56915	17096	30.0	232
4	Nigeria	91077	13517	14.8	693
5	South Africa	121758	8917	7.3	1554
6	Egypt	99545	72	0.1	72
7	Bangladesh	13017	1334	10.2	625
8	China	932743	163480	17.5	45083
9	India	297319	64113	21.6	32578
10	Indonesia	181157	104986	5810	9871
11	Malaysia	32855	92292	58.7	1750
12	Pakistan	7708	2361	3.1	980
13	France	55010	15341	29.9	961
14	U.K	24160	2794	11.6	1928

Source: (FAO of the United Nations)

International Environmental Organizations recommend that a country should have 20-25% of the land cover by forest. The area covered by forests, at present is far less than the desirable ratio of 20-255 considered necessary for balanced economic development and environmental stability of a country, (PFI Peshawar 1987). The natural forest of Pakistan are confronted by a wide variety of threats and pressure with population growth in the country , forests are under increasing demand for watershed regulation and substance uses including fire wood and grazing .Higher population growth in the country, forests are under increasing demand for watershed regulation and substance uses including firewood and grazing . Higher population growth rate (2.4% in 1998) together with increasing demands for socio economic development have put tremendous burden on natural resources including energy, water and forests etc. Deforestation rate is about 7000-9000 hectares per year. This contributes towards erosion, resulting inloss of grassland cover and loss of habitat of flora and fauna. (Govt. of Pakistan Planning commission September 1, 2005).The project consumption and growth of forests in Pakistan depicts a rapid increase in forest resources. It is natural forest asset is very small and most forest are slow growing. Pakistan is one of the most developing countries with n remaining biologically undisturbed forests. The major demand arises from industrial wood based sector and fuel wood consumption bifurcated into urban and ruler sources of demands. The fact that Pakistan has one of the lowest forest endowments is the world is not in much doubt, nor that has even this limited recourse come under increasing stress over the years. In general development has led directly to mining of the forest wealth; independent estimated show that woody biomass is disappearing at a rate between 4-6% per annum, which is feared to be second heist in the world. It's estimated that if the present trend continuous Pakistan's total woody biomass could be consumed within the next 10-15 years. (SDPI)

Pakistan's forest is urgent need of protection and conservation. The country has one of the highest rates of deforestation in the world. The primary causes of deforestation are population growth and settlement, lack of fuel food alternatives insect damage and diseases, forest fires and lake awareness about the importance of preservation.

1.3 DEFORESTATION

1.3.1 PRESENT STATUS

Deforestation is most important and serious problem in Asia. In 1980 less than 20% of the region was covered with forests and the percentage has decreased at an estimated rate of 0.6% per year. Pakistan is already in an unhappy position of being amongst the group of countries with lowest area (4.8% of the total area) under the forests. In Pakistan forest area is less than 0.05 hectare per capita, while in the world it is one hectare. Extensive deforestation particularly in the watersheds is the major ecological threat to the nation as a whole. In Pakistan deforestation rate is 7000 ha per year, due to the extensive and illegal logging the area under forest is decreasing at the rate of 1% every year.

Deforestation is uncontrolled logging or cutting of the forests in the way that the process of replacement is far slower than the process of removal. At present 33%of the world land is under forests. As many as 63% of the originally forest area in South Asia and 38% in South East Asia are now denuded. Tropical forests the most important surviving woodland contains about 2/3 of all plants and animal species have lost very rapidly. Extensive deforestation particularly in the watersheds is the major ecological threat to the nation as a whole. In Pakistan deforestation rate is 7000 ha per year, due to the extensive and illegal logging the area under forest is decreasing at the rate of 1% every year. Environmental degradation i.e. Ozone layer depletion, Greenhouse effect is now a day becoming a serious problem for the whole world. In this regard forest is considered as a kidney of atmosphere as it absorbs excess carbon dioxide which is released from industries.

In this sense Chitral situated on the North corner of the country is already in unhappy position in respect of forest which is being out indiscriminately. The total forest area is 4.2% and is found mostly in the south and south western parts of the district. The forests occur between 915 and 3506 m above sea level and comprise of Deodar, Spruce and Blue pine. Oak is also found but scattered mainly on those hill slopes which are exposed to the sun. Birch and Juniper are also found sporadically in various pockets of upper Chitral. The forest faces different problems like ruthless cutting, grazing, lopping, falling and torch wood extraction. The total forest area under working plan is 90,196 acres, whereas the rest of 35000 acres are not included in working plan. Thus by including the total forest area is 55, 196 acres. The total area under working plan is divided into two main ranges, 364 compartments and sub-compartments as detailed below:

a. Ayun Range = 30862 acres

b. Drosh Range = 59334 acres

Ayun range comprises of the following sites:

Ayun Doak	2.Auckulgol
Birrir	4.Bachugtigon
Backgol	6.Batrika
Chimersan	8.Darmaligol
Doak	10.Gangalwat
Jingerate	12.Jangerate
Kalak	14.Kandrisar
Rumber	16.Urghuch

Drosh range comprises of the following localities:

1.Arkogol	2.Bela
Birgah	4.Beown
Beori	6.Chinnisar
Chakdam	8.Domuch
Damel	10. Josh bai
Gatasian	12.Jurin
Jashtingol	14.Kashigol
Kawash	16.Kalas
Kaldam	18.Korai
Langorebat	20. Lao-Nissar
Madaklasht	22.Purigol

Puritgol

Generally forests are divided into commercial working circle and non-commercial working circle.

Annual felling from commercial working circle = 4, 00, 000 cft.

Annual felling non-commercial working circle = 1, 50, 000 mds.

Source: Chitral forest Department (40 kg = 1 md)

1.3.2 CAUSES OF DEFORESTATION:

i. Mass (i.e. man influence)

ii. Live-stock

iii. Natural

i. Mass: Over cutting of forests for various purposes like development of agriculture lands, fuel-construction furniture wood etc can causes deforestation.

a. Fire: Intentional fires are initiated in the forests to make the trees dry before they are cut for the purpose of obtaining timber. This practice has now been stopped by administration but many of the forests still bear visible signs of this damage. Occasional fires do occur even now either due to negligence of the grazers who kindle fire for cooking or it may be intentional to get chilghoza seeds.

b. Lopping and Felling: The trees are lopped extensively for fodder and fire wood throughout the forests. Worst affected species is Q.Ilex but Deodar is also lopped in these areas like Madaklasht where there are no oak trees. The intensity of lopping is so heavy and frequent especially near habitations. The lopping for fuel wood is limited as the fire wood is mostly obtained from the twigs lopped for fodder. Because of continues lopping and fallings the oak forests have gradually receded away from the habitation. Bare slopes around Chitral and Ayun are very clear examples of this process. A certain amount of damage in the form of felling deodar trees for house construction is also noticeable in some of the forests like Urghuch, Janyjaret, Rumbur, Ayun Doak, Barrier, Drosh, Johbai and Kaldam.

Extraction of Deodar oil: the mature deodar trees hollowed at the base and fire is burnt in the cavity for sometimes to get resinous oil used for treating the wounds. This type of damage though not extensive is found in the most forest areas.

c. Forest Ownership: It is also cause of deforestation because the owners keep gougers in their areas which have a large number of cattle such as sheep, goats, etc. They graze their cattle in their forest and pay compensation to the owner which is called Qalang. They do not take care to forest regeneration because they pay compensation. So in this way they damage the forest indiscriminately.

d. Smuggling: is also considered a cause of deforestation in Chitral.

iv. Livestock:

The inhabitants living near the forests keep large herde of goats and sheep to supplement their food supplies in the form of milk and meat as well as providing leather and wool used in various local crafts such as patti etc. therefore over grazing poses another problem for these forests. During winter months when practically whole of the tract is under snow, flocks are fed on oak leaves for which trees are lopped. The intensity of lopping is heavy and quite frequently the entire new growth is

removed. During the mid-summer months these flocks are grazed in the Alpine pasture where they often heard in the upper forest limit. Birch (Betulautilis) growing in the zone is lopped extensively for fodder. As a consequence of repeated lopping the species is at the verge of extinction. While going to and returning from the Alpine pasture the herds are grazed in the forest belt for about one and half moths, in spring and approximately the same period is spent in autumn. As the area is being in the dry zone there are very little grasses and under-growth which suffice hardly for few days for large number of goats and sheep. The flocks are therefore fed on leaf-fodder. Furthermore, in spring season when the ground is wet due to residual moisture of snow and the deodar seedling sprout the roaming of the flocks in the forest causes uprooting of innumerable seedlings. This factor is mainly responsible for the scarcity of deodar regeneration at lower elevation. Thus the freely roaming livestock poses the greatest to a forestation programmer.

v. Natural Cause:

The injuries due to natural causes like snow, wind, hail, frost, lightning etc, do occur but except for the snow the damage caused by other causes is not serious. The nature of damage done by each one of these agencies is discussed below:

a. Snow: The most extensive damage by snow slides and avalanches is in the form of either uprooting of big trees or breaking of their stems. The avalanches occur very frequently during the period from February to April and are responsible for considerable damage to the forests. The localities where avalanches occur frequent are completely devoid of vegetation. On this account most of the forests present a picture of alternative patches of dense tree growth and bare slope. Accumulations of snow on the uphill side of young trees result in bend at the base of small trees.

b. Wind: Windfalls occurring during wind storms of high velocity usually after the heavy down pour. The damage is however limited. Monsoon clouds can reach Chitral which is drier than Dir. The average annual precipitation is said to be about 320 mm. March and April is the wettest and July and August are the driest months.

The wind blows regularly throughout the year, the average speed during July and August being about 15 knots. The wind is responsible for high rate of transpiration and evaporation, thereby creating arid condition. Thus the rate of growth of plants is reduced and the trees remain branchy and short stemmed. As the wind blows in one direction i.e. north to south and south to north, the poles of trees are affected and tend to become elliptical. However, nearly all the forests are situated inside the valleys which are to a great extant, protected from the wind of high velocities prevalent in the main valley. The forgoing effect is less conspicuous though they are not altogether absent

c. Hail storm: The areas are subjected to hail storms during spring. Severe hail storms inflict appreciable damage in the form of uprooting of the seedlings and make older trees leafless and consequently retard their growth.

d. Frost: The frost of severe intensity occurs during the winter but all the species growing in the area are resistant to its effect so little damage is done. Occasional late frosts during early part of the growing season however do result in the form of killing the young plants and damaging the growing parts of the mature trees.

e. Lightning: Very little damage is done by lightning and restricted to the area like Ayun Doak and Joshbie of the study area.

f. Wild animals: The wild animals which are worth mentioning in this regard are bear, ibex, urial, markhor, monkey, and porcupine. During winter months when food supply is limited the bear strips off the bark of young poles at the base and eats away the bark. The trees thus damaged become dry and even if they survive they generally develop rot.

Ibex, urial and markhor do some damage to regeneration during severe winter, when there is nothing else to eat. Monkeys and porcupines are found around the Damal Nissarand Arandu only where the former ear the tree seeds while the damage of the later is similar to that of bear. Squirrels (bird) hobble the unripe cones and tender shoots of deodar and silver fir, thus retarding both the regeneration as well as growth of trees. Likewise the pheasant and chokers are sometimes responsible for uprooting of seedlings by turning the soil in search for seed and insects.

g. Insects and fungi: The insects and fungi form an integral part of biological complex of forests and the nature of damage done by them to the crops depends on the habits and characteristics of these species. The extent and damage of these agencies is not serious. The parasitic plants like viscumspecieson the (Oak) and Areceuthobium spp. On Kail and Juniper are noticeable occasionally.

1.3.3 EFFECT OF DEFORESTATION

I. Positive Effects

ii. Negative Effects

I. Positive Effects

i. Land for agriculture

ii. Wood for fuel and furniture

Before 19th century the upper part of Bomb orate was covered by thick forest. Due to revolution in Afghanistan and settled here. They cut the forests for cultivation and also for fuel-furniture wood.

ii. Negative Effects

i. Soil Erosion and Desertification: Vegetation provides protection to the soil surface against the erosion through their roots and decomposition products. Therefore the forests control soil erosion. When cut down the operation lead to the erosion of fertile upper soil layer which results in exposing the underlying. Ruji 25 km off from Chitral city covered by dense forests is an example of deforestation.

ii. Situation in Lakes: Deforestation is a leading cause for higher run-off flash, flooding and soil erosion. The river of Garam Chashma, Bomborate and Shishi are habitats for a large number of fishes hasbeenm affected due to situation in these lakes.

iii. Drainage Runoff and Drainage Channels: Lack of forests increase the speed of rain water which cause severe damage to the soil in the form of landslides and thus forms regular water channels.

iv. Green house Effect (Global warming): Vegetation severe as a factory for generation of oxygen and intake of carbon dioxide through photosynthesis leading to the state of equilibrium in nature. As a result of loss of vegetation co2 concentration in the air leads to the formation of blanket around earth biosphere. This blanket serves as a green house and increases the temperature of earth. Increase co2 also damages the ozone layer above the biosphere. This process is called ozone layer depletion. It absorbs ultraviolet rays and protects earth from its adverse effects.

v. Decrease in Rainfall: Due to the absence of forests there is general tendency in decrease in rainfall that affects the weather to high temperature.

vi. Increase of Wood Price: Due to the shortage of wood supply there is an increase in the price of wood needed for cooking, furniture and construction purposes.

CHAPTER - 2

LITERATURE REVIEW

Mahr (1989) reported that the underlying cause of deforestation has not been thoroughly researched and as a result are not completely understood. The purpose of this document is to shed further light further on the subject by analyze the effect of certain government policies on deforestation. the emphasis is on policies which encourage economic activities that are the detrimental to the environment on those sub region that are now experiencing the most rapid deforestation . the principal finding is that attempt to reduce or stop deforestation through land use zoning ,legislation for establishing national park , or legal prohibition of certain type of economic activity.

Le-Tacon and Harley (1990) analyzed the cause of forest destruction. we generally propose those remedies and specific action which have been proposed by the world resources institute for the year 1987-1991 and by the Silva conference held in Paris in February 1986,contrary to those deforestation can be arrested if the developing and the develop countries change their current behavior . Research in forestry can make contribution of major significances but alone cannot solve the entire problem. There is a requirement for research in forest production, in the economic use of what is treated as waste. It is an important duty of international foundation for science to encourage increase application in forestry.

Myers (1992) observed that the destruction rate of tropical forest is at present faster than ever. The rate almost doubled during 1980s. The main agent of deforestation turns out to be the displaced peasant or landless farmers, sometime known as the shifted cultivators.

This group accounts for more forest loss than the combined impact of the commercial logger, the cattle rancher and all other better known sources of deforestation. So far little attention is directed toward the shifted cultivator, and next to nothing is done to address the problem which this group represents. In turn, it must also be determined that what motivates these people to abandon established farming area in the regions concerned and to migrate into the forests. Population growth, misdistribution of arable lands, inadequate rural infrastructure and lack of government attention to subsistence's agriculture. In other words, the problem is due to amalgam of non forestry factors, and conservationists are bound to fail in safeguarding the remaining forests unless they direct much more emphasis toward the root cause of deforestation.

Hyde and Seve (1993) observed that “Malawais”3.6% rate of annual deforestation is among the worst in the world .Wood fuel consumption and agricultural land conversions are the primary causes. This paper examines the historic evidence and developed conceptual model of deforestation and the response to it especially by the small holders and forestry department .The model feature indigenous stock and growth as well as reforestation with new seedling largely delivered by forest department. The empirical evidence is sparse and of uncertain reliability .Nevertheless cautious specification of the model suggests that small holders are more responsive they rapidly reforest in response to economic scarcity especially where their tenure is secure continuing small holders reforestation activity may be highly dependent on forestry department capacity to deliver seedling and extension services . Continuing deforestation in Malawi will be strictly a function of agricultural land conversion it will not be due to fuel wood or other wood product demand.

Lugo et al (1993) discussed the close of species as a result of deforestation and degradation of tropical forest land. The analyses shows that natural resiliency cause the models to overestimate the rate of species extinction for given incentive of deforestation.

There is an opportunity to couple natural process with management activities to reduce species extinctions and restore species richness to degraded lands. The study show as to how tropical mono cultural tree plantations can foster diverse native forest in areas previously deforested. The finding of the study is that well directed human actions laws provide the means to conserve biodiversity and restore it in location previously degraded.

Krutilla et al (1995) develop a conceptual bio economic model to explained deforestation around developing country cities and apply the model in an empirical analysis to a cross section of 33 cities in Africa assai and central and Latin American .The study concludes that forest decline around cities is in response to urban income growth. The deforestation pertain reflects a combination of factors such as transportation development topography precipitation and island location. It also found that the establishment of protective state property regimes appears to have little impact on steaming deforestation in the vicinity of developing country cities.

Boehner (1998) reported that economic development on factors including capital labor force and natural resources. Forests are natural resources which if properly managed can provide habitats for animals and plants species pasture for livestock

wood for shelters timber and fuel wood land for agricultural and can have favorable effect on whether in climatic pattern nevertheless deforestation has been wide spread phenomenon in tropical Africa with an annual forest clearance of between 1.3 to 3.7 million ha. This paper reviews the pattern of deforestation in tropical Africa by examining it causes and consequences as well as assessing the prospects for the attempts being made to control it. It identifies forest clearance for subsistence fanning as the principal determinant of deforestation but does not consider the ignorance of small scale farmers as the underlying causes.

Laurence (1999) concluded that tropical forests do for more than sustain biodiversity they are homes to indigenous people, pharmacopeias of natural product and provide vital eco system services such as flood amelioration and soil conversation. At regional and global scales tropical forests also have a major influence on carbon storage and climate. The study highlights these benefits and assesses the pattern and pace of tropical forest destruction in Americas Asia and Africa. Asia emerges as the most immediate concern because it has les surviving forest than the other two regions and higher relative rate of deforestation and logging. At regional and national levels however there is enormous variation in rates of forest los. The study also discussed some factors that tend to promote forest conversion in developing countries and proposes that for human population pressure we government institution and poor policies increasing trade liberalization and industrial logging and emerging as key drivers of forest destruction.

Fischer and Vesseur (2000) studied that deforestation is proceeding at alarming rates in the Central American republic of panama. This is leading to high losses of biodiversity local wood shortage increase erosion and sedimentation of water bodies one of the principal causes of deforestation is expansion of the agricultural frontier through extensive shifting cultivation system. These land use systems are becoming increasingly unsustainable as population increase and the amount of agricultural land available declines and are often associated with low crop productivity and reduce soil fertility. Agro forestry or the associations of tress with crops and live stock has the potential of providing both socio economic and ecological advantages to small holders.

Asifsyed December (2002) the main causes of deforestation and forest degradation and mounting population pressure dependence of urban and rural household on fuel wood suspension of forest management in natural forests unscientific grazing flood inadequate financial inputs and stake holders lack of involvements in the process of policy making .The activities of the timber mafia and lack of political will on the part of the government to bring them to book have further aggravated the situation .

Iqbal Mehmood NIPA September (2003) defined as the removal of the forest and its replacement by another land use class eg shifting or permanent agriculture mining, or water impoundment or the long term canopy cover to loss than 10% .In some causes deforestation many contribute to such severe land degradation, for e.g in ecologically marginal areas such as arid and mountain zone and in the tropics at little use can be subsequently made of the land without very costly re habitation. Land use for agriculture urbanization roads construction fuel wood consumption in rural areas and over grazing are the main causes of deforestation in Pakistan.

Ichikawa and Masahiro may(2007) Sweden agricultural logging and plantation development have been considered to be the primary common causes of degradation and loss of tropical rain forest in south east Asia .The study was conducted in east Malaysia and observed that land use began about hundred years ago by a native group called “iqban” commercial logging began in the 1960 and the development of oil Palme plantation began recently , concluded that on “ state land” where commercial logging and oil palm plantation development are accruing, large area of forest have been distribute in a short periods of time, in the iban territory where the iban practiced their land use ,land conversion has not accrued on a large scale and in a short periods of time , even though the forest has been cut and agricultural field has been created in response to social and economic condition as well. In Sarawak, monocarp plantation is rapidly expanding and little primeval forest remains.

Miles, LeraandKpos June (2008) recent climate talk in bali have made progress toward action on deforestation and forest degradation in developing countries, within the anticipated post-Kyoto emissions reduction Agreement. As a result of such action many forest will be better protected, but some land use change will be displaced to other locations. The demonstration phase launched at Bali offers an opportunity to examine potential outcomes for biodiversity and ecosystem services. Research will be needed in to selection of priority areas for reducing emission from deforestation and forest degradation to deliver multiple benefits on the ground methods to best ensure these benefits and minimization of displaced land used change in to known target countries and eco system including through revised conservation investments.

Siddhi Mary Rose and teeming July (2008) the contribution of forest disturbance to the decline of tropical birds is discussed. Hebetate loss through deforestation in tropical regions is the primary cause of species endangerment and local extinctions and it has been predicted that current deforestation rates could cause mot threatened bird species to disappear by the end of the century .Forest disturbance end degradation effect bird survival by altering forest community in term declining bird population effect ecosystem processes. Forest fragmentation timber harvesting practices agricultural practices and

urbanization all impact bird survival.

Sheil D Bashkir and Wan. M September (2009) government in tropical countries are still responding to increasing forest degradation by implementing different types of protected areas. In general due to their negative image as cause of deforestation local communities are being excluded from any management role in these conservation areas. However in Vietnam since 1986 various incentives have been proposed for alternative conservation models. They concluded that conservation can be enhanced if local priorities prosperities and wishes are better identified and taken in to communities can and should be actively involved in building a shared understanding of what and the forest provide how it can be conserved and the benefits to be obtained.

Green glass Baccini. A and Waker .W december (2010) emission of carbon from tropical deforestation and degradation currently account for 12 to 15% of total anthropogenic carbon emission each year and reducing emission from deforestation and forest degradation (REDD" including REDD+) is poised to by the primary international mechanism with the potential to reduce these emissions)this articles provides a brief summary of the scientific research that let to REDD and that continuous to help refined and resolve issues of effectiveness efficiency and equitability for a REDD mechanism . However REDD deals only with tropical forests and there are other regions ecosystems and processes that govern the source and sings of carbon in terrestrial ecosystem.

Davidar Sahoo and Manxman December (2010) in India conservation of biodiversity goes hand and hand with human welfare as million of people's lives adjacent or within protected and depend upon forest product .The high density and biomass requirements of these household could result in the degradation of forests ubiquitously fuel collection green leaves collection for making fertilizer footer collection and land use for agriculture purposes are main causes of forest degradation in the study area.

Fensham. R. J, Silcock. J.L and Dwyer. J. M Dec 2011 significant increase in richness or abundance of native plants with grazing protection persistence of perennial grasses regeneration of mulga and scanned evidence of a major decline in the regional r not consistent with establish assertions that long grassed mulga dry forest has crossed functional thresholds that limit recovery , Further a peak in species richness under intermediate (Macropod) Grazing is count to the shape of the responds predicted by the emerging theory for recovery of species richness in a low productivity environment the finding prompts a more thorough understanding of the distinction between environments with inherently low productivity and those degraded by grazing. Effects of deforestation and forest degradation: Deforestation exposes the soil to the forest of wind and water specially on the foothills of the mountain, The upper layer of the soil is eroded away and leaves behind infertile course land. With heavy rainfall the water gushes down the mountains with it large quantities of slit and lime stones. Cutting of trees disturbs the natural environment. The natural habitat is destroyed which results in the extinction of a number of valuable species and the wild life also get disturb with less visitations there is less evaporation and transpiration. The climate changes in particular there is less rainfall which cause many result in lower crop yields.

Jawad Akram 1990 deforestation is a global environment concern but the underlying processes vary a cross regions and countries. In Pakistan the threat to forest and biodiversity does not come primarily from local farmers but from unsustainable commercial logging .Employing an actor oriented approach this project paper focuses on deforestation in Pakistan emphasizing on KPK and northern parts of Pakistan.

Chiti et al, (2014) stated that in the Jomoro district in Ghana, tree plantation where the first of deforestation in the past, drastically reducing the area occupied by primary forests.

Waiswa and Danial (2015) stated that the key drivers of deforestation in the lake Victoria Crescent, Ugenda from 1989 to 2009, included policy and institute factors, economic factors population growth, technological change and change culture each resulting in a psychological dispossession of responsibility for forest resources is posited as the most important underlying driver of deforestation.

CHAPTER – 3

A BRIEF HISTORY OF THE STUDY AREA:

3.1.1 Introduction:

The history of Chitral reveals that it had been the part of Chinese state in 56 B.C. and remained under the domination of Buddhist in 1900 B.C. In 5th century A.D. this area was under the administration of the Balkh province of Iran. In the 8th century the Islamic forces led my King Shah Nadir occupied Turkistan and Afghanistan and also entered to this region, In the beginning of 16th century, Hamayun attacked this area and wrecked the whole culture. Later on several branches of Hone were set-up one white Hone, and the other Kalash, which still exists in the region of Chitral. Till 1860 A.D, this family ruled not only in entire Chitral but also over Gilgit, Finally in 1860 A.D. a heir of Taimur family Sangin Ali Khan 11 deathroned King of Abdul Qadir of Raeess family and laid the foundation of Katoor family in Chitral.

In 1880 Chitral was recognized as one United States under the ruler Prince Aman-ul-Mulk of a katoor family as a Mehtar Till its merger with Pakistan.

In 1947 Muzafa-ul-Mulk declared the affiliation of Chitral with Pakistan. In 1969 through a presidential order the special.

Status of the states were abrogated and the come the under the administration of Pakistan. In 1970 one unit was abolished and Chitral become a district of Malakand division of KPK.

3.1.2 Location:

Chitral, locally called Chitrar is famous Northern extreme district of KPK of Pakistan. It lies from 35 - 55 to north latitudes and 71 – 12 to 72 - 55 east longitudes. The area is bounded by Afghanistan on the north and west. Gilgit and swat district on the east and the Dir district on the south, the total area is approximately 14850 sq.km.

District Chitral is composed of two subdivisions i.e. Chitral and Mastuj also known as upper and lower Chitral. Each subdivision is divided into three tehsil I.e. Drosh, Chitral and Lotkoh tehsils; and one sub-tehsil Arandu while Mastuj subdivision comprises of Torkhow, Molkhow and Mastuj tehsils.

Subdivision Mastuj (upper Chitral) begins from Reshun at an elevation of 1950 m and end at Boroghol at an elevation of 3803 m above sea level. The area consists of a number of deep and narrow valleys, namely Oweer, Terich and a famous Terich Meer Peak (7690 meters) Tehsil Mastuj is the largest tehsil of district Chitral, while Torkhow is the smallest. The total population of district Chitral is approximately 447, 362 where male; 225, 846 and female 221,515.

3.1.3 Communication:

a. By Air: Three flights are run daily from Peshawar to Chitral and two flights weekly from Islamabad via swat to Chitral (subject to weather conditions)

b. By Road: Chitral is connected by road to Peshawar and its also linked with Gilgit via Gupis and Shandur top.

3.1.4 Climate:

The climate of Chitral is generally dry but it varies from Arandu situated at an altitude of 10066 m in the south of Boroghal at an altitude of 3803 m in the north. Generally summer season is cool, while winter season season is chilly. Frost starts in the beginning of November and snow-falls occurs on the high peak even during the month of October. By December the whole Chitral is covered with snow of varying depths, which stays till the beginning of March, The extreme minimum temperature recorded at Drosh and Chitral stations have been 4c for month of January and February, respectively. On the average Chitral districts receives 250m to 1000mm rainfall per year.

3.1.5 Soil:

Soil of various colors ranging from dark-grey to yellow, red and white is found in Chitral. This is perhaps due to parent matariel and chemical weathering. The types recognized by the local people are based on the soil structures and texture. Different types of soil found throughout the district are given below:

a. Khareez-Langa Soil (stony soil):

This type of soil contains gravel deposits with little clay contents and is unsuitable for cultivation.

b. Shusk:

This type of soil is mostly composed of clay, sand and a little or no gravel is considered to be the best soils which occur on the high terraces.

C. Amoshta 9 Mixed gravel and sandy):

This type of soil is composed of 2\3 %clay and the rest are gravel or stone or sand.

D. Shughoor Sandy Soil):

This type of soil is found along the banks of the rivers and mainly consists of coarse sands which are unsuitable for cultivation due to its low water-holding capacity.

3.1.6 Geology:

The geological formation of Chitral was described for the first time by Mr. Hayden in 1914.

Chitral district is characterized by the occurrence thick sedimentary series of the Tethys zone of the Northern Karakorum and of the volcano sedimentary sequences of the southern Karakuram. South the sequences were intruded by the tertiary rocks. (Austro-mineral report). The experts have investigated some important mineral depositions and have confirmed the presence of Gold. Antimony, lead, mica in tehsil Lotkoh, iron ore, talc, Magnesite in Tehsil Drosh; copper and lead in pakhturi area in Tehsil Mulkhow. Molybdenum and tungston from Shah junali in tehsil Turkhow, iron ore is also found in Booniioneof tehsil Mastuj.

3.1.7 Agriculture:

According to agriculture statistics of Govt of KPK for 1987-88 the total farm area of Chitral is 66462 hectares where is the cropped area is 25508 hectares and the area under forest is 40954 hectares.

3.1.8 Flora:

The vegetation of Chitral can be divided into the following Types:

a. Dry temperate coniferous forest.
b. Oak forest.
c. Fraxinas xamthoxyloids open scrub forest.
d. Sub-alpine scrub-forest.
e. Alpine Herbaceous vegetation.
f. Cultivated plants.

The forest types (a) and (c) are confined to the lower parts of Chitral, from Kaghaze down to Arandu where as other type of vegetation are met with throughout the Chitral.

a. Dry temperate Coniferous Forest:

These forests can be divided further into the following groups:

a) Deodar forests.
b) Silver fire forests.

Deodar forests occupy about 70% of the total areas of the total area of coniferous species. The attitude limit very between 6000 to 10000 ft. The trees are slow growing generally with long persistent branches, Tapering pole and thick bark. The timber therefore, is of inferior quality and is liable to all sorts of defects like knots, shakes cracks etc.

The average quality class of crop is F.R.I- III though there are some compartments in Shishi valley where deodar crop of quality II, also is met with. Most of the forests contain striking proportion of dry trees which is probably due to the deterioration of site factor on account of the fires to which they have been subjected.

On all cool aspects, the regeneration of deodar is excellent and comes to profusely except for the places where the canopy of the over-wood too dense to allow the penetration of sufficient light. On gentle slopes having deep soil it often forms thick. Where the mature trees have been removed extensively e.g.in Ayun Dhok forest, he crop resemble periodic block (P.B.I) having scattered mature trees among the thicket of saplings and pole crop. On hotter aspects however the regeneration is scanty and comes-up only under the cover of mother trees are other protection like under-growth and shad of the builders etc. At the lower elevation the regeneration is absent on all aspacts due to grazing and compaction of soil. Similarly in propitious localities the regeneration of deodar is almost absent and such areas are being invaded by Chilghuza pine.

Kail regeneration is very scanty in the most favorable spots however, the regeneration come up in group but on the whole it appears that the species in the process of extinction from the areas. Its due to fact that the area being outside the influence of the monsoon rains. The climatic factors are less favorable for the reproduction of Kail as compared to that of deodar.

3.2.1 Sub-types (A):

This subtype covers about 60% of the area under deodar forest and occurs on all cool aspects and shady localities having milder gradient and deep soil. The crop is characterized by almost pure deodar. Occasionally sporadic kail trees are found

growing along the spurs. The broad leave associates like holy oak, maple, bird cherry, are rare. The banj (oak) appears in the lower limit. The altitudinal some of the Sub-types is from 6000-9500n ft.

The crop consists of mature and over mature trees with deficiency of younger age classes. Regeneration in the form of saplings is profuse and often forms thickest in the opening.

3.2.2 Sub-trees (B):

This type is found on all warmer aspects and contains mosty over mature trees with market defiency of other age classes. The density is open and regeneration is generally scanty. The main broad leaves associats is banj (oak). Chilghoza pine is also found scatterd but forms but almost pure stands in exposed precipitous localities.

Chilghoza pine regenerates freely on dry precipitous localities in deodar zone and often forms pure stands in such places. At the lower elevations this species also fails to reproduce satisfactorily. The reproduction of the broad leave species is poor throughout the tract.

Below the deodar belt are found the oak forests. This type of range 4,000 to 6,000 ft and is generally found pure. Chilghuza pine (P. gerardiana) is found in mixture in upper parts in exposed localities. Poradic trees of Kao, Punicagranatum andPistaciaKhinjuk are also met with at lower elevation at the extreme southern parts of the state. Other important plants of these forests are Rumexhastatus ,Periplocaaphylla, Ephedra intermedia , Plectranthusrugosus, Sophoramollis , Cotpeasternummuularia , and artimisia maritime.

The condition of the crop is very poor due to unrestricted lopping for fodder and fuel wood .Regeneration is conspicuous by its absence. The areas are subjected to very heavy grazing during early summer and late autumn. Oak forests of good density and fine quality do exist in a few areas like Domelgol but everywhere they are deteriorating at an alarming pace. The silver Fir forest are generally in form of a belt above deodar zone, at elevation ranging from 9500 to 11500 ft. The crop is generally pure but scattered trees of high altitude of kail, birch and junipers are also found growing in the stand in upper limits. Odd threes of horse chestnut, holy oak, maple, bird cherry, walnut and elm are met within cool shady places in lower of the zone. Sporadic trees of spurce are also met within the sheltered places. The density of crop on the whole is open and even the continuity of the stand is frequently broken by intervening mullahs and depressions which are completely devoid of growth due to snow slides.

Mostly the trees are mature to over mature with scanty regeneration on isolated, aspects and fair on cool aspects. In the upper reaches where the crop ascends to the zone of sub-alpine scrub, it is generally very open. In the lowest limit silver fir belt merges into that of deodar. The production of silver fir and spurce is generally satisfactory on all cool shady aspects. It is excellent in forest like Puritgol, Ashrat and Domelgol which receive higher summer rainfall than other areas. On hotter aspects it is scanty on higher altitude but it is almost absent in lower limit of silver fir zone.

3.2.3 Fraxinus Xanthoxyloides Open-scrub Forest:

The tract north of Chitral town is cold and arid and its flora resemble that of the steppes of Central Asia. The hill slopes are bare, almost devoid of soil except in the crevices. The only tree which is found in this area is the stunted Fraxinus Xanthoxyloides. The other common plants are Haloxylon spp. Artemisia maritime, Rheum tibeticum, Capparisspinosa, Hyoscyamuspusillus, Papaverspp, Tamarixgallica and Pennisetum spp.

3.2.4 Sub- Alpine Scrub Forest:

This type is found above silver fir forests in Shishi, Domel and Arandu valleys between 11500-12500 ft elevation .The main specie is Birch. The associate's shrubs are Salix hastate, Juniperuscummunis and Juniperusrecurva.

The common plants of the inner dry valley of the upper Chitral where moisture is available from the nearby glaciers are Selixspp, Prunusjacquemontil, Betulautilis, Rhamnusminuta, Heracleumthomsoni, Ribesvillosum and gerardiana.

3.2.5 Alpine Herbaceous Vegetation:

Above the tree limits i.e. 12500 Ft only the herbaceous plants grow. The density of the ground cover depends upon the available moisture and soil depth. The most common plants are Astragalusspp, Primulaspp, Polygonumspp, and Potentilla spp.

3.2.6 Cultivated plants:

In around the villages various trees are grown for fruits, shade, timber and fuel wood. These plantations are very jealously guarded by poplar trees as border trees. These are grown for timber and are protected from browsing damage by tying thorny branches around them. More commonly grown plants are black poplar (Populusnigra), apricot, walnut, mulberry, grape, sweet cherry, peach, amlock, fig, mirghis, chinar, willow.

Some of the common fruit trees grown in the area are: Apple (Pyrusmalus), Apricot (Prunusarmenica), Almond (Prunusamygdalus), Cherry (Prunuscerasifera), Grape (Vitisvinifera), Mulberry (Morusalba), Peach (Prunusparsica), Pear

(Pyruscommunis), Walnut (Juglansregia).

THE LIST OF COMMON PLANTS, THEIR LOCAL NAMES, BOTANICAL NAMES AND FAMILY IS GIVEN BELOW:

LOCAL NAME	BOTANICAL NAME	FAMILY
Berish	Aquilegia vulgaris	Renanculaceae
Bingu	Pistaciakhinjuk	Anacardiaceae
Birmough	Juglansregia	Juglandaceae
Bain	Menthasylvestris	Labiatae
Bong	Cannabis sativa	Urticaceae
Chinar	Platanusorientalis	Platanaceae
Chilghoza	Pinusgerardiana	Coniferae
Chijen	Pinuswallichiana	_
Darum	Punicagranatum	Lythraceae
Garmanzu	Astragalus spp.	Leguminosae
Glabis	Datiscacannabina	Datiscaceae
Guni	Prunuscarnuta	Rosaceae
Hojosh	Carumcarvi	Umbelliferae
Ispur	Loniceraasperifolia	Caprifolicaceae
KauOlea	cuspidate	Oleaceae
Koit	Ficuscarica	Urticaceae
Koknar	Papaver spp.	Papveraceae
Kawir	Capparisspinosa	Capparidaceae
Kandu	Prunusebernea	Rosaceae
Mirghis	Hippophaerhamnoides	Flaeagnaceae
PastaliSalix	pyconstackya	Salicaceae
Palogh	yrusmalus	Rosaceae
Rough	Cedrusdeodara	Coniferae
SomaniEphedra	gerardiana	Gnetaceae
Saruz	Juniperusmacropoda	Coniferae
Tong	Pyruscommunis	Rosaceae
Terak	Populusnigra	Salicaceae
Tali	Salix spp	_

3.3.1 FAUNA:

The following animal species are found in Chitral:

Markhor (Capra falconeri), Himalayan Ibex (Capraided), Urial (Ovisorientalis), Muskdeer (Moschusmoschiferus), Himalayan black bear (Selenartosthibetanus), Brown bear (Ursusarctos), Leopard (Patherapardus), Snow leopard (Patheraunicia), Wolf (Camislupu), Marcopolo sheep (Ovisammonpollii), Fox and Hare, among the birds Chakor (Aectorisqraea), Himalayan snow, Cooker, Ram chakor (Tetracoallushimalayensis), Monal pheasants (Lophophorusimoeijanus).

3.3.2 INJURIES/THREATS TO THE FOREST

The forests are liable to an array of damages caused by human and natural factors. The two sets of damages are enunciated below;

Biotic

The human damage often outweighs the injuries due to natural causes. Illicit cutting of trees, lopping, torchwood, extraction, tapping, deodar, oil, encroachment on forestland, grazing and browsing and fires are the main human-caused injuries to the crop.

Illicit Cutting:

For several decades, the forest have remained subject to heavy harvesting for local construction as well as firewood use. Due to establishment to forest Development Corporation(FDC), all harvesting oppressions are carried out by the corporation but the temptation for illicit cutting still exist because the contractors, who are mostly realty purchasers. The forest department (FD) can advocate sale on pre-fixed rates with Forest Development Corporation (FDC) compatible to market, which too be subject to revision after each 3-5 years. Moreover, made of payment to Forest Department (FD) and community needs to re-negociate to bring it to realistic scale.

Sawing Machines:

The timber legally available can no longer satisfy the escalating demand for timber increasing population warrants more housing facilities, resulting in an increase demand for timber. More timber is also needed to support the development activities in public and private sectors (schools, hospitals, hotels and others). Consequently, timber obtain from construction by locals find its way to illegal se in develop schemes. The illegal timber is mostly exchanged mostly in the saving machines, which too have been illegal installed. The machines encourages extravagant use of timber and big threat to the natural resources.

Lopping;

The trees are lopped extensively for fodder and firewood throughout the forested area. Worst effected species is Oak (Quercus ilex). The oaks are primarily lopped for leaf fodder; however the twings after stripped off the leaves re alse used as firewood. Lopping oaks fr firewood is extensive because it fetches handsome income to locals. Birch (betulautilis) anotherspecis extensively used for leave fodder. It is found in upper Chitral above the timber line, and constitutes and important source of fodder when the herds taken to alpine pastures in summer. Due to repeated and heavy lopping the species is almost on the verge of extinction.

Torchwood Extraction:

Torchwood extraction by hollowing the tree bottom as observed inHazara. Is not practiced in Chitral Here, the entire trees is felled and converted into torchwood are Chilghoza pine. Deodar and kail are seldom use for the purpose.

Encroachment;

Encroachment upon forestland is another threat to the forests. The forests at lower elevations near habitation and the forests on moderate slopes are cut be practice subsistence agriculture free the land of cultivation. The forests near the roads an Water are also cleared for house construction. The encroachment on forestland is visible in all valleys where forests exist.

Grazing and Browsing:

The great damage is done to the forest by grazing. About 450,000 livestock mostly goats and sheep, heavily depend on forests as a sources of fodder. In winter, when practically the entire tract is under snow cover, the livestock is stall fed on oak leaves. In summer the animals are taken to alpine pastures where they often graze in the upper forest limits depleting the range condition. Furthermore, tramping of animals can cause severe damage to natural regeneration

Fire:

The forests in Chitral where subjected to extensive fires till the beginning of the century. The people used to burn the forests for drying the trees they would cut for the timber. The practice has now ceased but several forests still bear visible signs of the fire damage.

Natural causes:

The natural causes responsible for the injuries to the forests include snow, wind, hailstorm, frost, lighting, wild animals, birds, insects and fungi.

Snow: The most extensive snow damage is by avalanches, which either uproot trees re break the stems. The most vulnerable to avalanches is 'Ashraith valley' where damage to forest crop is avalanches are devoid of vegetation.

Wind: The forests mostly occur in side valleys, and thus are protected from the characteristics wind of main valley. In expose places, however, winds do affect forests. The winds cause high evapo-transpiration loses and produce arid conditions. Consequently, the growth is low, stems are short and boles are branchy.

Hailstorm: The forests are subject to hailstorm during spring. Severe hailstorm do considerable damage by defoliating the trees, thus retarding growth.

Frost: The frost of severe intensity occurs in winter but it does it little or no damage to the forest. However; occasional late season forest adversely affects the natural regeneration and the growing parts of the mature once.

Lighting; Lightening is a potential cause of injury to the tress specially it is source if forest fire which damage mature as well as

young crop besides damage or regeneration.

Flying Squirrels; The squirrels nibble off unripe cones and tender shoots of deaodar and silver fir, thus retarding both the generation and the growth of the trees.

Wild Animals: The wild animals causing damage to the forest are Bear, Ibex, Urial, Markhor, Monkey and Procupine. In winter when food supplies are limited, the bear strips off the bark of the young poles at nthe base and eat away the bark. The trees thus damaged become dry, or develop, rots even if they survive, ibex, Urial, and Markhor damage forest generation.

Birds: The damage by birds is not considerable. Pheasants and Chakors may uproot the seeding while digging the soil is search of food.

Insects and Fungi: The insects and fungi from an integral part of biological complex of the forests. The nature or injury by them depend on habits and characteristics of specie. Only parasitic plants like (Vicunm spp.) on oak and (Arceuthobium spp.) on kail and juniper are noticed occasionally. Loranthagus spp. Is also observed, but it is confined to the cultivated fruit plants.

Table 3.1 land cover Data of District Chitral July, 2011

S. No	Land cover	Forest type	Hectares	Percentage
1	Agriculture land		32399.6	2.2
2	Alpine land	Alpine pasture	208157.5	14
3	Barren land		575979	38.8
4	Forest	Dry temperate	98339	6.6
5	Forest	Oak forest	46517.9	3.1
6	Rangeland		111221.6	7.5
7	Settlement		260.6	0
8	Shrubs and bushes		29969.7	1.8
9	Snow and Glacier		380286.2	25.6
10	Water Bodies		5608.8	0.4
Total			1485740	100

3.4.1 DISCRIPTION OF THE STUDY AREA (SHISHI KOH VALLEY)

3.4.2 LOCATION AND CONFIGURATION

Shishi koh valley is situated in north side of Drosh tehsil. It lies in eastern region of district Chitral and total population of Shishi koh valley is 25,280 according to the census of 20017.

3.4.3 GEOLOGY, ROCK AND SOIL

According to the geological survey of the area by James A. Calkins, S. Jamaludin, Kamaludin, Bhuyan and Ahmad Hussain (1981), covering an area of about 1400, square miles in the Hindukush mountain of Chitral district, which are composed of igneous and meta morphicrocks. The places of high minerals potential are the vien-type deposits along the fault zones in AwirethGol (Shoghot-Madashil area), Krinj and Shishi koh valley (Mannan. A. 2008)

The soil formed by the disintegration of the above mention rocks is generally fertile and varies from clayey-loam to sandy – loam. It is porous and fragile and readily washes-off by rain water. The steep slopes are highly susceptible to the run-off action. There for the soil on them is often shallow with frequent rock out crops. In the localities of heavy grazing, the soil porosity is considerably lost due to the excessive tramping.

3.4.4 CLIMATE:

Generally the summer are cool and pleasant, the winters are petty cold. Frost is common and starts in November. Snow starts falling on the high peaks during October. The rainfall is scanty and erratic; bulk of the annual precipitation (about 75%) is received in winter (Dec-May). The distribution of rainfall over the area is also unknown. In wake of climate change phenomenon rain period has extended up to June during last 10 to 12 years.

Steady winds are common features of the study area. Generally the wind speed is more at evening time. The wind direction is mainly southerly in summer, and northerly in winter. The floods are common in summer months. The catchment areas are generally steep and barren and even a moderate downpour causes the water to rush down the slope. The clouds burst are common in the month of July and September, especially in the forested area where Nullah (Gol) exists

Table-3.4.5 Rainfall (mm) and Temperature data of district Chitral

Month	**Rainfall(mm)**	**Mean Temp(c)** Maximum	**Mean Temp (C)** Minimum
January	36.80	8.82	-0.67
February	63.36	10.06	0.64
March	106.69	15.03	4.25
April	88.51	21.92	8.40
May	44.58	27.83	12.48
June	5.49	34.42	17.89
July	6.19	36.00	26.16
August	6.51	34.69	18.82
September	7.64	31.18	13.29
October	16.10	25.00	7.49
November	19.51	18.48	2.93
December	41.35	11.33	0.00
Total	442.32	22.29	8.80

Source: Metrological Department of KPK

3.4.6 VEGETATION

Shishi koh area is one of the unique because it comprises all the vegetation types of district Chitral mentioned above. The lower elevation starts from Drosh area about 4709 ft goes up to above 12000 ft height.

3.4.7 WILD LIFE

The fauna of the district Chitral used to be extremely rich as evident from the record of the trophies of Chitral Shikdar Club.

The wild life and bird population has declined in the recent past due to increase human interference.

PuritGol and ChinarGol Game reserve are main habitat for wild life in the study area. This reserve is spread over an area of 15,962 acre and carries population of snow leopard, wolf, red Fox, Markhor, chakor, and ram-chakor.

Being a forest area it is exposed to timber harvest for commercial as well as local purposes. Similarly it is under an exceeding pressure of grazing.

3.4.8 SETTLEMENT

The forests of chitral have been declared as protected forests but settlement of land has not been done so for the study area. Forest settlement is in progress to properly demarcate the boundaries of Govt forests and also record the privileges and concessions to the local people. This will also help in checking the encroachment over the forest lands.

3.4.9 PEOPLE AND LANGUAGES

There are three classes of people living in Chitral i.e, Adamzadas, Arbabzadas, and Faqirmaskeen. There are also some Pashtoons, Wardak, and Kohistanis, in the southern part f the study area, whileGujars are more abundant in shishikoh valley.

Therefore various languages are spoken in the study area, i.e, Khowar. Gujri, Madaklashti (tajik) ,Kohistani, and Peshtoetc

3.5.1 LOCAL INSTITUTION

A) Jirga

Jirga is the local institution of elders, which for resolving disputes/conflicts of inter land intra communal nature. It consists of representatives of all the tribes or Khel, who are influential, wealthy and well-reputed people of the area. It is resolve conflicts about forests, land to disputes and to settle other problem/issues ralted to community.

B) Village Development Committee

Various developing projects such as Chitral Area Development programme (CADP), Environmental rehabilitation Project, (ERP) and forestory sector project (FSP) worked for uplift of local communities in the whole district.

The forest department under forestry sector project (FSP) has also formed village development committees (VDCs) in more villages. They give training to the member of village's development committees (VDC) for nursery raising, livestock management and do development works in the area.

The village development committee (VDCs) Madaklasht, Kashngdal, and Batrik (Shishi koh valley) have well-defined role f forest protection and also for the punishment for the punishment for offenders.

3.5.2 REASON OF FOREST DEPLATION

- Non availability of alternatives for cooking and heating
- Weak forest law implementation
- Political interference in exploitation of natural resources
- Dispute among the right-holder on ownership of forest
- Illicit cutting, due to large area under single forest
- Right-holders sell their share in the forest to contractor (royalty purchaser) who tries to harvest more then prescribe volume through illegal means for more benefits
- Over population is one of the reasons of forest depletion
- Unemployment in the area exerts more pressure on natural resource
- Other problems of the people like health, education, communication and drinking water needs to be addressed (Mannan, A 2008)

CHAPTER – 4

MATERIAL AND METHODOLOGY

The study was conducted in Shishi Koh valley of district Chitral and was very tough job to collect data with in short period of time from the whole of the population. Some villages were selected randomly starting from pursad to Madaklasht (Patigar, Sherati, Goreen, Tar, Bella (Shaheed Bella), Kawash, Birga, Kalas and Madaklasht).

Outof these selected villages interviewed were made as per sampling designs. The distribution of respondents in each area is given in (table 4.1)

Table 4.1 population size +total numbers of households

S.NO	Villages	Populations	No of household
1	Pursad	271	35
2	Patigar	326	42
3	Shirati	1234	206
4	Goreen	895	125
5	Tar	990	137
6	Bella (ShaheedBilla)	548	72
7	Kawash	293	39
8	Birga	1306	235
9	Kalas+gosal	849	113
10	Madaklasht	2,744	376
Total		9,456	1,380

(Election commission office Chitral, census20017)

4.2 Objectives of the study:

- To know the causes of deforestation,
- To know the consequences of deforestation.
- To find out ways means of stopping deforestation,
- To know the prevailing management practices of natural resources and role of local community in forest protection.

4.3 Methodology:

Keeping in view the objectives of study, following methodology was adopted to perform the survey work

4.4 Extent of survey:

In view of limited time, lack of adequate transportation and mountainous area and harsh climatic conditions the study was limited to some areas of shishikoh valley

4.5 sampling design:

The sampling design used for data collection was random sampling using voters list .The interviews were conducted with the help of especially designed and pre-tested questioner

4.6 Sample size:

The total number of respondents to be interviewed was fixed as 100 from all the villages. In order to have same sampling intensity, the respondents of the sample ten villages were calculated with the help of sampling fraction.

Total observations =100

Total household in 10 villages =899

Sample fraction = total observation/total number of household

100/899=0.11

In order to have proportional number of respondents in each selected villages the number of households of each village were divided with the sampling fraction to arrive at required number of respondents and these required number of respondents were interviewed using data collectin g instrument (Questioner) given in (table 4.2)

Table 4.6 Total No of households and No of respondents in each village

S.No	Villages	Total no of household	Sample fraction	No of respondents
1	Pursad	35	14	3
2	Patigar	75	14	3
3	Shirati	129	14	15
4	Goreen	72	14	9
5	Tar	91	14	10
6	Bella (Shaheed Bella)	109	14	5
7	Kawash	69	14	3
8	Birga	147	14	17
9	Kalas+gosal	113	14	8
10	Madaklasht	2,744	14	27
total		9,456		100

Table 4.6 Total No of households and No of respondents in each village

4.7 Tools:

- Following tools were used to perform the study.
- Question for primary data collection
- Voters list for selection of respondents in a village
- Maps of the district Chitral
- Census report 2017 of district Chitral
- Ms office and other computers programs
- and Secondary statistical data about individual of rural localities

4.8 Constraints in data:

- Following main constraint were faced during data collections.
- Lack of awareness and fear from tax enforcing agencies /forest department
- Shortage of time and economic hindrance
- un favorable communication system (road and steep slope)
- Time consuming and tedious process

4.9 interviewing procedure:

The interview was conducted on the basis of questionaire .During interview local language was used .this made the task very easy people from old walk of life were interviewed. The sample also include formers, government servants and business man. During the informal meeting the question were asked from the respondents.

Authentic and objective types of question were used for getting detailed information .the selected peoples were interviewed in their own houses, shops or at farmlands. Identification and excess to the selected respondents head was made by the social facilitator in each village.

4.10 Questioner:

The pre-designed and pre tested data collecting instrument (questionaire) was used as survey instrument .The first part covers information pertaining to education, income source, occupation and family size. The second pat investigate causes of deforestation and forest degradation, rule of illegal cutting, fuel wood consumption and rule of local community and forest department in forest protection and in other forest management practices.

4.11 Data processing:

Statistical methods were employed or the analyses of data like average and percentages. Besides this computer program, such as MS World and MS Excel were also used.

4.12 Secondary Data Collection:

- Center library Peshawar university
- Pakistan forest institute Peshawar
- Environmental science department Peshawar
- Chitral forest Department
- Aga khan Rural support program
- Different annual reports and other contents News paper.
- Internet

CHAPTER – 5

RESULTS AND DISCUSSIONS

The results of data analysis and discussions are presented in the following section:

5.1 Age wise Distribution

Majority of the respondents were having the ages between (21-30) years which shows 54%, and having ages (31-40) years were 30% and remaining 14% were above 40 years and 2% were 20 years.

Table No 5.1 Age Wise Distribution

S No.	Age of Respondents	Frequency	Percentage
1	1 to 20	02	2%
2	21 to 30	54	54%
3	31 to 40	30	30%
4	41 and above	14	14%
Total		100	100%

Gender Wise Distribution

The table shows us that 80% of the respondents were male while 20% of the respondents were female.

Table 5.2 Gender Wise Distribution

S No.	Gender	Frequency	Percent %
1	Male	83	83%
2	Female	17	17%
Total		100	100%

Marital Status

This table shows the marital status of the respondents in which 75% of the respondents out of 100 were married while 25% of the respondents were unmarried.

Table 5.3 Marital status

S.No	Marital Status	Frequency	Percentage
1	Married	75	75%
2	Unmarried	25	25%
Total		100	100%

Education level

During the data collection different people were having different educational level. According to the analysis of the data 28% of the respondents were matriculate, 30% of the respondents were of intermediate level, and 29% of the respondents were in bachelor level while 13% of the respondents were in master level.

Table 5.4 Education Level

S.No	Educational Level of Respondents	Frequency	Percentage
1	Matric	28	28%
2	Intermediate	30	30%
3	Bachelor	29	29%
4	Master	13	13%
Total		100	100%

Source of Income:

This table shows the income source of the respondents which 27% of the respondents have cultivation as their source of income,24% of the respondents have forest wood collection as their source of income while17% of the respondents have governmental services and other source of income. While 15% of the respondents have livestock as their source of income and 17% of the respondent have other income source.

Table No 5.5 Income Source

S.No	Income source of Respondents	Frequency	Percentage
1	Cultivation	27	27%
2	Forest wood	24	24%
3	Livestock	15	15%
4	Government service	17	17%
5	Other	17	17%
Total		100	100%

Knowledge about deforestation Phenomena:

This table shows us the knowledge of respondents regarding deforestation which shows us that 64% of the respondents agreed that they have the knowledge about deforestation, and 31% of the respondents up to some extent had some idea about deforestation while 04% respondents don't know about deforestation phenomena.

Table 5.6 Knowledge about Deforestation Phenomena

S.No	Responses	Frequency	Percentage
1	Yes	64	64%
2	No	04	04%
3	Up to some extent	31	31%
Total		100	100%

Problem of deforestation:

The below graph shows the idea of the respondents about the problems of deforestation in their areas so 70% of the respondents agreed that they know the problems of deforestation while, 4% of the respondents don not know the problem of deforestation and 26% of the respondents know the problem of deforestation up to some extent.

Table 5.7 Facing Problems of deforestation

S.No	Problems of Deforestation	Frequency	Percentage
1	Yes	70	70%
2	No	4	4%
3	Up to some extent	26	26%
Total		100	100%

Main factors Responsible for Deforestation

The below graph shows us the respondents view about the factors responsible for deforestation 11% of the respondents view that deforestation is due to grazing cattle's, while 5% of them viewed that it is due to domestic use, 32% of them view that it is due to road construction 29% of them viewed that it was due to fire wood collection purposes while the rest of the respondents viewed that it was due to snow fall and flood reasons.

Table No 5.8Main Factors responsible for Deforestation

S.No	Factors responsible for Deforestation	Frequency	Percentage
1	Grazing	11	11%
2	Road construction	05	5%
3	Domestic use	32	32%
4	Firewood collection	29	29%
5	Snow	06	6%
6	Illicit Cutting	10	10%
7	Flood	07	7%
Total		100	100%

Awareness about impact of deforestation

According to the below table 58% of the respondents agreed that they are aware about the impact of deforestation while 35% of the respondents had an idea up to some extent and 7% of the respondents had no any idea about the impact of deforestation.

Table No 5.9 Awareness about impact of deforestation

S.No	Impact of deforestation	Frequency	Percent
1	Yes	58	58.0%
2	No	7	7.0%
3	Up to some extent	35	35.0%
Total		100	100%

Impact of deforestation:

This table shows us the respondents view on the impact of these deforestations 24% of them have the perception that it causes soil erosion, 21% of them have the perception that it causes land sliding while 18% of the respondents have the idea that it causes global warming while 9% and 6% of the respondents viewed that it causes rain fall and loss of medicinal plants.

Table no 5.10 impact of deforestation

S.No	Response	Frequency	Percentage
1	Soil erosion	24	24.0%
2	Desertification	12	12.0%
3	Silitation	4	4.0%
4	Land sliding	21	21.0%
5	Wildlife	6	6.0%
6	Rain fall	9	9.0%
7	loss of Medical Plants	6	6.0%
8	Global warming	18	18.0%
Total		100	100%

Use of timber from forest

The below table shows the view of the respondents that 90% of them uses timber wood from these forests while 10% of them uses timber wood up to some extent from these forests.

Table No 5.11: use of timber from forest

S.No	Response	Frequency	Percentage
1	Yes	90	90%
2	No	0	0
3	Up to some extent	10	10
Total		100	100%

Which factors force them to use timber from forests:

This table shows us the respondents view that some of the factors force them to use timber from these forests as 37% of the respondents viewed that due to lack of gas facilities, while 42% of the respondents viewed that due to low economy, while 12% of them viewed that due to severe temperature in their area and 9% of the respondents viewed that due to other reasons they use timber from forests.

Table no 5.12: factors force them to Use of timber from the forests.

S.No	Response	Frequency	Percentage
1	Lake of gases facilities	37	37.0%
2	Low economy	42	42.0%
3	Severe temperature in your area	12	.12%
4	Lake of transportation	0	.0
5	Any other	0	9%
Total		100	100.0

Income earning from Timber:

This table illustrate the respondents income after selling these timber so according to the respondents 5% of them have 1000 to 5000 income while 9% of the respondents said that they gained 6000 to 10,000 income and 34% of them viewed that they gain 11,000 to 15,000 while 24 % of the respondents gained 16,000 to 20,000 income and 28% of the respondents said that they gain 21,000 and above income from these forests by selling timber .

Table no 5.13 Income earning from timber

S.No	Response	Frequency	Percentage
1	1000 - 5000	5	5%
2	6000 – 10,000	9	9%
3	11,000 – 15,000	34	34%
4	16,000 – 20,000	24	24%
5	21,000 and Above	28	28%
Total		100	100%

Smuggling as a factor

This table shows us the respondents said that about smuggling as a major problem faced by these forests so according to the respondents 48% of them viewed that up to some extent, while 30% agreed that it is due to smuggling and 22% of the respondent view that it is not due to that smuggling.

Table no 5.14 smuggling as a factor

S,No	Response	Frequency	Percentage
1	Yes	29	30%
2	No	22	22%
3	Up to some extent	48	48%
Total		100	100%

Condition of forests nowadays

This table shows us the respondent's viewed that 46% of the respondents view that the condition of forests is fair, while 39% of the respondents view that its condition is bad and 15% of them view that its condition is good.

Table no.5.15 The condition of forests nowadays

S.No	Response	Frequency	Percentage
1	Good	15	15.0%
2	Bad	39	39.0%
3	Fair	46	46.0%
Total		100	100%

Cattle grazing:

This table shows the respondents view that 65% of the respondents graze their cattles in the forest while32% of them graze cattles in grazing land and 3% of the respondents graze their cattles in other grazing places and other

Table No 5.16 Cattle Grazing

S.No	Response	Frequency	Percentage
1	Forest	65	65.0%
2	Grazing land	32	32.0%
3	Others	3	3.0%
Total		100	100%

Presence of conservative community:

The above graph shows us that 44% of the respondent's viewed that up to some extent there is conservative community in their area, 30% of the respondents viewed that yes there is conservative community while 28% of the respondents didn't have any conservative community in their area

Table No5.17 Presence of conservative community

S.No	Response	Frequency	Percentage
1	Yes	30	30%
2	No	27	27%
3	Up to some extent	43	43%
Total		100	100%

Support from forest department

This table shows that45% of the respondents viewed that forest department is helping them up to some extent, 26% of the respondents agreed positively that forest department is helping them while 20% of them viewed that no any forest department is helping them.

Table no 5.18 support from forest department

S.No	Response	Frequency	Percentage
1	Yes	26	26%
2	No	29	29%
3	Up to some extent	45	45%
Total		100	100%

Responsible of deforestation in the area

This table shows us that 58% of the respondents viewed that local people are responsible for deforestation in our area, while 28% of them viewed that forest department is responsible for deforestation in our area and 10% of the respondents viewed that timber mafia is responsible for deforestation in our area while 2% of them view that other factors are responsible for deforestation in our area.

Table no 5.19 Responsible of deforestation in the area

S.No	Response	Frequency	Percentage
1	Local people	59	59.0%
2	Forest department	28	28.0%
3	Timber mafia	12	12.0%
4	Other	1	1.0%
Total		100	100%

purpose of trees being cut down

This table illustrate that 45% of the respondents viewed that they are cutting forests for cooking purpose ,20% of them viewed that they used it for construction purposes while 18 % of them used it for heating purposes and 5% of them used these forests for furniture uses.

Table no 5.20 purpose of trees being cut down

S.No	Response	Frequency	Percentage
1	For cooking	46	46.0%
2	For heating	18	18.0%
3	For construction	22	22.0%
4	For furniture	9	9.0%
5	All of above	5	5.0%
Total	Total	100	100%

Plantation in the area:

This table shows that 46% of them responded that there is no any plantation in our area, while 34% of them viewed that yes there is plantation in our area and 20% of them viewed that up to some extent there is plantation in our area.

Table no 5.21 plantation in the area

S,No	Response	Frequency	Percentage
1	Yes	34	34%
2	No	46	46%
3	Up to some extent	20	20%
Total		100	100%

Respondents view about Govt Support:

This table illustrates the respondents view about the Govt or any forest department helping them in controlling deforestation so according to the respondents 37% of them viewed that in alternative resources, while 26% are of the view that in afforestation and 21% are of view that they help us financially while 16% of them viewed that in any other way they have to help us.

Table no 5.22 respondents view about Govt. support

S. No	Response	Frequency	Percentage
1	Financially	21	21.0%
2	Alternative resources	37	37.0%
3	Afforestation	26	26.0%
4	Any other	16	16.0%
Total		100	100%

The use of land after cutting forest

This table shows us the respondents views that 40% of the respondents are of the view that after cutting these forests they use the land for construction, while 35% of the respondents uses the land for agriculture purpose, and 18 % of the respondents them uses the land for grazing and 5% of them uses it in other purposes.

Table no 5.23 the use of land after cutting forest

S.No	Response	Frequency	Percentage
1	For construction	40	40.0%
2	For agriculture	35	35.0%
3	For grazing	18	18.0%
4	Any other	7	7.0%
Total	Total	100	100%

Condition of forest 10 year back

The above graph shows the respondents view about the forests 10 years back so 45% of them responded that the forest was moderate while 32% of the respondent's view that it was dense forest and 20% of the respondents view that the forests were little.

Table no 5.24 The condition of forests 10 years back

S.No	Response	Frequency	Percentage
1	Dense	35	35.0%
2	Moderate	45	45.0%
3	Little	20	20.0%
Total		100	100%

Facilities respondents need in the area

This table illustrate the respondents view about the facilities they need in their area to save forests from cutting according to the respondents 45% of the respondents viewed that they need gas facilities, while 20% of the respondents viewed that they need livelihood facilities and 19% of them need any other facilities while 14% of the respondents need electricity in their area.

Table no 5.25 facilities respondents need in their area

S.No	Response	Frequency	Percentage
1	Electricity	12	12.0%
2	Gas	47	47.0%
3	livelihood program	21	21.0%
4	Any other	20	20.0%
Total		100	100%

Support from Govt /NGOs:

This table shows that 48% of them viewed that Govt/NGOs are supporting them up to some extent, while 25% of them viewed that no any organization is supporting them while 23% of them viewed that yes organizations are supporting them.

Table no 5.26 Support from Govt /NGOs

S.No	Response	Frequency	Percentage
1	Yes	24	24.0%
2	No	27	27.0%
3	Up to some extent	49	49.0%
Total		100	100%

Suggestion from respondents:

According to the question of suggestions from Govt or NGOS the respondents mostly preferred and suggested for awareness session among masses the importance of forests and also suggests forestry department to work with them for plantation of more and more trees. So the respondents suggested to have more HUG plantations and check upon the deforestation in the targeted area.

CHAPTER-6

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSIONS

1. The data indicated that most of the people cut down forests for cultivation as 27% of the respondents viewed that they use the land for cultivation purposes.
2. The study revealed that only 64% of the respondents have knowledge about impact of deforestation while remaining respondents have no any information about causes and consequences of deforestation.
3. The data indicated that there was a dense forest in the targeted area.
4. The data revealed that 32% of the respondents responded that the main purpose of deforestation of forests is for domestic purposes.
5. The study reveals that 58% responded that the people are aware about the impact of deforestation.
6. The data indicated that most of the timber wood is being taken from the forests as 90% of the respondents responded that they are using timber from forests.
7. The data indicated that 48% of the respondents viewed that smuggling is also a factor for deforestation in the targeted area.
8. Majority of the respondents revealed that the condition of forests is very bad now as compare to ten years back as responded by 49% of the respondents.
9. The study reveals that 65% of the respondents responded that they are grazing their cattle in the forests.
10. The study indicated that there is a conservative community in the targeted area as responded by 43% of the respondents.
11. The data indicated that 26% of the respondents viewed that forests department is supporting the people up to some extent.
12. 59% respondents are of the view that local people are the reason for deforestation in the targeted area.
13. The study reveals that most of the peoples in the targeted area needs Govt /NGOs support to raise awareness session about the deforestation in the area.
14. Majority of the respondents needs any alternative solution for preservation of forests, as most of the respondent needs plantation in the targeted area.
15. Following suggestions were given by the respondents as:
    - More and more plantation in the area, and other alternative sources for preservation of forests are needed.
    - Awareness program should be initiated by Govt./NGOs to aware masses about impact of deforestation.
    - Full community participation and conservative community for preservation of forests.
    - To have a proper implementation of forests rules and check upon the areas.
    - here should be ban on marketing of timber wood
    - There should be an evacuation planning in some villages of target area.

6.2 RECOMMENDATIONS

The following recommendations have been given to preserve forests which are as given below:

- Awareness program about the importance of forests and the impact of deforestation in the area such as floods, soil erosion etc.
- Proper monitoring forest deprtment in the targeted area so that no any person would get timber wood from forests.
- Community participation for the forests protection and management should be enhanced.
- Community forestry preservation should be enhanced and improved plantation in waste land.
- By the community participation they may be aware about the importance and preservation of trees.
- Any alternative sources should be provided to the local people so that they may graze their cattles in other places.
- Future planning for the forests preservation should be launched.

- They must have electricity and gas facilities for the targeted area so that they may not depend on forests.
- Forest ownership (Qalang) is still a problem therefore settlement of forests and proper division of royalty to the deserved area.
- Communication(transportation) is a big problem in the study area roads should be constructed properly.
- Provision of alternate source of fuel wood subsidizes electricity biogas plant etc.
- Rotational grazing system implementation.

IMPACTS OF FLOODS ON HEALTH

(A CASE STUDY OF CHITRAL GOL FLOODS 2015)

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ABSTRACT

This research study is conducted under the title of Impacts of floods on health (A case study of Chitral gol floods 2015). The study is focused on health problem faced by people in Chitral town, and surrounding villages of Chitral gol stream. This is a questionnaire based study. A total 40 respondent were asked different questions about the impact of flood in the study area. Major finding indicate that people face multi health issue. during floods The water sources and reservoirs becomes polluted and leads to increasing number of water borne diseases like, parasitic infestations, viral and bacterial infections like, typhoid fever, Hepatitis, cholera and other diarrheal diseases are major health problems in the aftermath of flood. Frequent flash flood result in iodine deficiency leading to various thyroid problems in the study area. During the study different vulnerable groups to the impacts has been identified. It's the need of our government as well as every single citizen of Pakistan to play a specific role to understand causes of different diseases. And how to control these problems by giving awareness and proper medical services to the people.

Chapter-1

INTRODUCTION

1.1 Background

Frequency and severity of weather events increase due to climate change, such as high precipitation, floods, storms and storm surges. People immediately affect by the flood that is caused by these events. (e.g. life loss and injuries) and after the event (e.g. through displacement, home damage, scarcity of water, destruction of basic facilities and economical loss). After these events the people also exposed to different hazards and suffer from mental illness. Two-thirds of flood-related deaths occur due to drowning in worldwide, and one-third of people in worldwide suffer from physical injuries, heart diseases, killed by electric shock, carbon monoxide poisoning, fire and infectious diseases. Health infrastructures such as hospital are also vulnerable to these extreme weather events particularly flooding. Health services are also disrupted such as services of clean drinking water, sanitation and transportation routes etc.

1.2 Disaster

Any catastrophic situation due to which the life, property, infrastructure, basic facilities, assets, communication routes and other facilities of life seriously disrupted is called disaster. Due to the disaster People also exposed to different diseases such as skin diseases etc., in disaster case people need, foods, cloths, shelters protection etc.

In worldwide thousands of people died and billions of habitats destroyed every year because of different disasters such as earthquake, floods, cyclones, landslide, avalanche and fires etc. Frequency and severity of natural disasters also increased due to the growth of population. the tropical climate and unstable landforms, coupled with deforestation, unplanned growth proliferation, non-engineered constructions which makes the disasters-prone areas more vulnerable, tardy communications, poor or no budgetary allocation for disaster prevention, developing countries suffer more or Less chronically by disaster. Asia is top of the list of causalities due to natural disaster.

1.3 Flood

Those extreme event or condition in which water cannot retained from its normal position or overflow from its bank because of heavy rain fall, melting of ice or glaciers etc., is called flood.

Overflow of waters or Unusual and rapid accumulation or runoff of surface waters from any source or Mudflow or Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood. Flood is caused by many reasons. It is usually occurring when the area is drained by stream and river and water is over balanced from its normal capacity. Due to the force of nature river channel is formed and thus the water easily flows. When the volume exceeds, water increase from its bank and spread in the land. This area is usually called the flood plain of the river. It should be important that the people living and working in that flood plain areas must aware of the fact that there is ever present threat of floods. In some dry zone rivers, it is low and in Kalu Ganga the chances may be very high. Even people in the flood plain who live above the possible flood may find himself cut off from the services because of floods. So it is important that those people must have aware and receive knowledge that will help them to cope with the flood and mitigate the possible risk. Throughout the history it is seen that fertile land and plain attracted people where their lives have been made easier by virtue of close proximity to source of food and water. Ironically the same river or stream that provides sustenance to the surrounding population also renders these populations vulnerable to disasters by periodic flooding. Flood can arise from abnormally heavy precipitation, dam failure and rapid snow melt or river blockages.

Flood is that event, action or condition of nature in which water is overflowed from its banks or its retention areas. It overflows into areas of human settlements, infrastructure, and economic activities. It becomes a disaster when community is vulnerable and exposed to flood and the people of community loss their life, property and other assets if they don't take any defensive action to cope with the flood.

1.3.1 Types of Flooding

There are following types of flood. Such as flash flood, riverine flood and costal flood.

1.3.2 Flash Floods

Flash floods are that flood which rise and falls rapidly with little and no advance warning. Flash flood usually results from intense rainfall over a small area.

1.3.3 Riverine Floods

It is that type of flood in which the river overflows from its bank, annually or seasonally. Riverine floods classified further by its magnitude and speed of flood.

1.3.4 Coastal Floods

Coastal flood usually occurs in coastal areas, when the sea overflows from its banks. Flash flood and riverine both combine to make the coastal flood which is usually occur in coastal areas.

1.3.5 Causes of Floods

Soil becomes saturated when rain fall occurs for a long period of time. In the saturated soil when water is unable to infiltrate, it is forced to flow over the soil, thus increasing surface runoff. River that are to accommodate excess rain water overflow their bank into neighboring flood plans. Beside prolong rainfall, deforestation and improper waste disposals are also major natural causes of flood.

The frequency and magnitude of flood also increase due to human action in many different ways such overpopulation, deforestation, overgrazing, traditional agricultural practices etc., are the anthropogenic causes of flood.

1.4 Impacts of Floods

The impacts of floods are classified into two types:

1.4.1 Socio-economic Impacts

The primary socio-economic impacts of floods are physical damages like poverty, damages to bridges, damages to buildings, roads, railway lines and canal system. The secondary socio-economic impacts of floods are landslides, soil erosion and land degradation.

1.4.2 Impacts of Floods on Health

The negative impact of flood on health may be categorized by directly or indirectly. Direct consequences are those resulting from direct exposure to the water and flooded environment, these include drowning, injuries from debris and hypothermia etc. indirect consequences are those which are associated with damage done by the water to natural and build environment. These include infectious diseases poverty related diseases and diseases associated with population.

1.4.3 Immediate Health Effects

1.4.4 Drowning

Death of people is usually caused by drowning. Often death of people is due to flooding. Due to late evacuation and mis-understanding the water depth, drowning usually occurred. Death of people often occurred by motor vehicles by driving on flooded road. In worldwide more than 57% of all the death occurred by motor vehicles.

1.4.5 Injuries

Collapse of building and other structures are caused by flood. When an individual try to escape from the danger such as collapsed building, flood related injuries occurred. From the water containing debris when people try to walk it results to Orthopedic Injuries.

1.4.6 Diarrhea

Epidemics and water borne diseases occurred by flood. After the flood water are contaminated and result water-borne diarrheal illness occurred. This is because of the blockage of purification and sewage disposal systems. Crowding and subsequent fecal-oral spread of gastrointestinal pathogens are secondary effects of flood, may also contribute spread of diarrheal diseases.

1.4.7 Eye Infection

Flood usually affects clean water. Water is used for every purpose, people directly interact with water. Due to the flooding water contaminated and thus usually Eye infection occurred.

1.4.8 Skin Infection

Skin infection is also a major disease which occurs due to flood. When flood occurred, they disrupt clean drinking water and block sewage system. People directly interact with their Environment, thus due to sewage and contaminated water skin diseases occurred.

1.4.9 Leptospirosis

It is a common zoonotic infection in the world. Infected mouse and other wild animals are the primary source, in which leptospirosis are produced in their urine. In mud, vegetation, damp soil and in fresh water one excreted bacteria live for a long time. Environmental changes, including increased vector population, facilitate the transmission during floods. Results

of Human infection are to contact with carrier animal or their environment. Drainage material contaminated with rodent urine may also collect on roads after floods. This creates a potential source of infection for those walking bare foot. Mostly the children are at risks that are attracted by puddles of rain water.

1.4.10 Respiratory Infection

After floods, respiratory tract infections are usually the common causes of morbidity and mortality in the survivors. Deposited flood water in home and building are the breeding ground for all sort of bacteria and viruses which may put people at risk. Many people don't expect during a flood that there will be possibility of sewage leak, which of course will leave huge amount of toxin in the flood water.

1.4.11 Leishmaniosis

Leishmaniosis SPP causes Leishmaniosis disease which is transmitted by sand fly. When it bits at any parts of the body it leads to deep, disfiguring sores. In Pakistan Systemic or visceral leishmaniosis are rare. This disease is spread due to poor sanitation and malnutrition, by providing a habitat for the sand fly and effect health of the population and making them more susceptible.

However, flood water may contaminate the clean water, food and disturb the sewage system which result to increase the potential communicable disease. Waterborne diseases such Escherichia coli, shigella, salmonella and hepatitis A virus are transmitted by contaminated water. The infectious diseases also caused by fecal contamination of live stalk and crop. Irrigation with the Contaminated water represents risk to farm and other outdoor workers.

Beside from all the above-mentioned diseases some vector borne disease, such as malaria, dengue, yellow fever, and west Nile fever also been noticed in recent flooding across the globe.

1.4.12 Long term Health Impacts

1.4.13 Disability

In longer term disability from trauma incurred during the flood is a common cause of morbidity particularly if exacerbated by complications such as infections. Disability may be associated with the exacerbation of chronic diseases such as asthma, ear, and nose and throat condition.

1.4.1 Mental Health Problem

Mental health problems are common life stressors. Disaster not only increase physical illness but also affect mental health. Peoples who have experienced that flood have been shown to have fourfold higher risk of psychological distress than do those not exposed to flood, and a suicide rate is 13.8% higher than pre-disaster rate. Personal, physical, social and economic losses may derive from mental health problem. Management of the mental health consequences of exposure to disaster have not been fully addressed by those in the field of disaster preparedness or services delivery. Young people specially girls in developing communities are more vulnerable. Disaster mental health teams should be sensitive to the socio- economic status, local culture, tradition, language and local livelihood pattern. Health directly affects through contact with flood water or indirectly damages to infrastructure Eco system, food and supplies or social support Ecosystem. In the world due to drowning third of flood related death occurred and one third from physical trauma, heart disease, electric shock, carbon mono oxide poisoning or fire.

1.5 Effect on people expose to Flood water included:

- Heart disease and other extreme consequences of cardio vascular disease.
- Drowning from walking or driving through flood water.
- Injuries due to contact with debris submerged objects in flood water falling into hidden manholes.
- Trying to move possession during flood building collapse and damage.
- Diarrheal, vector and rodent borne diseases.
- Reparatory, skin and eye infection.
- Stress and shorter- and longer-term mental health disorder including the impact of displacement.
- The negative health effects linked with overcrowding.
- Damage to health care and infrastructure.
- Loss of access to essential care.
- Loss of access to failure obtains continuing health care.
- Water storage and contamination due to loss of water treatment works and sewage treatment plants.
- Damage to water and sanitation infrastructure and damage to crops.

- Disruption of food supplies and recovery fear of reoccurrence.

The health impacts of floods vary between effected populations (related to their vulnerabilities). They also differ according's to type of flood events (slow on set and rapid on set floods) and background health situation of the population.

1.6 Food Safety During and After Flood Event

At any point before its consumption food become contaminated, including during preparation if not properly handled prepared and stored. Food safety is very important for infants, pregnant women elderly people during flooding.

1.7 Flood Safety Concern Include

- Increase risk outbreak of food borne disease including diarrhea dysentery and fever etc.
- Increased livelihood of using contaminated water for food handling and preparation.
- Contaminated fruits and vegetables.
- Poor sanitation lake safe water and toilet facilities.

1.8 Study Area

Chitral is located in the Northern side of Khyber pakhtun khawa. Chitral is the largest district of KPK on the basis of territory and cover 18,50sq kilometer. In the East it shares a border with Gilgit-Baltistan, and with Kunar, Badakhshan. Nuristan provinces of Afghanistan on the North and West, and with Swat and Dir in the south. in the North narrow strip of Wakhan corridor separates Chitral from Tajikistan. Chitral is counted amongst the highest regions of the world. Seeping from the 10, 94 meters at Arandu, 7,726 meters at Tirichmir. Packing over 40 peaks and more than 6,100 meters in height. Administratively Chitral is divided in to two sub division, Chitral and Mastuj. Having seven Tehsil and twenty-four union councils. The district has about 414,000 population. The general population is mainly of the Kho people. Who speak khowar, which is also spoken in parts of Yasin, Gilgit-Baltistan Dir and Swat. Chitral is also a home of Kailash tribe, they live in Bumburate and two other remote valleys located in the Southwest of Chitral town. On the night falling between 15th and 16th July, and again on 19th, 24th and 28th July 2015, different parts of district Chitral were hit by Flood which washed away many villages, roads, Bridges, Drinking water supply system, micro hydel power channels, public property and Agriculture crops. It has been reported that in Chitral 36 people have lost their life in various accidents. Due to inaccessibility to different affected areas, the exact number cannot be estimated.

1.8.1 Location

The location of Chitral is 35°53'15"N 71°48'01" in globe. The total area of chitral is 14850sqkm. Chitral has 32 Valleys and 30 Principal Passes on Hindu Kush mountain ranges. Chitral is connected with Afghanistan in NW. In South Upper Dir and Kunar province of Afghanistan. On the East by Ghizer district of Northern areas and Swat.

1.8.2 Annual means temperature (c°)

The maximum temperature in the study area is in the month of July which is 36c° and minimum temperature mostly record in the month of January which is 8c°. the maximum precipitation is 20(mm) which is recorded mostly in the month of July. And the minimum precipitation is -0.67 recorded in the month of January. The r humidity is mostly the same in winter season

which is the most in the month of January recorded as 51.09% and lowest in the month of June recorded 23.07% in the month of June.

1.9 Hazards in Chitral in recent time

Table No.1

S.No	Hazards	Months	Years
1	Flash Flood	June, July	2010 and 2015
2	Earthquake	October	2005
3	Floods	June, July	2010
4	Avalanches	March	2007
5	...	July	2010
6	Landslides	March, April	2015

1.10 Disaster situation

Chitral District lies in a peculiar geographical location and is such a topographic location that it is porous to every climatic catastrophe. The district comes under seismic zone and slightest jolt of earthquake rock the entire district and other climatic devastation often happen. During the year 2007 as a result of unusual and unexpected heavy rains and snowfall from 19th to 22nd March 2007 and 30th March to 1st April 2007, the entire District suffered an alarming situation. During the above-mentioned period the snow fall in District HQ i.e. Chitral was recorded 24 to 28 inches while in the upper areas of Chitral it was about 5-feet. This caused heavy devastation in the District because of Glaciers, Avalanches, flood, Land Sliding, Boulders and collapse of houses. All infrastructures damaged badly i.e. all main roads, link roads within the District remained blocked, Electricity supply and telephone system remained disrupted for many days.

Table No. 2

Damages Due to Floods

YEAR	DEAD	INJURED
March- April 2007	78	57
June- July, 2007	1	-

Source: Metrological Centre Chitral (2018)

1.11 Chitral Flood 2015

1.11.1 Overview

The historical profile of Chitral showed that Chitral is suffered from many natural disasters. Due to which large number of losses of loss to human and materials. On 16th July 2015 riverine, flash floods, Glacial lake outburst flood (GLOF) events with very high frequency and intensity hit different areas of Chitral sub division Mastuj caused by heavy rain falls. These phenomena were started on 15th July 2015 and periodically reported till 2nd August 2015.

In the history of Chitral, 2015 flood was one of the most destructive events. Due to this destructive event productive, public infrastructure and social services sectors including private and community assets are damaged. This event also disrupted houses, building, assets, roads, bridges, irrigation channel infrastructure, water supply, crops, schools and health facilities.

1.12 Chitral GoI

Chitral GoI National Park (CGNP) was established in 1984 to provide protection to the rich biodiversity of the area. Extending

over 7,750 hectares, the Park supports the largest populations of Flare-horned Markhor, resident population of Snow Leopard and other globally important floral and faunal species. Several of these species have been under threat primarily due to anthropogenic factors originating from communities settled around the Park itself. Since long the communities have been using the Park for fuel-wood and timber extraction, hunting, grazing and for meeting other livelihood needs.

In order to conserve the globally significant biodiversity of CGNP, the World Bank, supported by the Global Environment Facility (GEF), approved the Protected Areas Management Project (PAMP) for Pakistan. One of the three selected sites of the Project is CGNP situated in the north of kpk.The Project is being implemented in Chitral by the Wildlife Department, Government of Pakistan while World Wide Fund for Nature – Pakistan (WWFP) is providing technical assistance during five years of project execution.

1.13 Floods Impacts in Study Area

In the study area more than 36 people lost their life and many inquired because of the floods. While most of the affected population is suffer from the physical and social trauma. Due to damages to water supply schemes and sanitation different communicable diseases have been erupted. Burden of communicable diseases also increased due to shortage of medicine. Venomous snake bites during floods is common phenomenon. Severe consequences caused by the biting of venomous snakes. Most of the victims suffered from extreme pain and sometime lost their life. Flash flood is common occurring phenomenon in Chitral town, sub division Mastuj and Garamchama. The health facilities in these areas are intact but inaccessible due to entering the rain water and letter of mud. Water is contaminated due to the flood. Use of these contaminated water different diseases occur such as Diarrhea, Dysentery, Skin infections, Worm infections etc. In Chitral town the main source of drinking water are streams that are coming from different mountains. As a result of flooding water source are disturb due to which the surrounding areas completely damaged and create water scarcity in different areas of Chitral town. Chitral Gol stream is one of the main sources for drinking and irrigation water of different villages like Goldoor, Tinkshan, Chewdok, Zargarandeh, Moldeh, Hone etc. It covered the main bazar and many Government and Private Offices and Institution include hospitals, school and colleges etc. In 2015 flooding season Chitral town suffered from water shortage up to 3 months. Clean drinking water, water for irrigation that are arise from main stream also flown by the flood water in Chitral Gol steam.

Impacts of flood are wide ranging and depend on a number of factors. However, in case of health impacts flood are specific to the particular context. Drowning, injuries, hypothermia and animal bites are the immediate health impacts of flood. Health risks are also associated with the evacuation of patients, loss of health workers and loss of health infrastructures including essential drug and supply. The indirect effects of flood on health in medium term are infected wound, complication of injuries, poisoning, poor mental health, communicable diseases and starvation. In the long term the chronic diseases, disability, poor mental health and poverty related disease including malnutrition is the potential legacy. The impacts of Chitral flood 2015 can be assessed on

- 38 water supplies which were providing drinking water to 7,759 households were washed away and due to this safe drinking water were not available and put high risk of water born disease and kidney diseases.
- Many people were injured and disable.
- Snake bit, hypothermia and dysentery may occur and many families or people remained homeless.

1.14 Doctors Interview about the Impacts of Flood on Health in the Study Area

The previous 2 to 3 decades can be turned as Disaster Era, as both severity and frequency of various disasters has increased many folds. Chitral due to its geographical terrine and specific weather condition, a disaster prone and most sufferer district of the country. Flood, Flash flood and avalanches are permanent feature of this district. Infrastructures of health institutions effected in one or the way.in case of collapse and demolition, various problems are witnessed. For example, due to lack of space, conduce atmosphere thorough examinations and investigations of the patients becomes difficult, resulting in misdiagnosis and these patients are wrongly treated leading to complications and death. Water supply of the health institutions disrupted, this condition deteriorating the hygiene of the health institutions resulting in hospital borne diseases....The flood has many impacts on the health of children of the area in many ways and in this manner affect the society as children's comprises 40 % of the population...the sight of the flood has frighten experience to the children and hence leads to psychological problems in the children...The water sources and reservoirs becomes polluted and leads to increasing number of water borne diseases like, parasitic infestations, viral and bacterial infections like, typhoid fever, Hepatitis, polio, cholera and other diarrheal diseases are major health problems in the aftermath of flood. Frequent flash flood result in iodine deficiency leading to various thyroid problems. The flood puts many psychological effects on the inhabitant especially on women; they suffered in anxiety, depression, tension resulting in preterm labor, abortions, and miscarriages in pregnant women. These ultimately result in pregnant mature, low birth and I'll neonates. Preventive strategy for deforestation is key to prevent flood, plantations, vaccinations of population and use of boiled water for drinking can

prevent many diseases.

1.15 Statement of the Problem

Due to the flash flood 2015 The water sources and reservoirs becomes polluted and leads to increasing number of water's borne diseases like, parasitic infestations, viral and bacterial infections like, typhoid fever, Hepatitis, polio, cholera and other diarrheal diseases are major health problems in the aftermath of flood. Frequent flash flood result in iodine deficiency leading to various thyroid problems in the study area.

1.16 Purpose of the Study

The purpose of the study to understand the causes of different diseases arise after floods in the study area. And to mitigate the impacts of flood on health in the study area.

1.17 Objective

The objectives of the study are

- To identify the incidence of chronic diseases, arise flood in the study area.
- To identify the causes of these diseases.
- To analyze spatial distribution of disease in the study area.

1.18 Conclusion

historical profile of floods in Chitral is composed of many natural events due to which large number of losses to human and material were recorded. Flood is a common hazard in the study area. The impact of flood on health has been increased in recent time. Flood in the study area contaminate drinking water due to which different types of chronic and water borne diseases, like diarrhea, malaria, skin infection, warm infection, kidney stone and respiratory infection has been recorded in the study area. There is a need to understand these health problems. And need a proper management to mitigate the impacts of flood on human health. The damages due to flood may be categorized directly or indirectly. Direct damages are those resulting from direct exposure to the contaminated water and flooded environment. These include drowning, injuries from debris and hypothermia etc. Indirect damages those are those which are associated with damage done by the water to natural and build environment. These include infectious diseases, poverty related diseases and diseases associated with population.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

Impacts of flood are wide ranging and depend on a number of factors. However, in case of health impacts flood are specific to the particular context. Drowning, injuries, hypothermia and animal bites are the immediate health impacts of flood. Health risks are also associated with the evacuation of patients, loss of health workers and loss of health infrastructures including essential drug and supply. The indirect effects of flood on health in medium term are infected wound, complication of injuries, poisoning, poor mental health, communicable diseases and starvation. In the long term the chronic diseases, disability, poor mental health and poverty related disease including malnutrition is the potential legacy.

2.2 Impact of Flood on Health at Global level

In term of both developed and developing countries, floods are the common hazard. their impact is uncountable in global level. 1959 floods in china, 1974 in Bangladesh and in 2004 Tsunami in South Asia were most devastating events. The impact of these devastating events on health were varying from population to population because of the vulnerabilities and type of events. Under future climate change, altered patterns of precipitation and sea level rise are expected to increase the frequency and intensity of floods in many regions of the world. We review the epidemiologic evidence of flood-related health impacts.

According to the (Centre for Research on the Epidemiology of Disasters) and in two reinsurance company databases, deaths associated with flood disasters are reported. (E. coli de Santé Publique, University Catholique de Louvain, Brussels, Belgium). These databases include little epidemiologic information (age, gender, cause). However, in both high and less and developed countries flood-related mortality has been studied. From the drowning or trauma, the most readily flood deaths were identified, such as being hit by objects in fast-flowing waters. The number of such deaths is identified by the characteristics of the flood, including its speed of onset (flash floods are more hazardous than slow-onset ones), depth, and extent. Due to the flood water many vehicles are swept away and drownings occurs. According to the developed countries evidence relating to flash floods suggest that most deaths are due to drowning. In United States particularly vehicle related. Information on risk factors for flood-related death remains limited, but men appear more at risk than women. Those drowning in their own homes are largely than elderly.

During the period of flooding the risk of deaths is increased. The controlled study of the 1969 floods in Bristol, United Kingdom, Bennet reported that after the flood all causes of deaths increase 50 % in flooded population and mostly 45-64 aged people affected. A delayed increase in deaths have examined by few other studies. But it was also reported by Lorraine in relation to the 1953 storm surge flood of Caney Island, United Kingdom, but not in two Australian studies. In less developed countries inconclusive evidence of diarrheal deaths has been reported by several studies of flood. 1988 floods in Khartoum, Sudan, Surveillance data showed an apparent increase of mortality from diarrhea. But a similar rise was also apparent in the same period (May–July) of the preceding yea. In 1988 Bangladesh floods, Routine surveillance data and hospital admissions records similarly showed that 27% death were caused by diarrhea. But again, the effect of the flood was not separately quantified from seasonal influence. After the 1998 floods in Bangladesh, Kunii et al. conducted a cross-sectional survey and determined that 3,109 people affected by the flood, (0.23%) died (but not necessarily a consequence of) the flood, two from diarrhea, two from suspected heart attacks, and three from undetermined/unrecorded causes.

2.2.1 Injuries

The injuries related to flood occur as an individual attempt to remove themselves, their family, or valued possessions from danger. The potential risk to the life and the chances of injuries also increased when people return to their homes and businesses and begin the clean-up operation e.g., unstable buildings and electrical power cables.

In a community survey of 1988 floods in Nimes, France. filled questionnaires from 108 out 181 households. 6 percent of surveyed households reported that mild injuries (contusions, cuts, sprains) related to the flood. After the Midwest floods of 1993 in Missouri, injuries were reported through the routine surveillance system. Total of 524 flood-related conditions were reported between July 16 and September 3, 1993. Out of these 250 (48%) were injuries: sprains/strains (34%), lacerations (24%) “Other injuries” (11%), and abrasions/contusions (11%). Similar data were also reported from Iowa.

little information is available about the frequency of nonfatal flood injuries. There are mostly not routinely reported are identified about flood. Although the international database records about such injuries are much less robust than the

reports of the deaths.

2.2.2 Fecal-Oral Disease

The transmission of Fecal Oral Disease increased due the flood, especially in those areas where the population does not have access to clean water and sanitation. Published studies (case-control studies, cross-sectional surveys, outbreak investigations, analyses of routine data) have reported that different types of disease increased such as Cholera, Cryptosporidiosis, Nonspecific diarrhea, Poliomyelitis, Rotavirus, and Typhoid and Paratype because of the post flood. Some of the report related to risks associated that flooding are substantial. In Indonesia, Villard et al., found that flood increase paratyphoid fever, with an odds ratio of 4.52 (95%) confidence interval. Katsumata et al. Found it to increase the risk of cryptosporidiosis, with an odds ratio of 3.08 (95%).

2.3 Impacts of Flood on Health in Pakistan

According to the historical profile of floods in Pakistan, majority of areas of Pakistan affected by floods events. 1950, 1992, 1998, 2010 and 2011 floods were recorded numerous deaths and affect large number of national economies. In decade 1991 to 2001 according to authority sources, floods in Pakistan created unexpected harm over Rs 78,000 million to property. In 2011 Akhtar, established the relationship between flood damages and South Asia monsoon in Indus river basin. Floods appeared to be influencing approximately around 75 million people with mortality rate 20,000 people/year. Pakistan were affected by many floods. The flood of 2010 was most catastrophic in the history of Pakistan. Due to which large parts of Pakistan affected and thousands of people lost their life. Report published by United Nations Development Program Bureau for Crisis Prevention and Recovery (UNDP-BCPR), according to him in South Asia Pakistan is the fourth most vulnerable country in case of health impact. The ranking is done on the basis of disaster risk index (DRI). Which is based on exposure of people to the hazardous situation and mortality-based index in a particular country. Infrastructures were also severely damaged by the flood. 515 health facilities were damaged from the floods of 2010-2011 and around 35000 health workers were displaced. Around $50 million worth of damages were calculated. Epidemic diseases were also borne in the flood affected areas. According to Annual report of UNICEF (2014), after 2012 floods around 200,000 measles vaccines have been provided to the affected area. 2012 in Pakistan 8046 cases of measles were reported, according to report of WHO (2013). Furthermore, the report summarizes that around 480,000 children were treated from severe diarrhea, pneumonia and acute respiratory infections. In affected areas around 77000 children were diagnosed with malnutrition. Shabbier (2013) discussed in his paper that the most pervasive transferrable diseases in Pakistan are intense respiratory contamination, diarrhea, polio, tuberculosis, hepatitis B and C, measles and vector borne malady including malaria, Leishmaniosis and hemorrhagic fever (CCHF). In ruler part of the country pervasiveness of intestinal sickness is more. In 2010 to 2012 floods total 37.36 million medical consultancies were conducted in the affected area. The most widely recognized ailments are intense respiratory contamination (23%), skin illnesses (11%), diarrhea (9%) and malaria (6%) according to the report of 2008 Pakistan has an endemic issue with 297,00 tuberculosis and polio case. Nishtar (2007) discussed that the burden of communicable diseases was more prominent except any other types of diseases. Due to the communicable diseases in Pakistan 38.4% people died on daily basis. These communicable diseases are mostly affected the flood-stricken areas. 43.3% of all post-neonatal deaths among children of years and under occurred due to the Diarrheal. An expected 10-11% of the aggregate of children under five are influenced by the floods (i.e., roughly 2.4-2.8 million youngsters under five years "influenced" and 1.2-1.4 million "extremely influenced"). Both the short- and long-haul floods have critical effect on children's health. Evaluation reports of Health Cluster bulletin propose an increment in squandering among some flood influenced populaces of kids.

According to the annual report of UNICEF (2013), in Pakistan 100-150 kids consistently pass to the consequence of diarrheal-related illnesses. Many of these deaths can be anticipated by insufficient sanitation, and unsafe drinking water. Around 60 and 75 million individuals are influenced by diarrheal-related sicknesses in each year. Because of water and sanitation related sickness 60% of children's deaths occurred. Therefore, it is important that the food must be secure from the flood. Because due to the flood scarcity of food and food cannot be secured and thus vulnerabilities of diseases increased. According to the report of UNICEF after the six months of flood 2010, 22% of children in Sindh were experienced intense malnutrition.

2.4 Health issues due to Floods in the Study Area (Chitral town)

The historical profile of Chitral showed that Chitral is suffered from many natural disasters. Due to which large number of losses of loss to human and materials. On 16th July 2015 riverine, flash floods, Glacial lake outburst flood (GLOF) events with very high frequency and intensity hit different areas of Chitral sub division Mastuj caused by heavy rain falls. These phenomena were started on 15th July 2015 and periodically reported till 2nd August 2015.

In the history of Chitral, 2015 flood was one of the most destructive events. Due to this destructive event productive, public infrastructure and social services sectors including private and community assets are damaged. This event also disrupted

houses, building, assets, roads, bridges, irrigation channel infrastructure, water supply, crops, schools and health facilities.

Floods in the study area affected many people and their properties. Due to these floods, 36 people lost their life many of them inquired and most of the people suffered from psychological trauma. Due to damages to water supply schemes and sanitation different communicable diseases have been erupted in study area. Burden of communicable diseases also increased due to shortage of medicine. Venomous snake bites during floods is common phenomenon in the study area. Severe consequences caused by the biting of venomous snakes in the study area. Most of the victims suffered from extreme pain and sometime lost their life. Flash flood is common occurring phenomenon in study area and Garamchama. The health facilities in the study area are intact but inaccessible due to entering the rain water and letter of mud. Water is contaminated due to the flood in the study area. Use of these contaminated water different diseases occur such as Diarrhea, Dysentery, Skin infections, Worm infections etc. In the study area the main source of drinking water are streams that are coming from different mountains. As a result of flooding water source are disturb due to which the surrounding areas completely damaged and create water scarcity in different villages of the study area. Chitral Gol stream is one of the main sources for drinking and irrigation water of different villages of the study area like Goldoor, Tinkshan, Chewdok, Zargarandeh, Moldeh, Hone etc. It covered the main bazar and many Government and Private Offices and Institution include hospitals, school and colleges etc. In 2015 flooding season study area suffered from water shortage up to 3 months. Clean drinking water, water for irrigation that are arise from main stream also flown by the flood water in Chitral Gol steam. Beside this eye, ear and skin infections have increased due to use of contaminated and dirty water as discussed by DHO Chitral (Handicap international 2015).

2.5 Conclusion

There is limited evidence about the impact of flood on health, particularly in relation to morbidity. Specially in less developed countries, this is may be due to the difficulties of carrying out rigorous controlled epidemiologic studies of floods. Evidence on public health interventions (e.g., the need for measures to reduce the spread of infectious disease, dealing with mental health impacts, targeting of vulnerable groups) appears particularly limited. We have not founded any studies about effectiveness of public health measures, including early warning systems. Nonetheless the wide range of risks to health and well-being. Both physical and mental, is understood, though there remains scientific uncertainty about the strength of association and public health burden for specific health effects. The immediate risks of trauma and death are generally clear, but it seems that longer-term impacts. Specifically, on mental well-being, are often underestimated and probably receive too little attention from public health authorities. In the study area we identified that there are further risk to the infectious diseases because of the floods. In terms of public health responses, some caution is required in drawing general lessons from a global literature, because floods vary greatly in their character and in the size and vulnerability of the populations they affect. The evidence is also dominated by studies of slow-onset floods in high-income countries that may have little relevance to flash floods and floods in low-income settings.

RESEARCH METHODOLOGY

3.1 Introduction

The scope of research methodology is wider than that of research methods because it considered the logic behind the method and techniques used in the of the research study. It also explains the reason behind using particular method and techniques for research study. It explains the process of selecting research problem, formulating research hypothesis, and undertaking a particular research study. Research methodology also defines the types and mood of data collection in the study. The current is focused on various health impacts of flooding in Chitral town and surrounding areas in district Chitral Pakistan.

3.2 Universe of the Study

The selected area is Chitral district surrounding areas and villages near to Chitral gol like Gooldor, Zargarandeh, Tinkshan and Moldeh etc. The reason to selecting this area is its geographical importance and location. The nearby areas of Chitral gol are most vulnerable to flash floods.

The selected area Chitral Gol steam is the main source of water for the surrounding villages. It provides drinking water and water for agriculture purposes in the surrounding villages of Chitral gal stream. In summer season due to excessive rain in upper cathect areas in Birmogh lasht and Soundings Mountain create huge flooding in Chitral Gol stream every year, which has direct impacts on health to the surroundings areas of Chitral town, as the stream cross near to main Chitral bazar and densely populated villages.

3.3 Sampling Methods and Sample Size

The primary data was collected from the district disaster management officer Chitral, the doctors and people in the communities in the study area. Different respondent was selected and asked different question about the impacts of flood on health in the study area.

A total 40 respondent were selected and 25 houses were survived through snow ball sampling for participation in the study

3.4 Data Collection Tools

The primary data was directly collected from member of the community and effected people through questionnaire. Different respondent was selected and asked different question about the impacts of flood on health and different diseases arise during and after floods 2015 in nearby areas of Chitral Gol stream. Discussion was done with the members of community and government official's doctor's disaster management officers etc. who deal with flash flood in the study area. They were also asked questions about how different diseases arise after flooding and other health impacts of flood in the community. A standard questioner was used for illiterate people while an interview schedule was conceived as best tools for data collection from illiterate people o the study. The respondent helps the researchers to carry out data collection.

3.5 Data Analysis and Interpretation

The data was analyzed and coded with the help of (MS excel software). Frequency and percentage were used which helps in briefing the data, to define the respondent tendency and forms.

3.6 Delimitation of the Study Area

Although the study is carried out in well manage methodology; however, some delimitation were also found during data collection process. Following are delimitation of the research study that found during the survey and data collection process.

Lack of health organization regarding disasters

Lack of secondary data regarding health problems after disasters.

Chapter-4

DATA ANALYSIS

Introduction

This research study is questionnaire based. Questionnaire is used to determine various health problems faced by people in the surrounding areas of Chitral Gol stream in Chitral town. A questionnaire was developed by which we gather information from the participant gender, marital status, education age, and different health problems like diarrhea malaria skin infection after flood, area specific diseases. Health problems with respect to different age gander and vulnerable groups. The study also suggests that lack of alternate drinking water source is the biggest reason of health problem in the study area. A total 40 respondent 25 male and 15 males from the study area were selected for questionnaire. Beside questionnaire the secondary data were collected from different health organizations like public health department Chitral and district disaster management officer Chitral. An interview from Dr Sami khan child specialist DHQ hospital Chitral was also part of this research work.

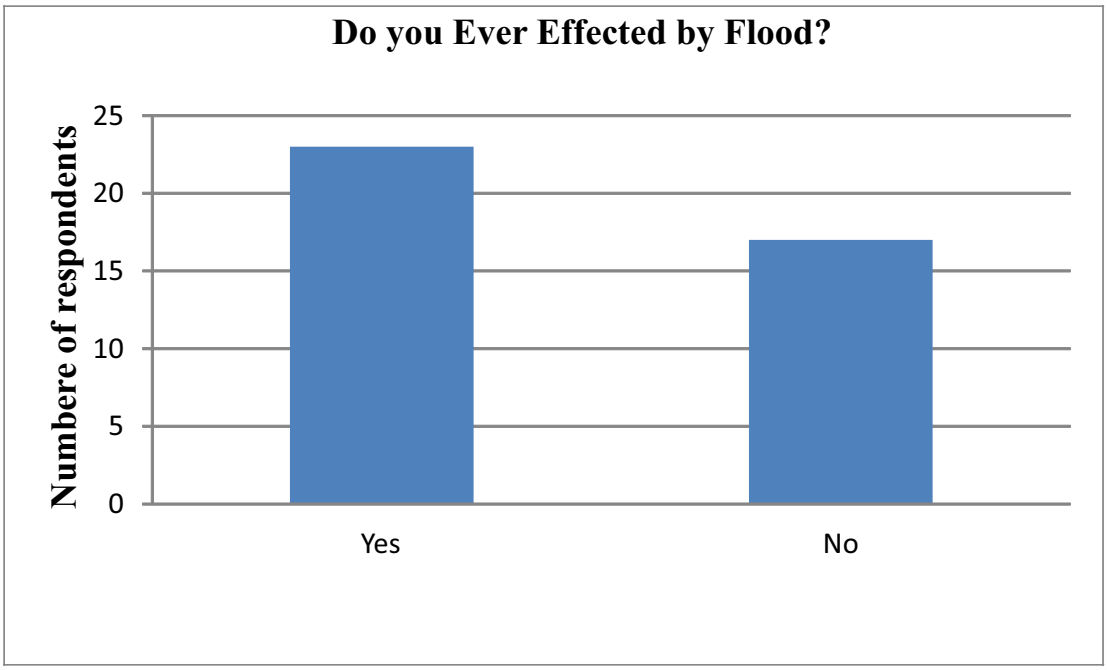


Fig: 4.1 Source: (Field study, 2018)

We started the survey by asking the above question. Did they really effected by flood hazard or not? if a person is affected by flood it can understand the real impacts of flood on their health and social life. In the above graph 4.1 a question was asked from the respondent about, did they ever effect by floods. As flood is a common and most reoccurring hazard in the study area many people have been affected by it. In this survey out of 40, 23 of the respondents have been affected by floods directly or indirectly. And 13 respondents didn't support the above statement.

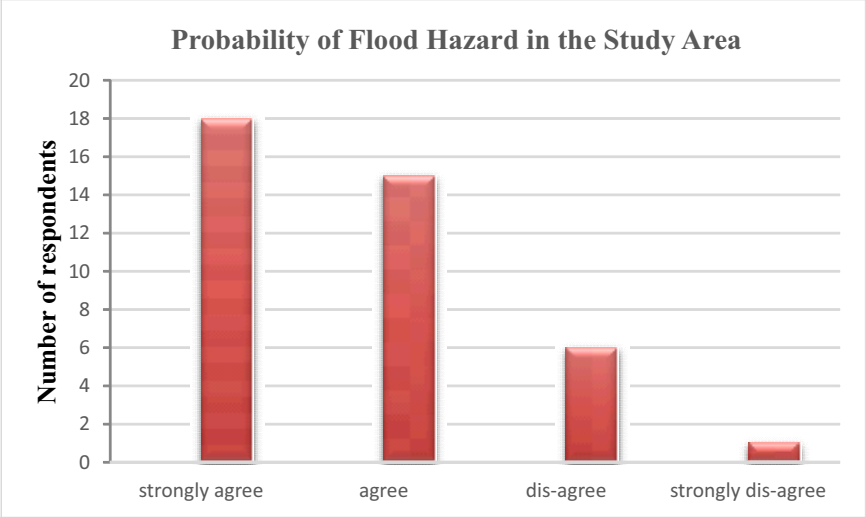


Fig: 4.2 Source: (Field survey, 2018)

4.2 Description

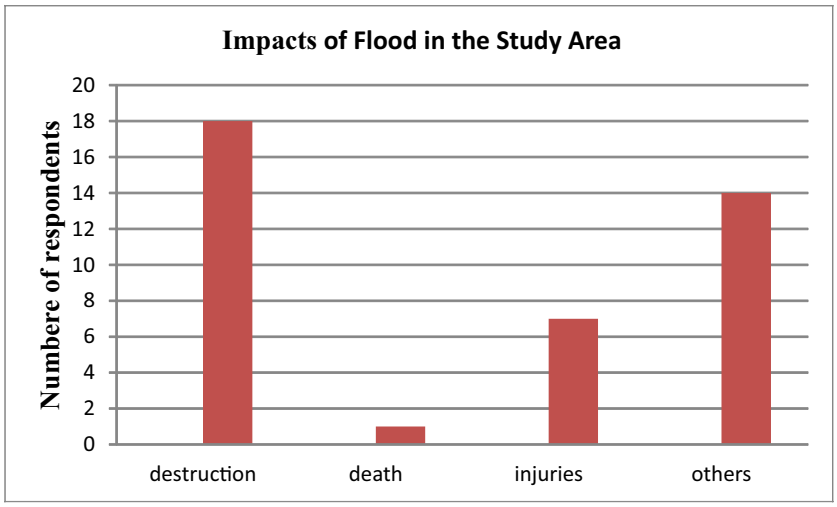


Fig: 4.3 Source: (Field survey, 2018)

Those extreme event or condition in which water cannot retained from its normal position or overflow from its bank because of heavy rain fall, melting of ice or glaciers etc. As a result, it overflows into areas with human settlements, infrastructure facilities and economic activities. Due to monsoon rains fall in Pakistan's mountainous northwest region about July 22, causing flash floods in Khyber Pakhtunkhwa, Punjab, and Baluchistan provinces. The unprecedented volume of rainwater over whelmed flood defenses, sweeping away roads and bridges and inundating large areas of land. By August 1 at least 1,000 people had been killed by flooding and at least 1,000,000 had been forced from their homes. As the floodwaters surged downriver into Baluchistan and Sindh provinces in August, rain continued to fall in the northwest. With one-fifth of Pakistan affected by mid-August. The above graph 4.2 shows that flood is the common hazard in the study area. The study area is affecting by flood almost every year. The frequency and intensity of flood has been increased after 2010 floods. Each year people in the study area are experiencing flash floods of different intensity with immediate impacts. In the above graph more than 60% strongly agreed that flood is the common hazard in the study area. Only 2 respondents dis- agreed and didn't support the above statement.

4.3 Description

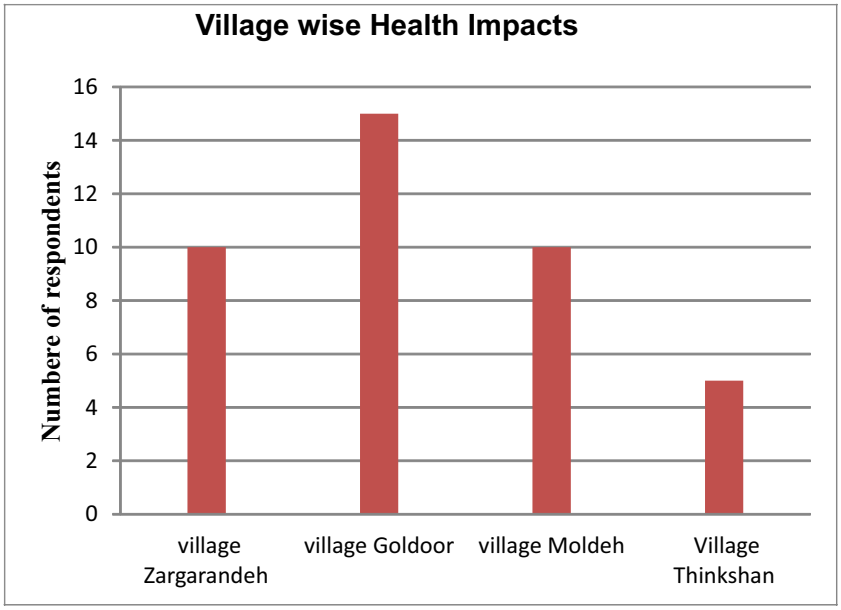


Fig: 4.4 Source: (Field survey 2018)

The impact of flood can be categorized by directly and indirectly. Direct result from loss to life, injuries and property damages. Indirect result diseases and poverty. The above 4.3 graph show that the immediate impact of flood is destruction in the study area. Out of 40 respondent 6 people considered that injuries are also the immediate impact of flood in the study area. According to this survey death toll is not high during Chitral Gol flood 2015.

4.4 Description

Flash flood 2015 in Chitral gol stream washout many drinking water pipelines. Due to floods the surrounding areas suffered from shortage of drinking water. Different water borne disease has been noticed in the study area.

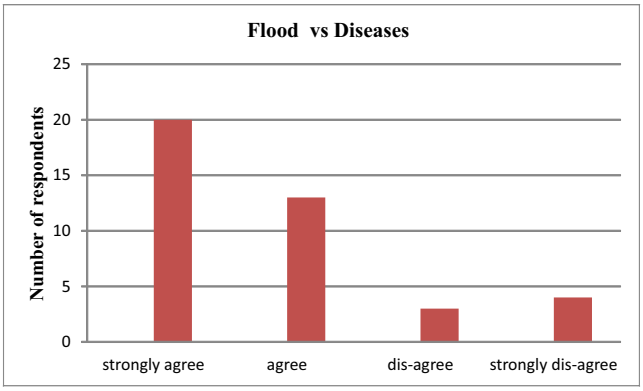


Fig: 4.5 Source: (Field survey, 2018)

The above graph shows that Goldoor village is the most prone village to the impacts of flood. According to the survey out of 40, 15 respondents considered Goldoor is the most vulnerable village. 10 respondents considered Zargarandeh 10 respondent considered Moldeh and 6 people considered Tinkhshan as the most prone village to the impacts of Chitral gol flood. According to the survey the village Goldoor has no alternative source of drinking water. It's due to its location and direct attachment with the stream people in the village suffer more.

4.5 Description

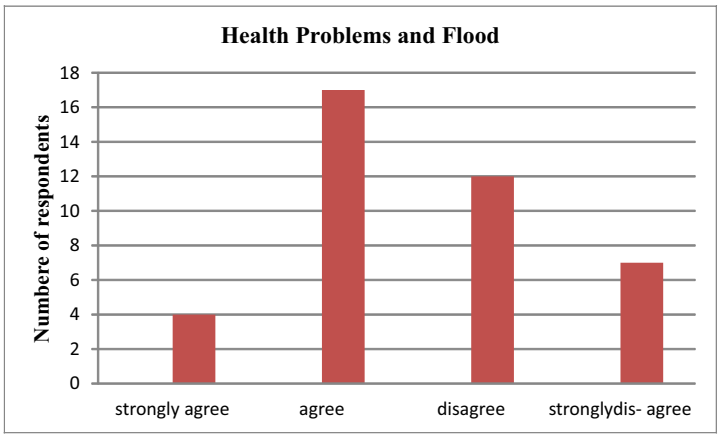


Fig: 4.6 Source: (Field survey, 2018)

The water sources and reservoirs become polluted and leads to increasing number of waters borne diseases like, parasitic infestations, viral and bacterial infections like, typhoid fever, Hepatitis, polio, cholera and other diarrheal diseases are major health problems in the aftermath of flood. Frequent flash flood result in iodine deficiency leading to various thyroid problems. The flood puts many psychological effects on the inhabitant especially on women; they suffered in anxiety, depression, and tension resulting in preterm labor, abortions, and miscarriages in pregnant women. (Dr. Sami DHQ Chitral). The above figure 4.5 show that out of 40 respondents 20 people strongly agreed that flood prone areas are more vulnerable to the impacts of flood on health. As they are the first respondent of the hazard. Floods have direct impact on their lives and livelihood. The surrounding villages like Goldoor Zargarandeh and Moldeh are the most vulnerable to disease arise after floods.Impact of floods include drowning, injuries, hyperthermia, and other health risks are severe in the surrounding areas of flooding's. Out of 40 respondents only 3 respondents dis- agreed with the above statement.

4.6 Description

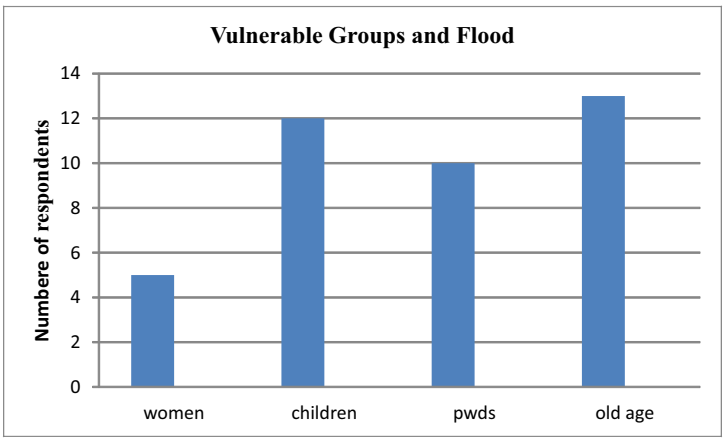


Fig: 4.7 Source: (Field survey, 2018)

Due to the flood water, vector borne diseases and other epidemics diseases occur. Water borne diseases is caused by the contaminated water which result from diarrheal illness. The flood in Pakistan have resulted that 115 922 cases of acute diarrhea had been reported in fixed and out breached medical centers.

In the above figure 4.6 question were asked from the respondent that flood can create health problem in the study area. Out of 40 respondent 17 people agreed that. 12 people disagreed and didn't support the above statement. Out of 40 respondent 6 people strongly agreed that flood can create health problems in the study area.

4.7 Description

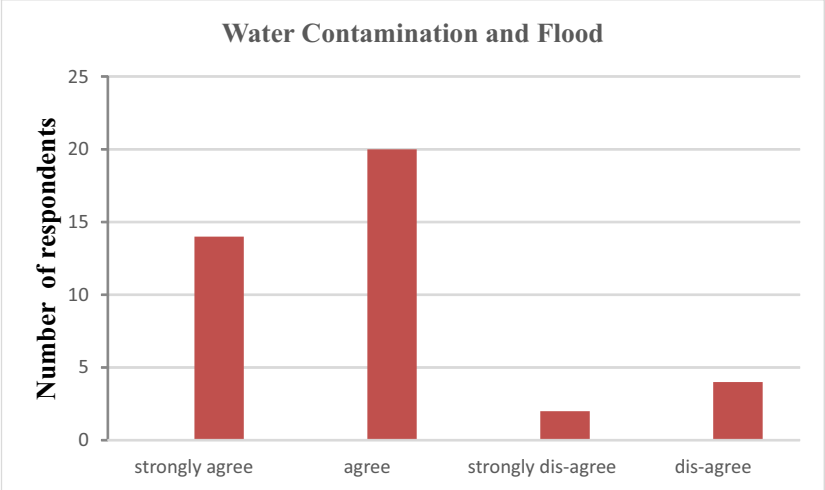


Fig 4.8 Source: (Field survey, 2018)

Children, women, people with disability, and old age people are the vulnerable groups with the context of floods.

Figure 4.7 show that according to the respondents old age people are the most vulnerable group to the impacts of flood in the study area. Out of 40 respondent 12 people consider children as the second most vulnerable group in the study area with context to floods. 10 respondents considered PWDS and 5 respondent considered women as vulnerable group in the study area.

Old age and children are more vulnerable to the impacts of flood because these groups are despondent on other. Children are directly affected multifold like no education water borne diseases, depression and mantel sickness.

4.8 Description

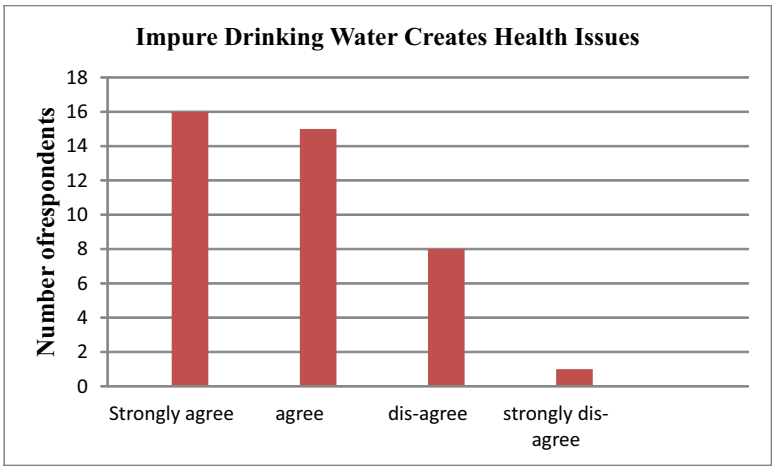


Fig4.9 Source: (Field survey, 2018)

Due to the location and sanitation system, flood water can contaminate drinking water (surface water, groundwater, and distribution systems). Groundwater wells can be rendered useless from inundation of water laced with toxins, chemicals, animal carcasses, septic seepage, and municipal sewage. Surface water sources are impacted in similar manners. Infectious diseases can also be spread through contaminated drinking water. As indicated by the Center for Disease control such illnesses might include: leptospirosis, diarrhea, legionnaires diseases. The secondary impact of flood is water scarcity. Flood water contaminates pure drinking water and washout water pipe lines and canals which create shortage of drinking water in the surrounding areas.

In the summer season in Chitral Gol stream the water become contaminated for many weeks thus creating pure drinking water scarcity in the study area. The Above figure 4.8 shows that Out of 40 respondent 20 people agreed that flood is contaminating drinking water in the study area. Only 4 people dis-agreed the above statement.

4.9 Description

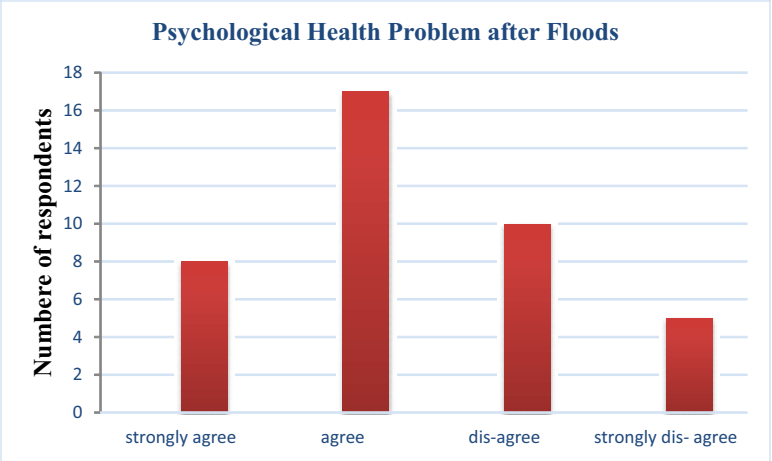


Fig: 4.10 Source: (Field survey, 2018)

In figure 4.9 a question was asked to the respondent about drinking impure water create health problem, more than 80% of the respondent agreed that drinking impure water is the main reason behind health problems in the study area. Flood water contaminates pure drinking water and washout water pipe lines and canals which create shortage of drinking water in the surrounding areas.

4.10 Description

In above figure 4.10 out of 40 respondents 17 people agreed that psychological health problem arise after severe floods in the study area. Some of the respondent dis-agrees with above statement. A number of studies have shown a range of symptoms resulting from exposure to natural disasters such as flooding. Among these consequences, individuals may experience symptoms of post-traumatic stress disorder (PTSD), depression and anxiety.

4.11 Description

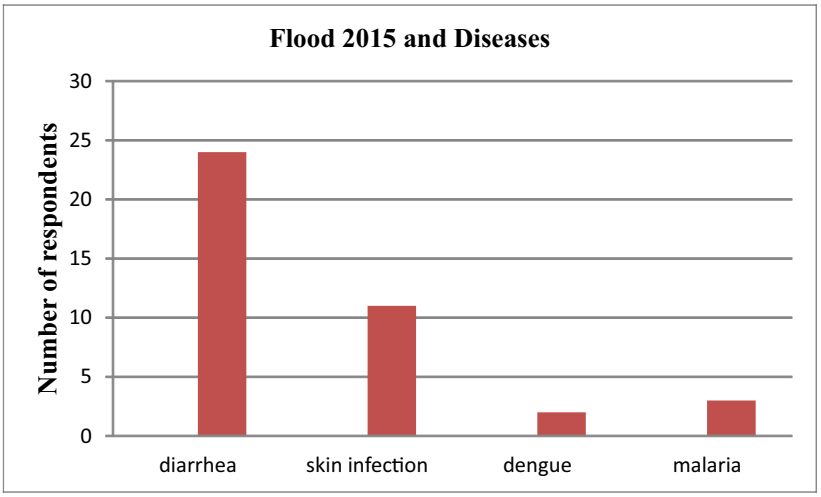


Fig: 4.11 Source: (Field survey, 2018)

The above graph represents that different disease arise after flood in the study s area. Out of 40 respondent 24 respondents said that diarrhea is the most occurred disease in the study area. 11 people say that skin infection is also occurred in the study area. According to the survey dengue was least occurring disease in the study area. The percentage of diarrhea is very high in the study area because the use of impure drinking water.

4.12 Description

In above graph 4.12 a question was asked from the respondent that which health department is providing better facilities in the study area. Out of 40 respondent 17 people said that AKHS is performing better in field of health. 15 people said that DHQ is providing better facilities in study area, 4 people thinks that public health and CMH is the better health department in the study area. The above-mentioned health departments are working during floods is praise worthy. Doctors and health facilitators are providing major part in field of health.

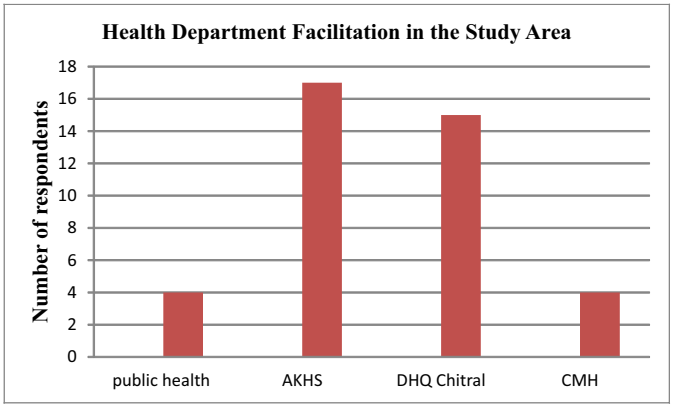


Fig: 4.12 Source: (Field study, 2018)

4.13 Description

Improper water management in the study area is the main reason behind the impacts of flood in the study area. Chitral Gol stream is the main source of water to its surrounding densely populated villages. According to the survey out of 40 respondent 32 people agreed that improper water management is the main reason behind water contamination in the study area. The water pipelines are directly attached with the stream water. During flood it washout drinking water pipelines. And due to the improper water management in Chitral Gol stream people in the study area are suffering from many flood impacts.

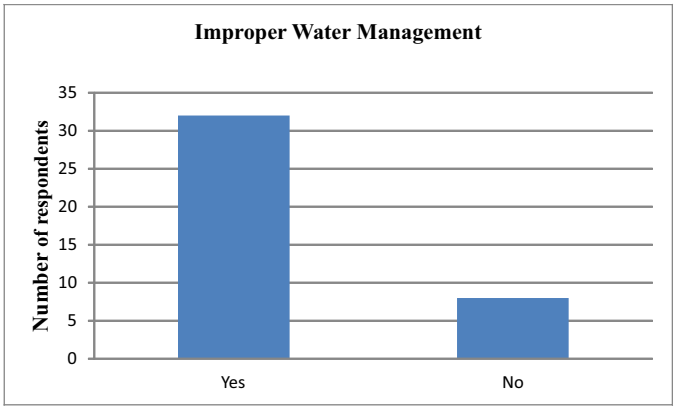


Fig: 4.13 Source: (Field study, 2018)

Chapter-5

FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 Findings

1. In our study we found that flood is the common and most reoccurring hazard in the study area. Its frequency and intensity have been increased in recent times.
2. Flood can be the cause of many diseases in the study.
3. Lack of alternative drinking water is not available in the study area. Due to this people in the study area use contaminated water in summer season.
4. Water borne diseases were spreading in the study area. And many people suffered from different diseases like diarrhea, skin infection malaria etc. And some diseases are area specific like near to the river pool most affected.
5. People in the study area are unaware of water borne diseases and unable to recognize the impact of flood on health for many times.
6. We found that children and old age people are the most vulnerable group to the impacts of flood in the study area.
7. Another big problem we found in the study area is lack of proper health facilities and major emergency hospitals in the study area.
8. In the study area different health departments don not have records about impacts of flood on health. They don't have authentic data about different people suffering from different water borne disease.
9. As the people were not provided with quality medical assistance so they become psychologically depressed.
10. In nutshell all these health-related issues add to the problem of the people of the study area and made their life truly suffering.

5.2 Conclusion

The research study conducted under the title of IMPACTS OF FLOOD ON HEALTH (A case study of Chitral Gol floods 2015). The study was focused on the health issues faced by the people of surrounding Village's Chitral Gol stream in Chitral town. The health problem was identified during the study and the causes of the problem water, chronic diseases, lack of proper medical care and lack of emergency hospitals, were studied in detail. The study was conducted in Chitral town and surrounding villages of Chitral Gol stream in district Chitral. The total population of the study area is more than 2000. Due to the lack of authentically data the actual number of effected people is not mentioned. Data was collected by random sampling method through questionnaire. Total sample size was 40 respondents. The important objectives of the study were to identify the types of disease like diarrhea, malaria, skin infection and psychological health problems due to floods.

To identify the types of diseases to identify the causes of these diseases and to analyze spatial distribution of disease in the study area and give recommendation to face in future these type of health challenges. We choose 25 males and female most of the respondent were under the age 18-36 years and the majority was unmarried. Majority of the respondent were bachelor and masters which ratio was near to 70%. Every respondent has different opinion about the impacts of flood on health in the study area.

According to the respondent more than 50% people agreed that flood is the common and most reoccurring hazard in the study area. The main health problems in the study area are mostly due to the drinking of impure water in flooding season. Government is working on relief and reconstruction but not enough in the field of health in the study area.

5.3 Recommendations

- We recommend that a phase wise program should be initiated to protect water source in the community.
- Household should be made aware of the use of protected water of the use of protected water.
- We need a child centered planning and there should be awareness and training at schools about the impacts of flood on health.
- Stress counselling for children is required during and after flood hazard.
- Health departments should be updated according to the scenario.
- There should be an emergency team in the hospitals that can deal flood affected people
- There should be a Preventive strategy for deforestation, to prevent floods.
- Plantation, vaccination, of population and use of boiled water for drinking can prevent many diseases.
- Government should provide water cleaning tablets during flooding season in the study area.

FLASH FLOOD VULNERABILITY ASSESSMENT

OF VILLAGE KOTLA MOHSAN KHAN, PESHAWAR

Submitted By

Saba Mehak

&

Sajid Afridi

M.SC. Final Year

ABSTRACT

The purpose of this study is to assess the people's vulnerability toward flash flood hazard in Kotla Mohsan khan District Peshawar. People in study area, are facing many problems due to frequent and flash flooding since last 10 years. It was imperative to study the vulnerability of people in study area and to put forth possible solution of the reduction of vulnerabilities to future flood events. Study explored the level of awareness about the causes and impacts of flood. A mixed method approach was adopted and data was collected through pre structured questionnaire and focus group discussion (FGDs). Stratified random sampling method was used for selection of respondents. The study finding reveals that Kotla Mohsan khan is highly vulnerable to future flood hazard. People in study area have high physical, economic and attitudinal vulnerabilities while social vulnerability is comparatively low due to cooperation among the community members. Majority of people think government is responsible to prepare them for flood event and they don't have any role in preparedness for flood. The reason for this careless attitude and lack of understanding is due to low level of literacy of the inhabitant of the area. Besides, poverty is another indicator that prevent people from reducing vulnerabilities. The study suggests that awareness and training programs should launched to the local community about the flood hazard and its management. Laws and regulations shall be strictly implemented to minimize future vulnerabilities. Protection along the Naala or Khwar are inadequate and there is immense need to protect the the housing and agriculture sector from negative impacts of flood.

CHAPTER 1

INTRODUCTION

Introduction

Flooding occurs when a river's discharge exceeds its channel's volume causing the river to overflow onto the area surrounding the channel known as the floodplain. The increase in discharge can be triggered by several events. The most common reason of flooding is prolonged rainfall. If it rains for a long time, the ground will become more saturated and the soil will not be capable to store further water, leading to increased surface runoff. Rainwater will enter the river much faster than it would if the ground was not saturated leading to higher discharge levels and floods . Flood is the general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal water from the unusual and rapid accumulation or runoff of surface waters from any source . Flood is a temporary covering by water of land commonly no longer covered by water. This shall consist of floods from rivers, mountain torrents, Mediterranean ephemeral water courses, and floods from the sea in coastal regions, and may exclude floods from sewerage systems (National Oceanic Atmospheric Administration) . A flood caused by overwhelming or extreme precipitation in a brief timeframe, for the most part under 6 hours. Flash floods are normally described by seething deluges after substantial downpours that tear through streambeds, urban boulevards, or mountain gullies clearing everything before them. They can happen inside minutes or a couple of hours of over the top precipitation. They can likewise happen regardless of the possibility that no rain has fallen, for example after a levee or dam has fizzled, or after a sudden release of water by a debris or ice jam . Natural calamities do not discriminate amongst poor and rich, and every life spared is as valuable as the next. In any case, it is likewise genuine that poorer social orders or portions of society are frequently the most defenseless against the effect of calamities in light of where and under what conditions individuals live and work, and their more constrained ability to recoup. A calamity is the consequence of a characteristic risk affecting on defenseless individuals.

Introduction to study area

The study area is located on 34.0778° North and 71.4522° East. It is approximately 1150 feet above sea level. It is located to the north west of the district Peshawar about 16 kilometers away. Total area of Kotla Mohsan khan is 7,818 acres population is 15532. Gharimosa khan bound it to the north, to the northeast by Mushtaqabad Ghari, left canal, to the west by Arbab Dheri, to the east by village, and to the south by Rajabad. Lund Khuwar and Shahi Khwarh (local name of the torrent) are the important seasonal streams. The former width of the Lund Khwarh was 15-25 feet, which is now increased up to 140 feet in some parts. Further Widening of the torrent is in progress. The study area was severely affected by flash floods in 2008 and 2010 and is more vulnerable to natural disaster like flash flood, and social conflicts. Flooding phenomenon mostly occurs in monsoon season due to heavy rainfall, and due to snow melting in summer season. Flood occurs in the months of April May June July and august in the subject locality. Floods are usually intensive in nature in subject area due to its topography.

Vulnerability in this context can be defined as the diminished capacity of an individual

or group to anticipate, cope with, resist and recover from the impact of a natural or man-

made hazard. The concept is relative and dynamic.

Vulnerability describes the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors . Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability emerges when an individual/group/country has no adequate assets to adapt or withstand a catastrophe. Communities across the nation are diversely vulnerable over the time some may be physically vulnerable because of exposure and vicinity of their residences, structures and foundation to the dangerous territory. The geography of the region is additionally a critical factor that contributes in making individuals vulnerable in physical, financial/economical point of view as a result of their common position and the majority of their monetary exercises are concentrated in their own particular geography that suffer more physically and economically in a disaster circumstance .

There are four (4) main types of vulnerability:

- Physical Vulnerability
- Social Vulnerability

- Economic Vulnerability
- Environmental Vulnerability

Physical vulnerability may determine by aspects such as population density levels, remoteness of a settlement, the site, design and materials used for critical infrastructure and for housing . For example, mud houses are more vulnerable to flood as compare to cemented house if both are at the same location near the bank water body (River, torrent, canal etc.) Social Vulnerability alludes to the failure of individuals, associations and social orders to withstand unfriendly effects to hazards because of attributes intrinsic in social interaction, establishments and frameworks of social esteems. It is connected to the level of prosperity of people, groups and society. It incorporates perspectives identified with levels of proficiency and instruction, the presence of peace and security, access to fundamental human rights, frameworks of good administration, social value, positive customary esteems, traditions and ideological convictions and general aggregate authoritative frameworks . For example, when flooding occurs some citizens, women, children, aged and disables may be unable to protect themselves or evacuate if necessary. The level of vulnerability is exceptionally reliant upon the financial status of people, groups and countries the poor are generally more helpless against catastrophes since they do not have the assets to manufacture solid structures and set up other designing measures to shield themselves from being adversely affected by disaster. For example, poorer families may live in squatter settlements because they cannot afford to live in safer areas that are more expensive. Floodwater deposit sedimentation, because of silt, air contamination will be the significant issue in particular areas, which are key aspects of environmental vulnerability. For example, as floodwater bring many minerals and salts along with itself, due to increase of salt in the soil it can cause salinity, and water pollution problem, etc. Deposited material due to flood can cause air pollution like increasing of sand and dust particles in air.

Economic and political factors often decide individuals' level of vulnerability and the quality of their ability to oppose, adapt and recoup. Vulnerability is for the most part more noteworthy where destitution or potentially lacking social insurance make individuals less fit for opposing risks . Because of the absence of mindfulness, absence of equipment, absence of prepared staff and absence of early cautioning frameworks the vulnerability level get more expanded. "Vulnerability implies how much an individual, a family unit, a group or a zone might be unfavorably influenced by a calamity" .

Flood Vulnerability Assessment

Vulnerability assessments can assume a key part in the plan of suitable adjustment and alleviation arrangements focused towards climate change and its effects on marine and oceanic biological communities, and the individuals who rely on these assets for their vocations and prosperity. Evaluating which specific individual, gathering, group, region, species or country is vulnerable, and in what ways, empowers clear and powerful responses to be defined. Vulnerability as a valuable idea has been encompassed by wrangle in late decades, with discourses including the ability to measure vulnerability statistically and even look at it between different groups and areas (Barsley, 2013). Vulnerability assessment is conducted to achieve certain goals, it is the examination of vulnerable areas, hazard reduction measures, development of certain mitigative and adaptive strategies. According to IPC 2007, vulnerability assessment has three principle markers like exposure, susceptibility and adaptive capacity/resilience or lack of resilience. Even more particularly in the event of flood, exposure is identified with climatic conditions. Here susceptibility alludes to the degree or level of being influenced by the hazard. It relies on the geographic and in addition socioeconomic factors, while adaptive capacity or resilience portrays the quality and strength of socioeconomic components to withstand unfriendly circumstances adequately . The similarity between all of these studies is that they agree on the three factors that define vulnerability. Sometimes they use other names for factors, but the main principle is the same, flood vulnerability consists of the factors exposure, susceptibility and resilience. In this research, flood vulnerability will be defined as “the function of the factors exposure, sensitivity and resilience of a system”.

In Asian countries like Pakistan, India, Bangladesh mostly these countries are effected by the worst consequences of flood due to western depression and the monsoonal winds. Pakistan is located on trophic of cancer this region has been termed prone against natural calamities generally to flood in monsoon. Further the reasons for vulnerability to natural hazards is because of poor individuals, poor development material utilized as a part of foundations, singular houses units and different structures especially in rural areas. The role of fragile environment, poor domesticated agriculture and livestock practices, absence of communication infrastructure, basic services, feeble early warning system, additionally absence of training and awareness is escalating the vulnerabilities of groups over Pakistan in post debacle circumstance. Another imperative factor which is assuming a major part in making Pakistan vulnerable is its delicate regular habitat in the upstream of Indus waterway bowl, deforestation in northern territories prompting soil erosion which contributing to intensification of floods and landslide. Today Pakistan has left with 4% of its woodland and vegetation cover where the standard required is 25%. That is the reason Pakistan is looking with high precipitation amid rainstorm seasons, another factor is rise in worldwide normal temperature, which is contributing in the melting of Himalayan ice sheets and adding to the strengthening of floods and avalanches dangers .

Statement of the Problem

Human society and the natural environment have become increasingly vulnerable to various and wide range natural hazards like Earthquake and floods. Similar problem prevails in the study area, which is highly vulnerable to flash floods in the local torrents called Lund Khwar.

Purpose of the study

Keeping in view, the vulnerabilities prevailing in the study area it will make the study helpful for the community in the way that they properly get awareness about their problems, vulnerabilities and their coping capacities. Although community members know about their situation of vulnerability but a proper study gives a more refined view of their rough experiences. In addition, this study will be also helpful for the researchers and authorities as a basis for their future work in the community.

Objectives

Main objectives of this research is to:

- To identify the Physical, social, economic and attitudinal vulnerability in the study area.
- To understand the factors causing widespread vulnerability in area.
- To determine/ recommend the possible actions for the vulnerability reduction and

Organization of the Study

Organization of this study consist of five (5) chapters. First chapter is Introduction, in which background and types of vulnerabilities are given. In addition, introduction about vulnerability assessment is briefly discussed statement of the problem, purpose of the study and objectives are given in this chapter. Second chapter is literature review in which relevant literature regarding the flood vulnerability at global, national and local level is reviewed. Third chapter is research methodology, which consist of nature and procedure of the study, delimitation of the study, ethical considerations, sapling and sampling techniques methodology and tools for data collection are explained. Chapter fourth is data analysis in which obtained data from the fieldwork is analyzed and further interpreted for the better understanding. This chapter overall comprises of work on purely primary data collected from field. Fifth chapter is last chapter, which consist of findings of the study, conclusion and recommendations.

CHAPTER 2

LITERATURE REVIEW

This chapter provides a review of selected relevant literatures and research taken from the published and unpublished works. The basic purpose of literature review is to make an understanding between the existing knowledge with the objectives of proposed research. This chapter provides information's about flood vulnerability globally, national wide and status of flood vulnerability in subject locality. Similarly, in this chapter it also focused on the problem faced by local community due flood disaster. The literature review helps the researcher in the process of designing a valid reliable instrument for data collection from various sources.

Flood Vulnerability (Global perspective)

In the last few decades several research studies have been carried out on the flood vulnerability globally, focusing on factors shaping the flood vulnerability, level of risk to human lives and property. Similarly, numerous studies are carried out to evaluate the flood vulnerability, and possible measures to prevent or mitigate flood vulnerability are the major concern of several studies. Each study provide different kind of conclusion and recommendation depends upon the objectives of proposed research. Traditionally tributaries and other large bodies of water a central role in the development of civilization. Flood plain with fertile alluvial soil has always invigorated settled agriculture and has enjoyed a history of settlements. Globally flood is the recurrently happening phenomenon. Flood involves from widespread range of unpredictable, high-localized flash flood to predicted and widespread river flood. Therefore, floods are considered to be among the worst natural disaster affecting society. However, in terms of floods related damages, 90% are reported from developing countries. In these countries, poverty is a major risk factor to all disaster having low level of disaster resilience.

Societal vulnerability to flood damages is a function of land use, land values, human habitation and population. All together flood accounted approx. 30% of all natural disasters and approx. 40% of the facilities. However, floods may also provide benefits as it recharges the aquifer and deposit the fertile silt. Flood is a rapid flooding of geomorphic low-lying ranges; washes, waterways, dry lakes, and bowls. Flood might be caused by substantial rain associated with a serious thunderstorm, typhoon, hurricane, or melting water from ice or snow streaming over ice sheets or snowfields. Flash floods may happen after crumple of a natural ice or debris dam, or human structures . Flood is as often as possible influencing various individuals, structures, and foundation over the world. The dramatic and progressing urbanization process on the planet is prompting an expansion of the flood risk and an increment of populace and infrastructure in flood inclined territories . Flooding is a natural and normal process related with stream flow, yet over the world and all through the ages; floods have influenced human wellbeing, the earth, social legacy and financial exercises. The floods in various areas of the world were caused by a series of climatic events kept going through the winter. In numerous areas, these floods caused the most astounding water levels or potentially discharge at any point recorded. In spite of the fact that the harm was as yet critical, the measures taken for instance in Austria and Germany after the 2002 floods ended up being exceedingly successful "European Ecological office" . Flood is the most common of all environmental hazards. The reason lies in the widespread geographical distribution of river valleys and how low lying coasts, together with the long-standing attractions for human settlement. No country is immune from floods. Although in various cases, the risk is limited to reasonably well defined flood plains and estuarine areas. More than any environmental hazard floods bring paybacks as well as facilities too. They are essential part of most river ecosystem where they help to sustain a wide range of wetlands habitats . The actual measure of flood harm of a particular flood event relies upon the vulnerability of the influenced socio economic and ecological system, i.e., broadly defined, on their potential to be harmed by a hazardous event . The conditions determined by physical, social and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards for positive factors, which increases the ability of people to cope with hazards . Physical vulnerability can be dictated by considering several perspectives for example, area of settlement, populace thickness, and kind of development material utilized and the strategy for development of foundation. Social vulnerability can be recognized through social issues like education, presence of security and peace, access to rights, social equity, customary esteems, belief and organizational values. A few groups are more vulnerable as contrast with others, individuals less special in class or position framework, ethnic minorities, ladies, maturity, and kids will probably more exposed to the impacts of hazard. While financial vulnerability is identified with poverty, and in addition it likewise incorporates the level of wage stores of an individual or country, level of charge, access to loans .

Vulnerability assessment is a key advanced step towards effective disaster risk reduction. It is a multi-dimensional approach because of the social economic, political and physical patterns of the society. Due to the multi-dimensional characteristics of

vulnerability, it is exceptionally hard to quantify the vulnerability straightforwardly. For the estimation of vulnerability distinctive social, economic, political, physical and environmental ought to be considered . We cannot evade or stop the event of any calamity. However suitable and on time measure can help in the decrease of the unfavorable impacts of debacles. The consequences of event like flood relies on the vulnerability of the affected socioeconomic and framework. In this way unique social, economic, and physical vulnerabilities should be surveyed legitimately. Likewise, vulnerability and risk maps in view of legitimate vulnerability appraisal can be drawn which can assist the decision maker with adopting proper strategies and choices. In spite of the fact that it is fundamental to evaluate the vulnerabilities yet it is muddled because of the financial, social, political and institutional patterns of the society .

A case study of Gangetic West Bengal, India

Flood is an interminable common peril in the flood plains of monsoon Asia, where more than 80% of yearly precipitation is gotten in the four wet a very long time from June to September. The issue of river flooding is of incredible worry in the Indian province of West Bengal. The Irrigation and Waterways Department of West Bengal Government reports that, since its independence in 1947, there has only been 5 years in which it has been spared from the effects of monsoon inundation. One of the most devastating of its kind was experienced in September–October 2000. A total of 23 756-km2 land area was inundated and 22 million people were affected . This specific flood event got everyone uninformed. The ill-equipped state of the organization to adapt to this sort of regular catastrophe was completely uncovered. Lately, various examinations have perceived the significance of assessing individuals' vulnerability to natural hazards, as opposed to holding a restricted concentrate on the physical processes of the hazard itself . Contended that natural disaster is a function of both natural hazard and vulnerable individuals. He highlighted the need to comprehend the interaction amongst hazard and individuals' vulnerability. Albeit the vast majority of the developed nations are all around outfitted with detail flood hazard maps, forward flood insurance maps and post-disaster hazard mitigation technical support . There is not any itemized spatial database for flood counteractive action and alleviation in the developing nations. As of late, endeavors have been made to utilize remote detecting and geographic information system (GISs) for making national-level flood risk maps for Bangladesh . Populace thickness and other socio economic information have been incorporated with hydrologic data to distinguish need zones for actualizing anti-flood measures . These studies were undertaken on a regional scale using coarse-resolution AVHRR imageries from NOAA satellites. The results of such investigations would only be useful for national level macro planning.

The concentrate of this paper is on singular settlements. Its motivation is to examine how the area of an individual settlement opposite the surge inclined zone and its financial attributes make it vulnerable against monsoon surges. The hypothetical system of this examination depends on the hypothesis that settlements are vulnerable against flood from three viewpoints. (1) Whether the people have access to relatively higher ground to take shelter during an extreme hydrological event. (2) Whether a settlement falls in a zone that is relied upon to encounter a high surge release causing remarkable harm of life and property; (3) whether the populace thickness of the range is sufficiently high to bring about immense loss of property even in a direct flood. The illustration utilized for this examination is Gangetic West Bengal, which is a natural flood prone area whose fluvial attributes have made it extremely appropriate for rice development. The populace thickness in this locale is one of the most astounding on the planet. Albeit human settlement is plenteous in this district, the nearby individuals generally settled just on moderately higher ground, referred to locally as Danga. Quickly expanding populace thickness, because of both common development and the convergence of a huge number of evacuees in the post-autonomy period from the then East Pakistan, left next to no decision for the general population to settle on higher ground specifically. Extreme deficiency of land has constrained individuals to settle aimlessly finished the exceedingly flood inclined zone. Landsat ETMC and ERS synthetic aperture radar (SAR) imageries are utilized as a part of this examination to group non-overwhelmed ranges and flood profundity inside overflowed zones, and to depict human settlements at village level. The high spatial resolution of satellite imageries enables us to obtain detailed classification results that are suitable for formulating planning measures on a small scale. An additional favorable position is that the high determination hydrologic data can be helpfully coordinated with statistic information gathered from smaller administrative units. This would significantly improve the capacity of the spatial database to assess vulnerability of individual settlements to an extraordinary flood event.

Flood vulnerability (National Perspective)

Pakistan is one of the most vulnerable country in south Asia with the highest annual average number of people expose to floods. Pakistan is prone to flood hazard and Pakistan has a bad history of flood in Pakistan, Pakistan is situated in Asian monsoon zone receives rainfall due to seasonal currents, originating heavy rainfall from Bay of Bengal. Pakistan in the last three years has experienced erratic monsoon behavior causing massive flooding. Experts view this trend in the larger manifests itself more frequently in Pakistan. Last twenty years data indicates that monsoon precipitation impact zone has gradually shifted 80 to 100 kilometers westwards towards Indus and Kabul basin in Khyber Pakhtunkhwa, from its traditional catchment areas Kashmir . Historically Pakistan has experienced 13 major floods since independence in 1947. The super floods of 2010 were unprecedented while 2011 rains/ floods in Sindh province were unique in their nature and magnitude. In

2012 again the country experienced inundation of a number of districts in Sindh, Baluchistan, and Punjab provinces due torrential rains and hill torrents from Koh-e-Suleman . Pakistan is a disaster prone country frequently faces a number of natural Hazards like floods, earthquakes, landslides, cyclones and droughts that affects lives and livelihood of its citizens. Pakistan receives rainfall from three types of weather systems namely (i) Monsoon depression from Bay of Bengal, India (the most important system) (ii) Westerly winds from the Mediterranean Sea and (ii) seasonal lows from the Arabian Sea. Flood usually occurs during monsoon season . Pakistan is located in trophic of Cancer this region has been termed vulnerable to disasters mostly to flood in monsoon. Further causes that enhance the vulnerability to natural event is due to extreme poor population, poor construction material used in infrastructures, isolated houses and other buildings particularly in rural areas, the role of fragile natural environment, poor livestock and agricultural practices, lack of communication infrastructure, critical facilities, weak early warning systems. Moreover, lack of education and poverty is increasing the vulnerabilities of communities over Pakistan in post disaster situation. Another important factor, which is playing a vital role in making Pakistan vulnerable, is its fragile natural environment in the upstream of Indus river basin. Deforestation in northern areas leading to soil erosion, which is highly contributing to intensification of floods and landslides. Today Pakistan is left with 4% of its forest and vegetation cover where the standard required is 25% that's why Pakistan is facing with high precipitation during monsoon seasons, another factor is arise in global average temperature which is contributing in the melting of Himalayan glaciers and adding to the intensification of flood and landslides risks .

Due to its topography, climatic and ecological conditions, Pakistan constantly received flooding almost every year some of these floods take dangerous turn of becoming major natural calamity. Pakistan has a long history of flooding from Indus River and its tributaries. Flood of 1928, 1929, 1955, 1957, 1959, 1973, 1976, 1988, 1992, 1995, 1996, and that of 1997, 2005, 2007, 2010, 2012, 2014 and 2014 are more important flood events entailing tremendous damages to the life and properties in country . The 2010 flood surpassed all the previous records of flood in Pakistan. The flood affected the area of 100000 sq. km, the death toll was near to 2000 and the number of injured persons were 2946 . Amid June 2007, the southern bank of Pakistan suffered by a violent cyclone Yemini that offered approach to heavy rains all through the region. Because of the substantial rains in different territories of southern Pakistan, flashflood happened in various locale of Baluchistan and Sindh regions. The floods were among the most exceedingly awful in the previous ten years and an expected 2.5 million individuals were effected, among them somewhere in the range of 250,000 people were made homeless. An aggregate 22,334 houses destroyed in Sindh and 57,640 in Baluchistan . The 2010 floods are one of the main devastating floods and positioned first in term of zone influenced, loss to physical financial and social infrastructure and deaths. The surge influenced the whole length of the nation for which over all recuperation and remaking cost related with the floods is evaluated at roughly US $ 8.74 billion to 10.85 billion, which included assessed cost for relief, early recovery, and medium to long term reconstruction . The 2010 floods are blamed for phenomenal monsoon rain. The precipitation abnormality delineates by NASA demonstrates bizarrely serious monsoon downpours ascribed to wonder of La Nina. The 2010 floods caused greatest damages in the territory of KPK, Punjab and Sindh. The first and second monsoon spell begins from 26th July to ninth of August 2010 reason enormous precipitation everywhere throughout the nation particularly in northern parts of the nation .

A Case Study of District Chitral:

Different groups using qualitative data from approximately 300 individuals in the district Chitral carried out a study. The study revealed that the lack of safety related practices at schools made the lives of the children at risk during various situations. Some other important factors, which they identified included the lack of integration and cooperation among different institutions, time taken to respond to such natural disasters and operational issues. Some of the nongovernmental organizations like AKDN has taken some strong steps and has indulged in various practice and processes. Such interventions bring about some positive results. These processes were implemented with the help and support of other nongovernmental organizations. Approximately 87 percent of union councils were targeted. Some of the initiatives taken included the setup and creations of community based emergency response teams. Approximately 39 percent of the total schools in the Chitral district is vulnerable to different natural disaster especially for flood it more vulnerable. The location and area where the schools are located could somehow make disaster relief operations slow. Besides these, most schools lack safety equipment such as medical equipment and other such equipment. Besides these, the school children, teachers and their parents are not properly trained for such natural disaster. The size of some of schools are not proper or they do not have right facilities installed inside for various situations. The local communities are not well educated about the different and various types of disasters. Similarly, they also do not have knowledge of how to carry out relief operations during different situations. Most of the villager's idea and practices are based upon the incidents and events that have been occurred in the past (Sultan; Mirza, Shahzad Ali; Batool, Sadiqa, 2010).

Flood Vulnerability (Local Perspective)

The recent flood 2010 have resulted in devastation across the country, on July 27 heavy rains started falling throughout Khyber Pakhtunkhwa province, impacting more than 1.5 million people, severely damaging at least 156,934 homes. The

most vulnerable population at present are women elders and children's . The process by which these conditions are created involves “vulnerability” and that vulnerability leads to disaster much more than normal environmental events. This “vulnerability process”, rather than being a quantitative snapshot in space and time, is not only about the present state, but also related to what we have done to ourselves and to others over the long term. Why and how we done that in order to reach the present state; and how we might change the present state to improve in the future. The physical, economic, social, and political factors determine people's level of vulnerability and extent of their capacity to resist, cope with and recover from hazards. Poverty is a major contributor to vulnerability. Because poor people are more likely to live and work in areas exposed to potential hazards, while they have less resources to cope when a disaster strikes. The level of vulnerability also differs through economic condition of a region; as rich people usually have great capacity to resist the impact of a hazard. They tend to be better protected from hazards and have preparedness system in place. Higher socio economic condition and secure livelihoods increase resilience and it also enables to recover more quickly from hazard. In Village Kotla Mohsan khan, strong Pardah is imposed on women in circumventing this can be challenging and requires positive actions by organizations e.g. recruiting staff creating practices and processes for women involvement, which can be resisted locally in disaster. Women in general may affected differently from men because of their social status, family responsibilities or reproductive role, but they are not necessarily vulnerable. They are also resourceful and resilient in crisis and play a crucial role in recovery.

Physical Vulnerability in the study area

The flood destroyed the houses, agricultural land, roads linking urban areas. Due to the inundation of water health problem arises (measles, inundated standing water smell, water flow to house hold latrines are unworkable) as a result of flood/silt drain blockages and the destructions of exterior (walls) which created lack of privacy, which is a hardship particularly for women who culturally observes Purdah.

Economic vulnerability in the study area

The overall flood impacts for this agriculture and livestock based economy is profound. Throughout the Union Council, fields were expected production damage to Maize (corn) crop, sugarcane, livelihood restoration to solidify recovery post-flood and re-establish the productivity of agriculture livestock system, on which the local economy is based. On the other hand, people linked with business their livelihood source was small shops, which were washed out by floodwater.

Social and attitudinal vulnerability in study area

For enhancing the mental preparedness and strengthening social norms it is imperative the methods applied consider culture condition for females, who are expected to function under purdah norm requiring privacy and separation in living, and most of the women gender lives dependent due to cultural restrictions.

CHAPTER 3

RESEARCH METHODOLOGY

Nature and procedure of the Study

The nature of the data used in this research is of descriptive nature. The results are both in numerical and descriptive form. The study investigated the flash flood vulnerability in the study area. Relevant review was gathered from different sources i.e. survey reports, electronic sources, internet and available data of different local organizations. Keeping in view, the available literature structured questioners were formulated. Quantitative data obtained through questionnaires was analyzed statistically through SPSS, MS Excel and MS Word.

Delimitation

The study is delimited to the targeted area on the subject of flood vulnerability assessment. Factors that lead to flood vulnerability and element exposed to flood hazard have only been included in the study and the rest of the aspects associated with the subject have been excluded. The study is limited to identify the status of only physical, social, economic vulnerabilities in the subject locality. Civil societies and other non-governmental organizations engaged in reconstruction and development after 2008 flood have excluded of the study.

Methodology

Sampling

In this research, sampling is concerned with selection of individuals from within the statistical population in the subject locality to estimate the targeted characteristics of the whole population. The cost of using sampling methodology is lower and the process of data collection is faster.

Sampling Technique

Stratified random sampling technique was used in this research to collect the data from the subject area. In stratified random sampling age and profession wise strata were made.

Sample size

40 respondents were selected as sampling size for this study. In which 10 were female and 30 males. 10 were teachers and students, 10 Govt. servants, 10 farmers, 5 businesspersons while 5 were homemakers.

Data Collection

Descriptive survey method was used for this study in order to achieve the objectives of the study. In this study, data was collected from two sources.

Primary data

Primary data was collected directly from the field using pre-structured questionnaires and through field observation, FGDs and through transect walk with the community members

Secondary data

In order to get through information regarding the problem secondary data was collected from various sources i.e. research reports, books, articles, survey reports, and different organizations websites.

Tools and Techniques for data Analysis

The primary data collected from the field was analyzed through SPSS, MS Excel, and MS Word. After putting data in MS Excel and SPSS the required tables and graphs were drawn accordingly. The graphs and tables were then copied to MS Word for interpretation.

Ethical Consideration

The aims and objectives of the study was fully explained to the local respondents and other organizations. Privacy of the respondent was ensured. The required data was acquired through proper channel. As some of the respondents were illiterate so each question in questionnaire was discussed in detail with every single respondent by the researcher in its true essence. The respondents were selected on volunteer bases. Local and general norms of society and culture were considered while asking questions from respondents.

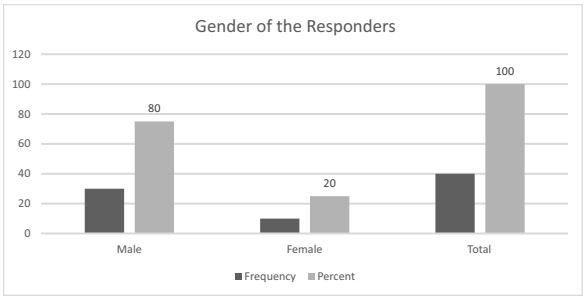
CHAPTER 4

RESULTS AND DISCUSSIONS

The target of this study were to identify the major causes of flash flood vulnerability, to identify elements at risk to flash flood hazard, to identify physical, social, economic and attitudinal vulnerabilities in the study area. 40 Respondent were selected from the whole population and were engaged through stratified random sampling technique. The data collected through questionnaire and field observation was then processed through SPSS version 23 and MS Excel and at the end copied to MS Word.

Interpretation

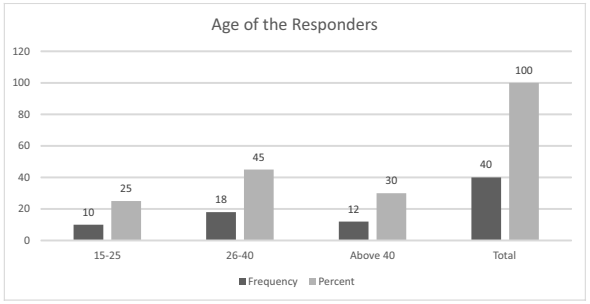
Gender play an important role in the increased or decreased vulnerability. It has been suggested that 'women always tend to suffer most from the impact of disasters (UN/ADPC 2010: 8). The high vulnerability of women is attributed to the weak physical and socioeconomic condition due to which they are more vulnerable as compared to the men. To conduct flash flood vulnerability assessment, the data is collected through stratified random sampling with the help of questionnaires from the 40 responders among which 80% are male with the frequency of 30 and 20% are female with frequency of 10.



Graph : Gender

Interpretation

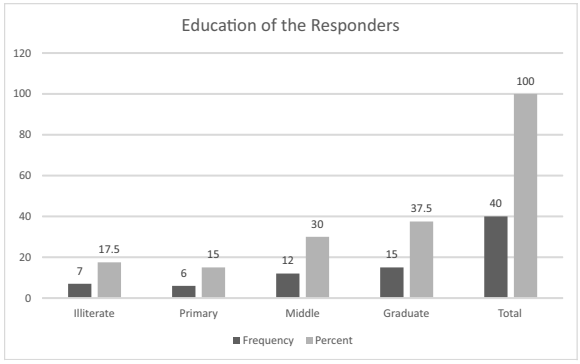
The questionnaires were distributed for the purpose of data collection of various variables among the responders of different age. 25% were of the age between 15-25 with frequency of 10, responders aging 26-40 were 45% with frequency 18 and above 40 years responders were 30% with frequency of 12. Age is directly linked with the flash flood vulnerability; children have high vulnerability which are below the age of 18 due its weak physical, biological features and less knowledge regarding the adverse consequences and adaptive measures against floods. Aged peoples have also high vulnerability due to physical weakness and dependency syndrome although they have better knowledge as compared to the rest because they have experienced floods several times before which help them during flood. Surveys in Latin America and the Caribbean show that 8 in 10 older people remain functionally independent despite having a disability . Older people can make positive contributions during times of crisis.



Graph : Age

Interpretation

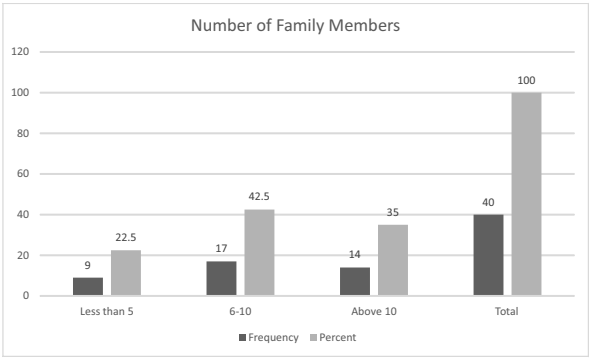
For flash flood vulnerability, the education is one of the most important component in identifying the social vulnerability of the community. Education have indirect (inverse) relation with the vulnerability if the education level is high it means that low vulnerability and if education status is low it shows that the community have high social vulnerability to flood. In the study area respondent were ask about their educational status.40 respondents were entertained through stratified random sampling technique. Among the responder 17.5 % were illiterate with frequency of 7, 15% were educated up to primary level with the frequency of 6, 30% responders educational status was up to middle with frequency of 12 while 37.5% educational level was graduated with the frequency of 15.



Graph : Education

Interpretation

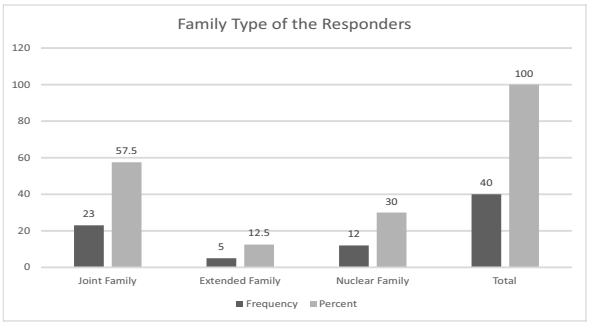
For identifying the social vulnerability of the community, it is important to find out the family size or number members in the family. It has direct relation with the flash flood vulnerability, like if the number of members in the family is high so the family will be more vulnerable and vice versa.40 Respondent were asked about the number of member in their family through stratified random sampling technique. 22.5% responders have less than 5 members in their family with frequency of 9, 42.5% have family members about 6 to 10 with frequency of 17, while 35% responders have above 10 family members with the frequency of 14.



Graph : Family Members

Interpretation

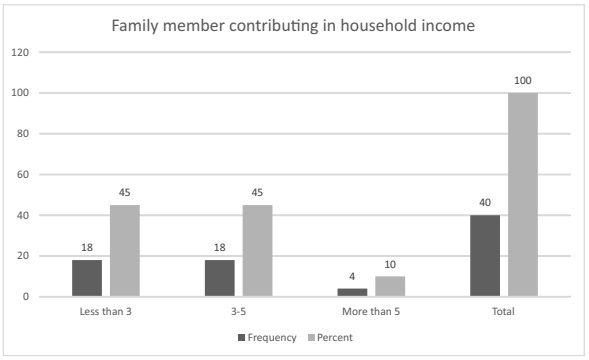
In the assessment of social vulnerability family type is one the component which can measure the level of their vulnerability e.g. a person living in joint family type will have less vulnerability and in nuclear family the person suffers the loss individually which makes him more vulnerable to flash flood. 40 responders were asked about their family type through stratified random sampling. Among the 40 responder 57.5% have joint family type with frequency of 23, 12.5% have extended family type with frequency of 5, while 30% have Nuclear family type with frequency of 12.



Graph : Family Type

Interpretation

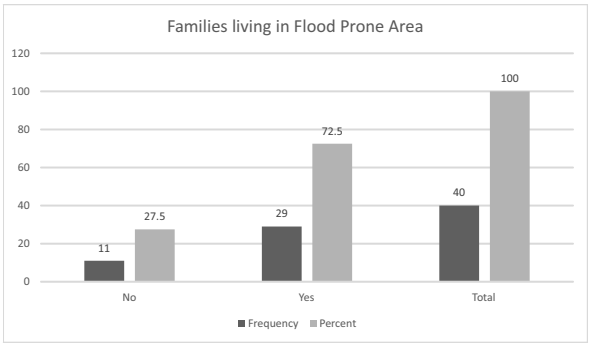
For flash flood vulnerability assessment, it is important to identify that how many members are contributing in the family income, more the members contribute in family income will have less vulnerability while less members contributes in family income will have high vulnerability. 40 responders were asked about their number of individual who are contributing in their family income. The technique used for data collection was stratified random sampling. Among 40 responders 45% answered that less than 3 members are contributing in their family income with frequency of 18. 45% answered that 3 to 5 individuals are contributing in their family income with the frequency of 18. While 10% of the responders answered that more than 5 family members are contributing in their household income with the frequency of 4.



Graph : Household income

Interpretation

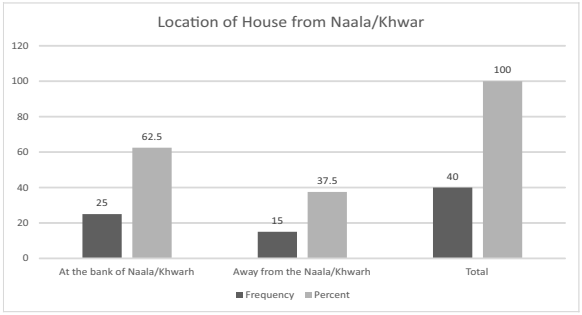
This is the indicator relevant for the direct vulnerability of the people. The indicator will assess whether the people are affected by every small flood in their community (they live in a highly flood prone area) or not even by extreme floods (they do not live in a flood prone area). Families which were living in the flood prone area of the highest level of floods were 72.5% (with frequency of 29). While 27.5% (with frequency of 11) were in the area where there is little or no chance of floods and their damages, which make them less vulnerable as compared to the other families that are living in the high flood zones that have high vulnerability.



Graph : Household income

Interpretation

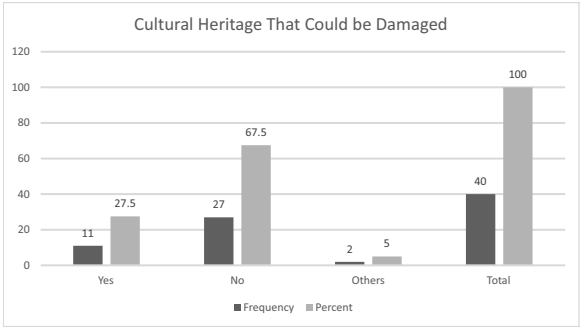
For identifying the physical vulnerability, it is important to know the location of the infrastructures or houses, the closer towards Naala/Khwar will have very high vulnerability and vice versa. 40 responders were entertained with stratified random sampling technique. 62.5% responders with frequency of 25 answered that their houses are at bank of Naala/Khwarh (Torrent), 37.5% responders with frequency of 15 answered that their houses are away from Naala/Khwarh.



Graph : Locations of Houses

Interpretation

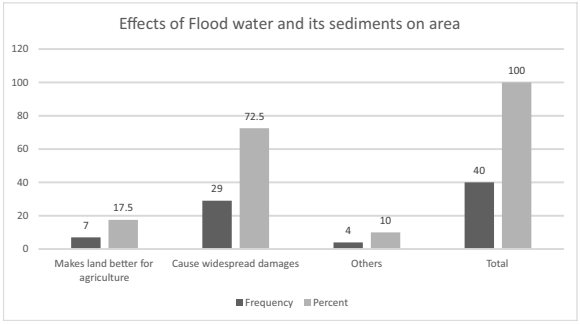
The indicator 'Cultural heritage' consists of cultural heritage, religious places like churches, mosques and historical sites and monuments. When assessing this indicator, it is about the presence of any cultural heritage that could be irreversibly damaged by a flood and about the importance for the people in the community. There are various infrastructures in the community that belong to the ancestors or traditional norms and values like Hujras and Mosques that also act as community centers, lies in the cultural heritage category. When the responders in the community were asked about if there is any cultural heritage that could be damaged then 67.5% (with frequency of 27) said that there is no cultural heritage that could be damaged while 27.5 accepted that yes there are cultural heritage which are in danger and are affected before severely. While 5% of the responders (with frequency of 2) claimed that there is some other valuable heritage that could not be recovered if they are damaged once.



Graph : Cultural heritage

Interpretation

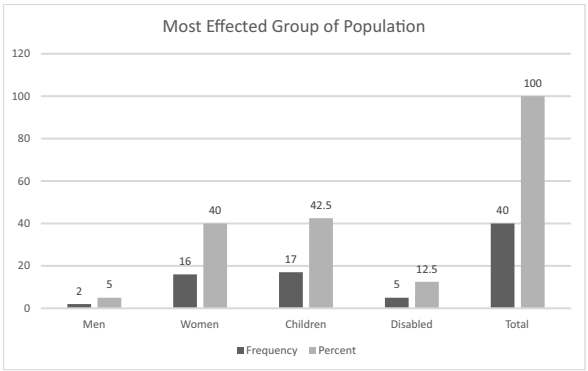
Flood water or flooding leaves behind both positive and negative effects on the area which is flooded. Sometime flooding make area better for agriculture because it brings fertile soil along with itself which increase the production of crops while contrary it also causes widespread damages when it inundates the area that is usually dry land destroying agricultures field and other valuable infrastructure. When the responders were asked about the effects of flood water then 17.5% (with frequency of 7) claimed that such water makes land better for agriculture and majority 72.5% (with frequency of 29) said that it cause widespread damages that are unbearable for the community and its dwellers. 10% Others (with frequency of 4) said that the effects are 50-50, for example they said that the losses are equal to the production of the crops after floods other than lives of the human beings.



Graph : Effects of Flood water

Interpretation

Effects of floods are not same on the different groups within the community as well as the vulnerability. In flash flood vulnerability assessment, it is important to find out the most vulnerable people and it can be only possible if we have past data of most effected people in flood. When 40 responders were asked about mostly effected people in case of flood in the study area so 5% responders with the frequency of 2 answered that Men are mostly effected from flood, 40% responders with frequency of 16 answered that Women are most effected from flood, 42.5% responders with frequency of 17 answered that children are most affected. While 12.5% responders with the frequency of 5 answered that disabled people are mostly effected. However, from this data, we can identify that women and children are the most vulnerable groups.

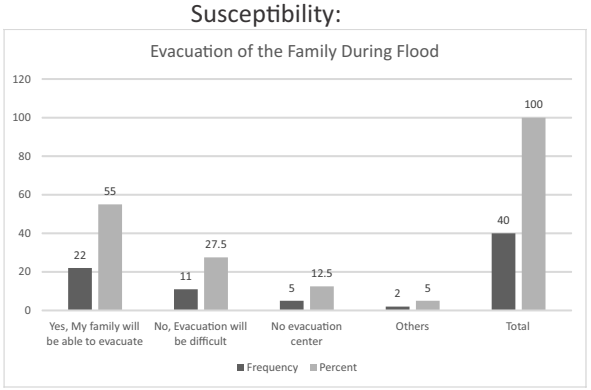


Graph : Effected Group of Population

Susceptibility:

Interpretation

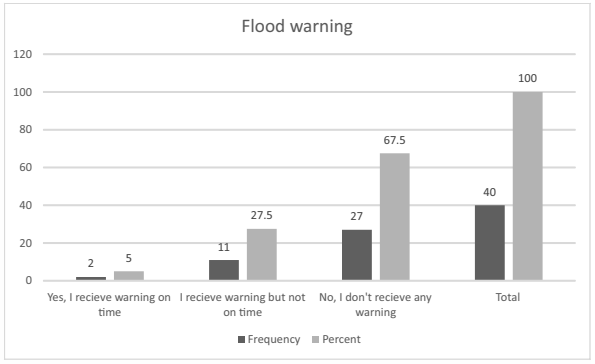
Evacuation before and during flood play an important role in minimizing the casualties, damages and as well as vulnerabilities. If there is an identified evacuation routs and centers well before the flood in the community, then timely and effective warning can give enough time to evacuate with cattle and other valuables. In flash flood vulnerability assessment, it is important to know that whether evacuation of the families is possible or not. If evacuation is possible then it leads to low vulnerability and vice versa. 40 respondents were asked about the evacuation then 55% with frequency of 22 said that yes their evacuation is possible and 27.5% with frequency of 11 said that no their evacuation will be difficult due to proximity of their location to Naala or Khwar. While 12.5% with frequency of 5 said that their village or community has no evacuation center. 5% others with frequency of 2 said they live far away from the Naala so they don't need any type of evacuation



Graph : Evacuation

Interpretation

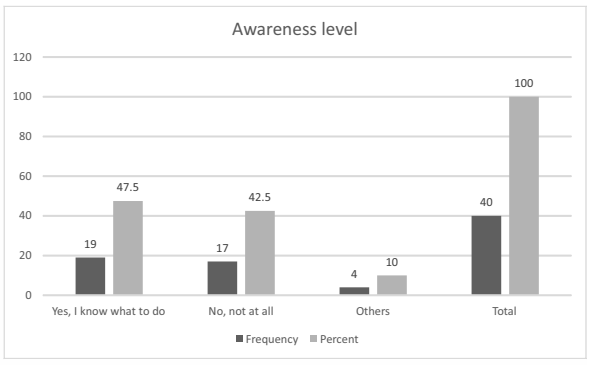
The indicator 'Warning system' indicates the speed of the flood warning or forecast, but also the quality and accuracy of the details about the overall danger or the depth, velocity or duration of the upcoming flood. If there is any early warning mechanism installed for flood, then it provides sufficient time to evacuate with valuables and if community lack such system then its vulnerability is further increased. When 40 responders were asked about early warning system that if they get before flood then only 5% with frequency of 2 said that yes they receive warning about flood from their friends via call or SMS or by firing a bullet. 27.5% with frequency of 11 said that they receive warning but not well before flood occur and is useless. While majority of the responders 67.5% with frequency of 27 claimed that they don't receive any kind of warning..



Graph : Warning

Interpretation

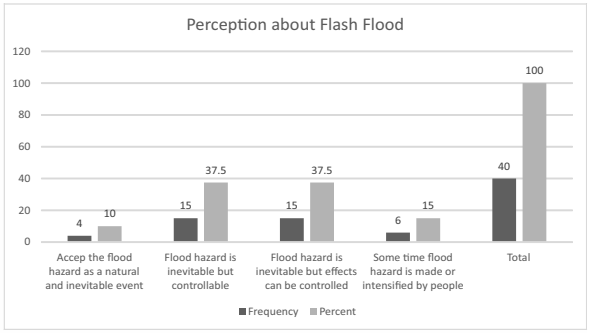
'Awareness' consists of the actual awareness of the people in the commune and of a training they did or things like manuals or instructions which causes the people to know what to do when the area floods. Awareness regarding every hazard is directly linked with the vulnerability to that hazard. If awareness level is high then it means less vulnerability and when awareness level is low, it further enhances vulnerability. Awareness level regarding flood vulnerability was examined in flash flood vulnerability assessment then the responses were like that. 47.5% (with frequency of 19) responded that yes we are aware and we know that what to do when flooding occur which means low vulnerability while 42.5% (with frequency of 17) said that they are not aware of what to do during and after flooding. Majority of them were female which further enhance their vulnerability. 10% others (with frequency of 4) said that flooding is not a serious phenomenon and we have other major problems in the community which should be identified and resolved.



Graph : Awareness level

Interpretation

For the flash flood attitudinal vulnerability assessment one of the most important component is the community people perception about flood. If the community people deny the flood hazard existence it means they have high vulnerability, if they accept the

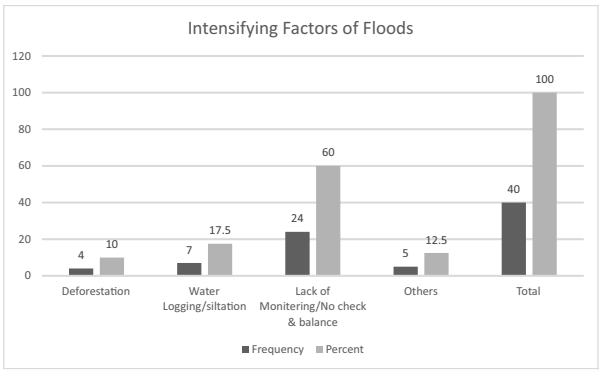


Graph : Perception

flood hazard as natural and inevitable event so they have less vulnerability. In the study area 40 responders were asked about their perception about flood in which 10% responders with the frequency of 4, they accepted the flood hazard as a natural inevitable event. 37.5% with frequency of 15 said that flood hazard is inevitable but controllable. 37.5% with frequency of 15 said that flood hazard is inevitable but effects can be controlled. While 15% with frequency of 6 claimed that sometime flood hazard is made or intensified by the people.

Interpretation

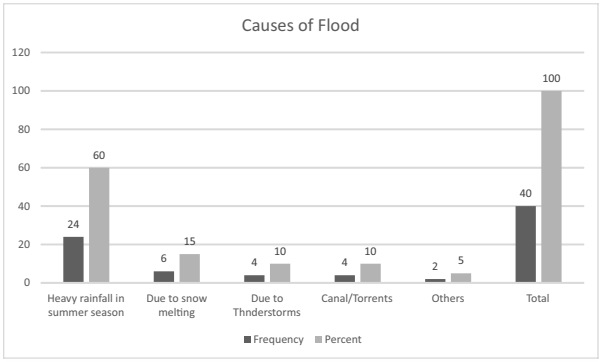
For finding out the flash flood physical vulnerability, it is very crucial to find out the intensifying factors of flood. That factor can result in high vulnerability. When 40 responders were asked about the intensifying factors for flood in the study area through stratified random sampling technique. 10% responders with frequency of 4 answered that deforestation is the intensifying factor, 17.5% responders with frequency of 7 answered that water logging and siltation is the intensifying factor for flood while 60% responders with the frequency of 24 answered that lack of monitoring/ no check and balance is the intensifying factor for flood. While 12.5% others with frequency of 5 sated that the community people are main reason behind flood. Therefore, from this we can conclude that due to lack on monitoring and no proper check and balance on flood protection measure it increases the chances of flood in the study area and the community become vulnerable to flood due to such factors.



Graph 16: Intensifying Factors

Interpretation

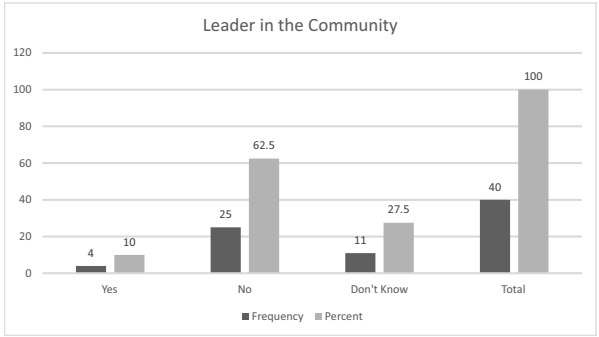
In the process of flash flood physical vulnerability assessment, it is important to know the root causes of flood in the community. When the root causes are known then we can relate it to the vulnerability of the community. E.g. if the root cause is heavy rainfall in summer season then we can analyze easily that the community to vulnerable to flood in case of heavy rainfall during summer season, or the vulnerability can also be linked with the canal/torrent and with other physical components. Among 40 responders 60% with the frequency of 24 they think that flood is caused by heavy rainfall in their village while 15% with the frequency of 6 thinks that flood is caused by snow melting in the upper northern areas. 10% with the frequency of 4 thinks that flood is caused due to thunderstorms. 10% with frequency of 4 claimed that flood is caused due to canal/torrents that are flowing in the community. While 5% with frequency of 2 marked Other reasons of the flooding.



Graph 17: Causes

Interpretation

For flash flood vulnerability assessment, it is also important to find out the social vulnerability. In social vulnerability, it also important to find out the leader in the community. Presence of a leader in community can guide and coordinate all the flood related arrangements properly. If a community have leader so it means that they have less vulnerability and vice versa. In study area, 40 responders were asked about the existence of leader in their community so 10% responders with the frequency of 4 answered that yes they have leader in the community while 62.5% responders with the frequency of 25 answered that there is no leader in the study area. While 27.5% responders with the frequency of 11 answered that, they do not know about the leader in the community.

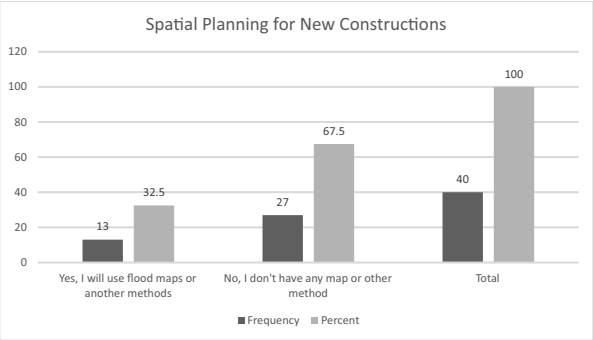


Graph 18: Leader

Interpretation

It indicates the amount of spatial planning, for example using a flood danger map when deciding which land to use for which

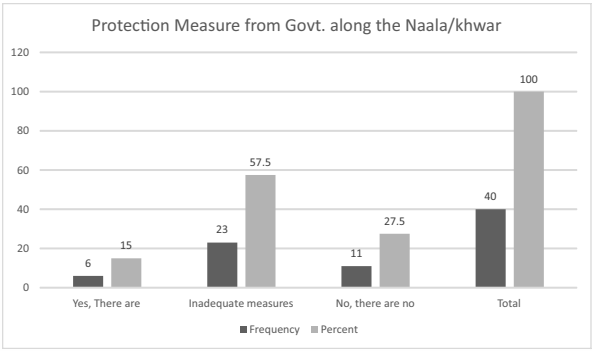
purposes. It is a necessary component to identify the attitudinal vulnerability that if the community members know land use planning. It reduces the vulnerability of the dwellers if they use flood plains through proper land use planning. When 40 responders were asked about such planning then 32.5% of the responders with frequency of 13 said that yes they will use flood maps or another method for their constructions while 67.5% with frequency of 27 claimed that no they don't have any flood maps or other means to plan for their construction.



Graph 19: Spatial Planning

Interpretation

It indicates the need for and the provided flood protection measures by the government, for example dams, dikes, pumping stations, drainage systems, levees and reservoirs for water storage. If there are mitigation and protection measures along the waterbody then it reduces the vulnerability of that community to the flood danger, which can arise from that water body. If there are no such measures, then it escalates the chances of damages leaving the population highly vulnerable. When the responders were asked about the protection measures along the Naala or Khwar then only 15% with frequency of 6 were satisfied with the protection measures that were taken along the Naala and 57.5% with frequency of 23 claimed that there are measures but they are inadequate and fails to protect the community and agricultural land from flood. While 27.5% with frequency of 11 stated that No there are no measures taken on Naala or Khwar near their settlements.

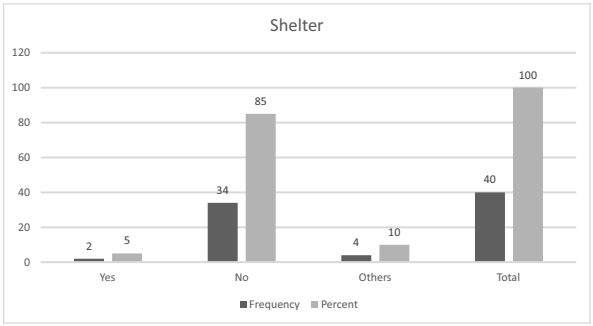


Graph 20: Protection measure

Resilience/lack of Resilience:

Interpretation

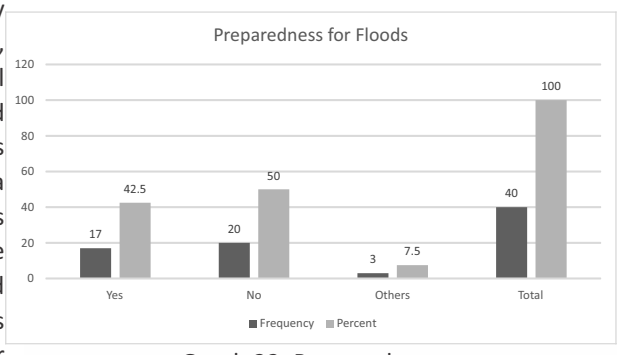
It indicates the availability of shelters such as high grounds, hospitals or other places where the affected people can seek shelter during and after the flood. If there are enough places available for shelter, then it decreases the vulnerability to floods and if not then it will lead to high vulnerability. 40 responders were asked about if any kind of shelter is available to them then only 5% with frequency of 2 said that yes they can manage shelter and majority 85% with frequency of 34 claimed that there is no shelter available for them if high exceptional floods like 2010 occurred.



Graph 21: Shelter

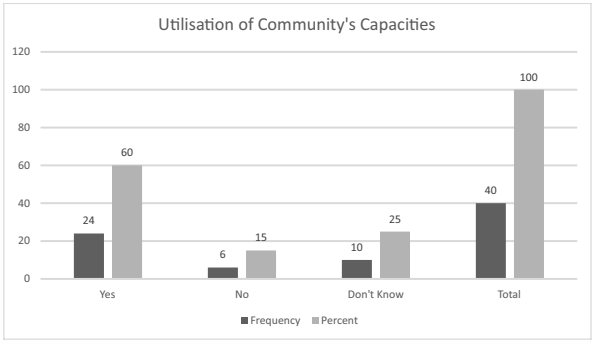
Interpretation

There is a major role of preparedness in the vulnerability to any type of hazard. Characteristics like awareness, having a solution, taking individual measures, or having food available in storage all indicate a level of preparedness. These characteristics are merged in this research to the indicator 'Preparedness'. If preparedness level is high, then it will result in low vulnerability because a prepared person or community will suffer fewer losses as compared to those who are not. Preparedness are all those measures, which enable the individuals, communities and government to respond rapidly and effectively to the disastrous situation. 40 responders were asked about their preparedness for flood then 42.5% with frequency of 17 said that yes they have experienced floods many times and are now prepared for floods and know what to do. And 50% with frequency of 20 said that no they are not prepared for the flood and they don't know what to do. Majority of them were women. While 7.5% with frequency of 3 said that they are less prepared and are unsatisfied from there preparedness to flood.



Graph 22: Preparedness

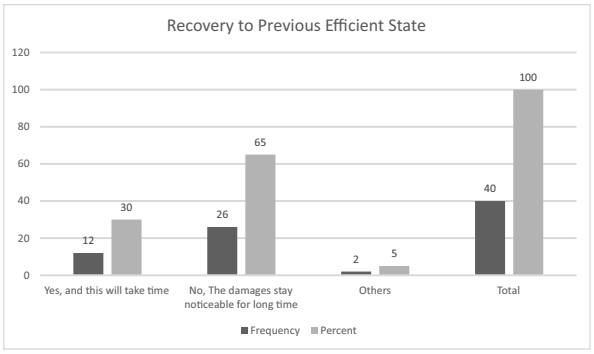
Interpretation



Graph 23: Utilisation of Capacities

In flash flood vulnerability assessment once it is identified that there are capacities available in the community, then it is important to identify that the available capacities can be utilized in the community or not. If the capacities are utilized it results in low vulnerability of community and vice versa. When the responders were asked about the utilization of resources that are present in the community regarding flood then 60% responders (with frequency of 24) responded positively with 'Yes' that the resources can be utilized to prevent, mitigate and prepare for the adverse impacts and consequences of the floods. 15% (with frequency of 6) believed that no such capacities are there in the community or they were unsatisfied and not sure about the potentials that can help during and after floods. While 25% of the responders (with frequency of 10) said, they do not know about any capacities that are available in the community.

Interpretation



Graph 24: Recovery

The time span of recovery from any previous disaster is directly linked with the higher or lower vulnerability. Indicates the amount of time needed for recovery to the previous efficient state. It consists recovery of infrastructure, communication lines, businesses, jobs and houses. If recovery take too much long time from previous time, then it means that the vulnerability of that community is much higher and when the recovery time period is of short duration envisage low vulnerability. It is the important component of flash flood vulnerability assessment to identify whether the recovery process take how much time. 40 responders were asked about the recovery from previous efficient state then 30% of the responders with frequency of 12 said that yes, they can be recovered easily and will take little time and majority 65% of the responders with frequency of 26 said No the damages stay noticeable for long time will take time to recover. While 5% others with frequency of 2 recorded their answer that they don't know about the recovery because they haven't experienced flood related damages nor about the recovery.

Interpretation

To find the social vulnerability in flood vulnerability assessment it is necessary to identify the cooperation level among the members in the community during flood. Strong bonding and cooperation level indicates less vulnerability while no cooperation leads to higher vulnerability and chances of damages and casualties are higher. 65% responders with frequency of 26 said that cooperation among the community members and 30% with frequency of 12 denied that no cooperation exist during and after floods. While 5% others with frequency of 2 said that cooperation exists but during the tense and horrific situation of flood everyone has to take care of themselves and cannot be relied on others.

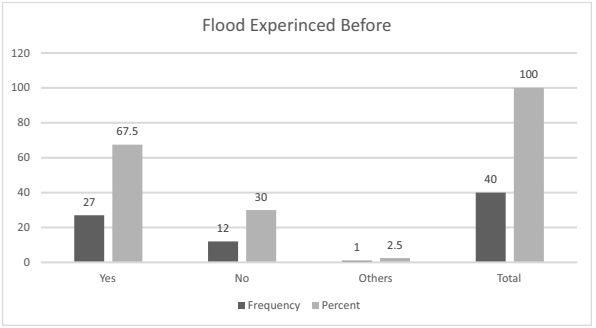
Interpretation

To calculate the social vulnerability assessment for flood it is also important to find out the existing conflicts in the community. If the community is exposed to more conflicts, so such type of community will have very high vulnerability and vice versa. When 40 respondents were asked about the existing conflicts in the study area then 37.5% with frequency of 15 answered that there is ethnic conflict in the study area. While 12.5% responders with frequency of 5, they answered that there is belief conflict, 10% responders with the frequency of 4 answered that there is caste

conflict, while 12.5% responders with the frequency of 8 answered that ideology conflicts exists in the study area. 27.5% responders with the frequency of 11 answered that there are no conflicts in the study area.

Interpretation

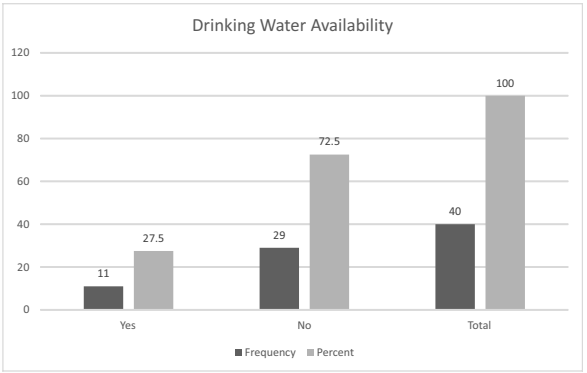
Experience makes it easier for people to come up with solutions to avoid or cope with floods. If a person has experienced floods before, then he will be aware about the negative impacts of flood. He will be experienced in what to do before, during and after floods. Such kind of experience decrease the vulnerability of that person as compared to the person who has never experienced flood. Among the 40 respondents selected through stratified random sampling, 67.5% responders with frequency of 27 said that yes they have experienced floods before several times while 30% with frequency of 12 has not experienced floods personally because they were far away from the flood prone area. While 2.5% others with frequency of 1 said that they have experienced floods but were not affected.



Graph 27: Flood Experince

Interpretation

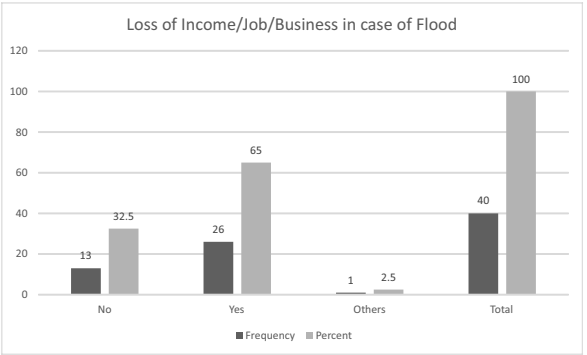
Flood contaminates all the water resources including underground water and tap water, which cause different diseases in the form of secondary hazards that further enhance the vulnerability of the already effected population. If pure drinking water is not available after flood, then it leads to higher vulnerability and vice versa. 40 responders were asked about the availability of pure drinking water then 27.5% of the responder with frequency of 11 said that yes they manage pure drinking water after flood while majority 72.5% with frequency of 29 said that they are deprived from pure drinking water after floods.



Graph 28 : Drinking Water

Interpretation

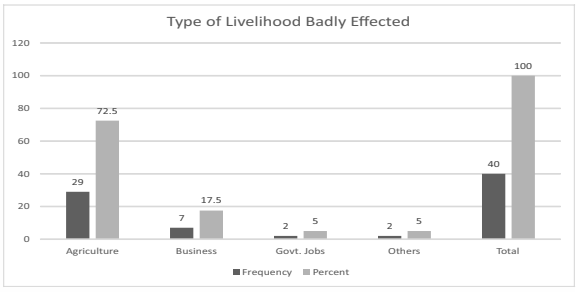
For flash vulnerability, it is important is to assess that if the dwellers of the community lose their income, job or business in case of flood. If their livelihoods lie in flood plain and there are chances to lose then they have high economic vulnerability, because it cannot be easily restored. When 40 responders asked about whether they can lose their income, job or business then 32.5% with frequency of 13 said that no they would not lose, majority of them were government servant. Majority of 65% with frequency of 26 said that yes they will lose their income because their sources were either agriculture or shops in their own villages. While 2.5% others with frequency of 1 said that they will also lose their income but they have alternative sources which can carry out their daily routine expenses.



Graph 29: Loss of Income/Job/Business

Interpretation

For identifying the level of vulnerability, it is important to identify the source of income or livelihood that is likely to effected most. If the person has source of income from agriculture or farming so that person will have high vulnerability because agriculture sector has more chances to get effected from flood as compare to other income

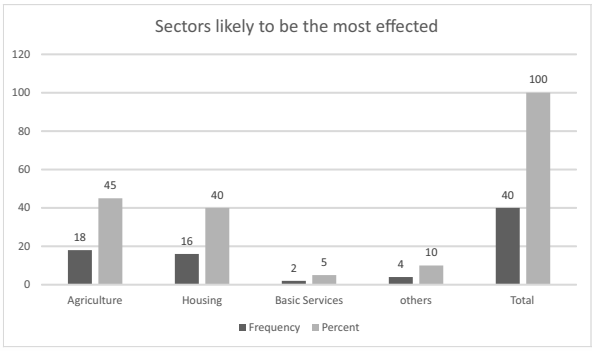


Graph 30: Livelihood Badly Effected

sources like government jobs and business. Among 40 responders 72.5% responders source of income is from agriculture with frequency of 29, while 17.5% source of income is from businesses that they own with the frequency of 7. On the other hand, 5% responder's source of income is associated with government jobs with the frequency of 2. While 5% responder's source of income is from other sources with frequency of 2.

Interpretation

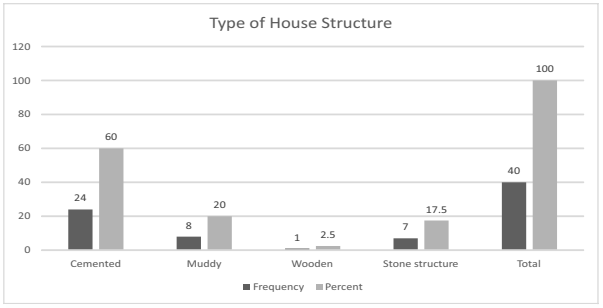
Another important component in finding out the flash flood physical vulnerability is to find out the sectors likely to be the most affected. Those sector who are more likely to be effected that sector will have high vulnerability. 45% responders with frequency of 18 answered that agriculture sector is likely to effected in the study area. 40% responders with the frequency of 16 answered that housing sector is likely to be effected from flood in the study area. Basic services 5% with frequency of 2 responder answered that it is likely to be effected but 10% responder with frequency of 4 answered that there is other sector which is likely to be effected. From this, we concluded that most vulnerable sectors are agriculture and housing sectors, which are more likely to effect from flood, after agriculture and housing sectors other basic services and commodities are the vulnerable most that are likely to be effected from flood.



Graph 31: Most effected Sector

Interpretation

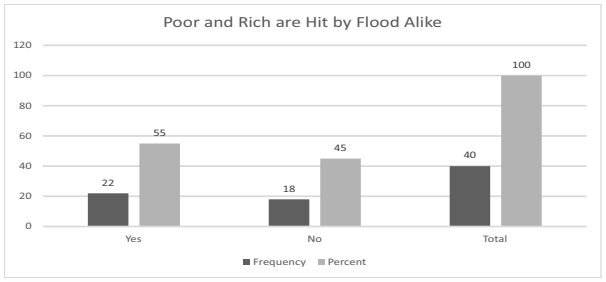
In flash flood physical vulnerability assessment, house structure type is another important component, if a house is made up of mud so that house is more vulnerable as compare to the cemented one. 60% responders with the frequency of 24 answered that they have cemented house structure; while 20% responders with frequency of 8 answered that they have muddy house structure. 2.5% have wooden structure with frequency of 1. The percent of the responders having stone structured house are 17.5% with frequency of 7.



Graph 32: House Structure

Interpretation

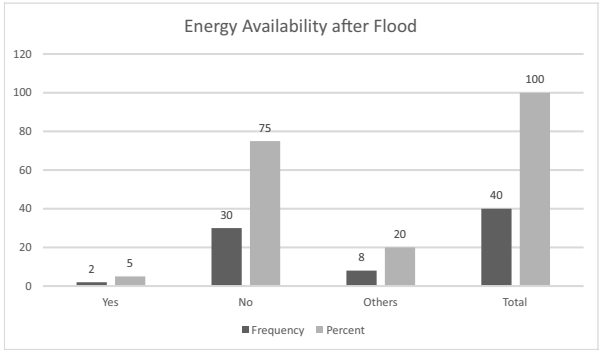
When floods hit a community, it does not discriminate between rich and poor but effects vary among the different groups. For flash flood vulnerability assessment, it is important to find out that what community think about the effects of flood on rich and poor and whether they are hit alike or not. Therefore, 55% responders with the frequency of 22 answered that yes poor and rich are hit by flood alike in the study area. While 45% with frequency of 18 said that No the effects are not same and vary among the rich and poor.



Graph 33: Poor and Rich

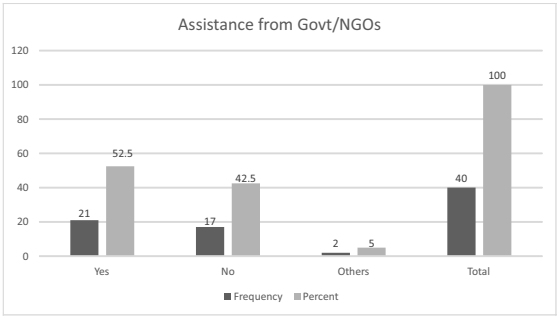
Interpretation

When floods occur, everything is disrupted including communication, transportation, sanitation and other basic utilities and services. In such crucial circumstances energy (coal, gas, petroleum, electricity) availability become scarce which negatively effects daily life routine and activities, which further enhance the vulnerability of the effected population. When the responders were asked about energy availability after floods, then only 5% responders with frequency of 2 said that yes energy is available after floods and majority 75% with frequency of 30 said that there is no energy available for daily life utilization. While 20% others with frequency of 8 replied that they somehow manage energy resources from other sources to continue daily life activities.



Graph 34: Energy Availability

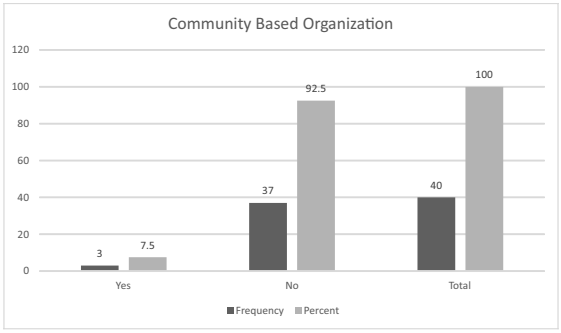
Interpretation



Graph 35: Assistance provided

Assistance provided by government or non-government organizations is directly linked to the vulnerabilities that arise after flood in form of secondary hazards. If the community is assisted with food, medicines, shelter etc then the community is less vulnerable as compared to the community not assisted by any government or non-government organizations after flood. The study area was severely affected by floods in Aug 2008 and 2010. When the responders were asked about any such assistance provided then 52.5% with frequency of 21 said that yes, they have been assisted and 42.5% with frequency of 17 claimed that they have not received any kind assistance. While 5% others with frequency of 2 said that they have received the assistance but were inadequate and useless.

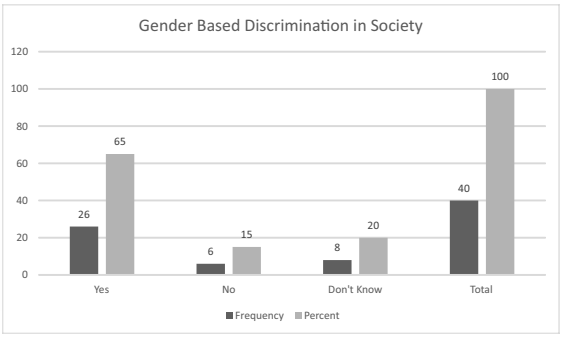
Interpretation



Graph 36: CBO

In the process of identifying, the social vulnerability to flood the most important component is the community-based organization. If there is community based organizations so that on right time they can respond to the flood effected area and they can save live and damages. If there is community based organizations so it means that the community have less vulnerability and vice versa. In the study area 7.5% responders with the frequency of 3 answered that yes there is community based organization while 92.5% responders with the frequency of 37 answered that No their community don't have any community based organizations.

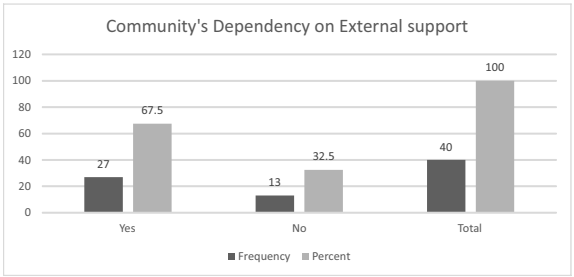
Interpretation



Graph 37: Gender Based Discrimination

For the calculation of social vulnerability to flash flood it is also important to find out that is there any gender based discrimination in the community or not. If yes, then it means that such area is more vulnerable to flood and vice versa. Such discrimination leaves behind women in various lifestyles including trainings, awareness and access or control over resources. In the study area 40 responders were asked that, Is there any gender based discrimination or not so 65% responders with the frequency of 26 answered that yes there is gender based discrimination. 15% responders with the frequency of 6 answered that No there is no gender based discrimination while 20% responders with the frequency of 8 answered that they don't know about the gender based discrimination in the study area.

Interpretation



Graph 38: Community's Dependency on External support

For flash flood vulnerability assessment, one of the most important component is the dependency of community on external support in case of flood. It has direct relation with the vulnerability, more dependency on external support resulting in high vulnerability and vice versa. In the study area, 40 responders were asked to answer about the dependency of community on external support so 67.5% responders with the frequency of 27 answered that yes community is dependent on external support, while 32.5% responders with the frequency of 14 answered that No community is not dependent on external support.

Low Medium High

I#	Exposure (Indicators)	%age	Vulnerability
1	Families living in Flood Prone Area		High
	1) No	27.5%	
	2) Yes	72.5%	
2	Location of the house from Naala/Khwar		High
	1) At the bank of Naala/Khwar	62.5%	
	2) Away from the Naala/Khwar	37.5%	
3	Cultural heritage that could be damaged		Low
	1) Yes	27.5%	
	2) None	67.5%	
	3) Others	5%	
4	Effects of Flood water and its sediments on area		High
	1) Makes land better for agriculture	17.5%	
	2) Cause widespread damages	72.5%	
	3) Others	10%	
5	Most affected Group of Population		High
	1) Men	5%	
	2) Women	40%	
	3) Children	42.5%	
	4) Disabled	12.5%	
II#	**Susceptibility (Indicators)**		
6	Evacuation of the Family During Flood		Med
	1) Yes, My family will be able to evacuate	55%	
	2) No, Evacuation will be difficult	27.5%	
	3) Our village has no evacuation center	12.5%	
	4) Others	5%	
7	Flood warning/forecast		High
	1) Yes, I receive the warning on time	5%	
	2) I receive warning but not on time	27.5%	
	3) I receive warning but not on time	67.5%	
8	Awareness		Med
	1) Yes, I know what to do	47.5%	
	2) No, not at all	42.5%	
	3) Others	10%	
9	Perception about Flash Flood		Med
	1) Accept the flood hazard as a natural and inevitable event.	10%	
	2) Flood hazard is inevitable but controllable	37.5%	
	3) Flood hazard is inevitable but effects can be controlled	37.5%	
	4) Sometime flood hazard is made or intensified by people	15%	
1	0Intensifying Factors of Floods		High
	1) Deforestation	10%	
	2) Water logging/Salinity	17.5%	
	3) Lack of monitoring/No check and balance	60%	
	4) Others	12.5%	

11	Causes of flood			High
	1)	Heavy rainfall in the summer season	60%	
	2)	Due to snow melting	15%	
	3)	Due to thunderstorms	10%	
	4)	Canal/torrents	10%	
	5)	Others	5%	
12	Any Leader in the community			High
	1)	Yes	10%	
	2)	No	62.5%	
	3)	Don't know	27.5%	
13	Spatial Planning for New Constructions			High
	1)	Yes, I will use flood map	32.5%	
	2)	No, I don't have maps	67.5%	
14	Protection measures provided from Govt.			High
	1)	Yes, there are measures	15%	
	2)	Inadequate measures	57.5%	
	3)	No measures	27.5%	
III#	**Lack of resilience/Resilience (Indicators)**			High
15	Shelter			
	1)	Yes	5%	
	2)	No	85%	
	3)	Others	10%	
16	Preparedness for flood			High
	1)	Yes	42.5%	
	2)	No	50%	
	3)	Others	7.5%	
17	Utilization community's capacities			Low
	1)	Yes	60%	
	2)	No	15%	
	3)	Don't know		
18	Recovery to the previous efficient state			High
	1)	Yes, and this will take little time	30%	
	2)	No, the damage stays noticeable for a long time	65%	
	3)	Others	5%	
19	Cooperation among community members			Low
	1)	Yes	65%	
	2)	No	30%	
	3)	Others	5%	
20	Conflicts Present in community			High
	1)	Ethnic	37.5%	
	2)	Belief	12.5%	
	3)	Caste	10%	
	4)	Ideology	12.5%	
	5)	None of these	27.5%	

21	Flood Experienced Before			Low
	1)	Yes	67.5%	
	2)	No	30%	
	3)	Others	2.5%	
22	Drinking water available after a flood			High
	1)	Yes	27.5%	
	2)	No	72.5%	
	3)	Others	0%	
23	loss of income/job/business in case of flood			High
	1)	No	32.5%	
	2)	Yes	65%	
	3)	Others	2.5%	
24	Type of livelihood badly affected			High
	1)	Agriculture	72.5%	
	2)	Business	17.5%	
	3)	Govt. jobs	5%	
	4)	Others	5%	
25	Most affected sector			High
	1)	Agriculture	45%	
	2)	Housing	40%	
	3)	Basic services	5%	
	4)	Others	10%	
26	Type of house structure			Med
	1)	Cemented	60%	
	2)	Muddy	20%	
	3)	Wooden	2.5%	
	4)	Stone structure	17.5%	
27	Does poor and rich hit alike by flood			Med
	1)	Yes	55%	
	2)	No	45%	
28	Energy available after flood			High
	1)	Yes	5%	
	2)	No	75%	
	3)	Others	20%	
29	Help from the Govt/NGOs after the flood			Med
	1)	Yes	52.5%	
	2)	No	42.5%	
	3)	Others	5%	
30	Community based Organization in the Community			High
	1)	Yes	7.5%	
	2)	No	92.5%	
31	Gender Based Discrimination in the Community			High
	1)	Yes	65%	
	2)	No	15%	
	3)	Don't know	20%	

32	Community's Dependency on External support			High
	1)	Yes	67.5%	
	2)	No	32.5%	

Focus Group Discussions

A focus group discussion (FGD) is a good way to gather people from similar backgrounds or experiences to discuss a specific topic of interest. Moderator guided the groups of participants. Who introduced topics for discussion and helped the groups to participate in a lively and natural discussion among themselves.

Three FGDs conducted in the study area. The aim of the conducting FGDs was to know about the existing physical, social, economic and attitudinal vulnerabilities. The purpose of the FGDs were also extended to find out the factors that cause these vulnerabilities and how these vulnerabilities can be reduced against the negative impacts of the floods in future. While conducting the FGDs in the study area, the community people were very friendly and cooperative. They tried their best to provide correct information about what was asked.

When asked from the Group First consisting of 8 members, about the prevailing vulnerabilities and local capacities, then they confirmed all the physical, social, economic and attitudinal vulnerabilities that negatively affect them while physical and economical vulnerabilities are much higher than the social and attitudinal vulnerabilities. Majority of the houses are not built with proper safety mechanism which make them vulnerable to floods and various other hazards that community face occasionally. Main reason behind such physical vulnerabilities is poverty, which leads to economical vulnerability. Social and attitudinal vulnerabilities prevail among the society due to lack or resistant to change or to unable to put pressure on political setup to consider measures that can resistant to flooding.

In the past, the community experienced losses several times by floods that has pushed back the developmental activities. Agriculture and housing are among the most effected sectors in which agriculture is the only and main source of income of majority of community dwellers.

Following are findings and possible suggestions they think that can help them in reducing their vulnerabilities as well as in the identification of the factors that are causing these vulnerabilities.

They agreed upon the capacities that are present in the community in the form of youth that can play a major and vital role in pre, during and post flooding arrangements and responsibilities like preparedness and response.

Group Second consisting of 10 members, were asked about the causes of such vulnerabilities. They argued and finally agreed upon that there are several causes but poverty, illiteracy, lack of awareness and trainings, weak building construction materials, conflicts regarding caste and ideology. As well as low economic opportunities, low or no assistance from government or NGOs, inadequate protection measures along the Naala/khwarh, behavior resistance to change, corruption in various floods related departments and lack of early warning system are the main factors and reasons in enhancing the vulnerabilities.

Group Third of 8 members were asked about, how these vulnerabilities can be reduced to avoid the damages and negative consequences. Then the responses recorded from the whole discussions were like that:

- Construction of small dams on the Naala/Khwar
- Construction of embankment or gabion wall along the banks of Naala/Khwar
- Vegetation cover along the bank of the Naala/Khwar
- Early warning system to be launched
- Flood related trainings to women and children
- Volunteer task force or community based organization should be launched and initiated
- Need for an evacuation center and routes were highlighted
- Monsoon contingency plan need was very much realized

CHAPTER 5

FINDINGS, CONCLUSION and RECOMMENDATION

Findings

In the study area the vulnerability assessment study has been done up to some possible extent and it is observed that the study area is more vulnerable in physical, economical, and attitudinal perspectives. Although the study area is more educated and literacy rate is higher as compare to surrounding. However, according to our study observations some of major issues are extracted which are given below.

- Two Naalas or Khwars are passing through the study area due to which it is prone to flood mainly in summer season.
- In the study area, economic vulnerability is high because majority of the dwellers rely upon the agriculture and local businesses in the form of shops, which are highly prone to floods and can be easily damaged, having no protective measures.
- Knowledge and awareness regarding Disaster Risk Reduction is extremely low and the people have to cope with traditional ways with floods.
- Weak building and construction materials used in the infrastructure, which further enhance the physical vulnerabilities that cannot withstand the high-level floods.
- Majority of the houses are not built with proper building codes are constructed from mixture of mud and cement i.e. most of the houses are semi pakka.
- Agriculture sector is most effected sector in the community followed by housing sector, because in this area agricultural practices are more.
- The responder exhibit strong favor for their vegetation cover over the bank of canal in the study area as most of the people totally rely on the agriculture sector and they describe it is one of the factor that contribute more than physical damages.
- In the study area, the main source of income is agriculture because most of the people are linked directly or indirectly with agriculture.
- The women and children is highly vulnerable to flooding as compare to aged and disabled people in the community. While men are also at stake because they have the major responsibility as breadwinner or caretaker of the family and losses can be directly and indirectly attributed to them.
- Most of the people do not know what they should do where to go in case of emergency / flooding and majority of them were women and children.
- There is no emergency evacuation center in the community or identified routes for evacuation.
- Education and awareness level is comparatively high which reduce some of their vulnerabilities but women as marginalized group are less literate and aware then men.
- Common family type prevailing in the study area is joint family that reduces the social vulnerability in the study area.
- At some points, gabion walls are constructed but the material used for the construction of that wall was of very low quality and whenever heavy rainfall occurs that walls are eroded.
- Women have less access to and ownership over the resources, which enhance their vulnerability.
- They have cooperative community
- Majority of the population lives in high flood prone area and their location to Naala/Khwar is much near.
- There are few cultural heritages like Hujras and mosques (community centers) are also vulnerable.
- Disadvantages of floodwater is more than its advantages.
- Evacuation for some families is much difficult, making them highly vulnerable.
- There is lack of proper warning system, although the side by communities provide warning through firing bullets, which is sometime misjudged.
- Perception about flood hazard is positive.

- According to the majority of the responses, lack of monitoring and no check and balance is the most intensifying factor to flood.
- Heavy rainfall in summer season (Monsoon) is a major cause of flood.
- There is no leader in the community who can guide and coordinate all the flood related measures.
- Community members have no plans are measure to avoid construction flood plains.
- The community members were unsatisfied with protective measures provided by the government.
- Majority of the responders said that resources with community can be utilized to avoid the negative consequences of floods in future.
- Due to their high vulnerability recovery from the previous flood is almost difficult and time taking.

Conclusion

Flood is very destructive and most occurring disaster in the study area, which causes severe damages to physical and economic property. Due to Climate Change and Global Warming the risk and intensity of hydrometeorological hazards is increased which is an alarm for further high exceptional floods in future. Although flood is natural phenomenon caused by high precipitation but its effects are intensified by some of the human role of intervention and lack of monitoring. The most important is lack of proper information related to flood. The people living in flood prone area are not communicated properly. Due to lack of coordination between government agencies and local people, land use planning, proper embankments, bridges on the road, flood forecasting, evacuation plan, emergency response and relief activities the damages are very high. Although there are some mitigative measures of government agencies and local community has been done but it is not enough. There are some developmental projects are in running state but it also need the government attention to be completed in time. The government needs to play important role not only in post disaster phase in pre disaster phase also. There is an urgent need of effective laws and policies for stopping encroachment, flood forecasting mechanism, public awareness, coordination and proper compensation system for loss of property and physical damages to reduce the future losses.

Suggestion and Recommendations

The vulnerability analysis and the above findings in the study area attracts the following suggestions and interventions that are much needed to reduce the vulnerability of local people. Both internal and external interventions are needed to educate the community in regards of flood disaster related actions.

- Mitigative measures are immensely needed to protect the agriculture land, local business and infrastructures, which are more expose to flood.
- They have cooperative community.
- Agriculture related activities are more and are at risk.
- Education about disaster disk reduction should be a part of primary and secondary education to bring awareness in the community particularly for women and children.
- Buildings and other infrastructure should be retrofitted with flood resistance techniques in engineered way and good construction materials should be enforced through external interventions with support of provincial and local administrations.
- Encroachment along the torrent/ canal must stopped.
- Gabion walls should be built on the both sides of the canal/torrent to protect the plane area of the study area.
- The study area is exposed to flood hazard so training and awareness programs on emergency is required.
- Emergency evacuation routes must be identified and the local community must be trained for it.
- Community must be trained on evacuation.
- Capacities of women through education, skill based programs and training should be enhancing in the community for better response in any flood emergency.
- Steps should be taken for the adaption of preventive and mitigative measures in the community.
- DRR trainings, rescue emergency management and first aid training are much needed.
- There should be a leader in the community who can guide and coordinate all the flood related measures.

IMPACTS OF INSURGENCY ON PRIMARY EDUCATION (BOYS)

A CASE STUDY OF TEHSIL PANJGUR, BALUCHISTAN

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ABSTRACT

Pakistan faces major challenges to education because of factors such as poor access, low enrollment rates, gender bias, lack of trained teachers, and poor physical infrastructure. Insurgency and militant violence has further exacerbated those challenges and disrupted the education of hundreds of thousands of children. Militant groups have damaged and destroyed school buildings, attacked teachers and students, and terrorized parents into keeping their children out of school. They have also targeted colleges and other higher-education institutions. Such attacks and threats of attack on education not only harm the students and families directly affected, they have an incalculable long-term effect on Pakistani society. Insurgency affected various sectors of Pakistan like education, industry, foreign investment and many other sectors. Education sector is one of the sectors succumbed to the insurgency and created serious educational crises in whole country, especially in tribal belt which also including Baluchistan and areas near Iran boarder like Panjgur Teachers, professors, and school administrators have found their lives increasingly under threat in Pakistan's western province of Baluchistan. Between January 2012 and October 2014, suspected militant groups targeted and killed at least 22 teachers and other education personnel in the province. Militants have also threatened, bombed, or otherwise attacked schools, resulting in injuries, deaths, property damage, and curtailed education for Baluchistan's children and youth. In study area tehsil Panjgur insurgents targeted 7 primary schools of total 48 schools during 2014-16 which are fully or partially demolished. In August 2018 two schools were burnt to sashes which lead to sores up drop out ratio, school's infrastructure were ruined, and many others obstacles were created in students learning process. This study is carried to find out impacts of insurgency and militancy on primary school children in Tehsil Panjgur of Panjgur district and to Provide data and recommendations to the local provincial government for better management of the challenges face by children and teachers in that area of Baluchistan.

CHAPTER-1

INTRODUCTION

1.1 Background of study

Insurgency can be defined as a rebellion against an authority, state when those taking part in the rebellion are not recognized as lawful combatants. Insurgency is an unorganized resistance that uses subversion, espionage terrorism and armed conflict to achieve specific goals. (Hyden 2008). The causes of insurgency may be injustice, poverty, illiteracy and weak governance. Whatever the causes may be but the insurgents try to implement their agenda by force. Their motives may be political, social or religious ideology which they cannot implement normally in the existing system. That is why they use terrorism, abductions and militancy as their tactics. They target security forces, general public, minorities, children and women. Infrastructure like schools, public buildings and religious centers are mostly targeted. (Hyden 2008).

Aftermath of the 9/11 attacks and announcement of war on terrorism has affected the world in many ways. US attack on Afghanistan resulted in infiltration of insurgents and militants in the tribal areas along Pakistan Afghanistan boarder that extends for hundreds of kilometers. The tough terrain facilities their activities and provide them protection against security forces. That is why militants take refuge here causing an increase in militancy and insurgency. They target not only security forces, general public, business community, minorities but also educational institutions. According to a study one fourth of total attacks on educational institutions in the world, took place in Pakistan. Militants attacked 724 schools from 2004-2013; the highest number in the world (Global terrorism database). A deadliest attack on APS Peshawar claimed as many as 160 school children and teachers including female principal of the school. Such attacks have drastically affected children's mental, psychological and physical health and wellness. (Dawn news 2015).

Baluchistan is largest province of Pakistan by area and smallest by population. It borders Iran and Afghanistan. Due to instability in Afghanistan and separation movements in Iranian Baluchistan, the area is influenced by the insurgents. Attacks are carried out almost on daily basis especially in districts bordering Afghanistan and Iran. Panjgur is one of such districts facing constant threat from insurgents which not only is hindering socio-economic activities but also educational activities and achievements are undermined. Due constant threat of insurgency students, teachers and parents are suffering from a number of health, mental and psychological complexities.

In Tehsil Panjgur there are 48 primary schools in which 7 schools were targeted during 2016. In August 2018 local media reported the incident of sitting two schools on fire by unknown militants. During 2014-16 a number of schools both in public and private sector have received threats from various militant groups operating in the region. The district administration had to close all the schools for weeks during 2015.

Our study focuses on various impacts on primary school children due to insurgency and militancy in Tehsil Panjgur of district Panjgur in Baluchistan.

1.2 Statement of the problem

Militancy and insurgency has disturbed many fields of life. Primary education has been one of the areas that has been under the anger of insurgents in the tribal belt of KPK and areas of Baluchistan. FATA and Baluchistan already have the lowest literacy rates in the country. Due to insurgency and contributing factors like poverty, tribal enmity, lack of communication and remote areas, the literacy rate observed drastic fall from 31% to 16% during year 2011-13. Students and teachers were particularly reluctant and felt unsafe to attend the school in high risk region of Pishin Panjgur and Dera Bugti.

1.3 Purpose of study

The purpose of the study is to find out impacts of insurgency and militancy on primary school children in Tehsil Panjgur of Panjgur district and to Provide data and recommendations to the local provincial government for better management of the challenges face by children and teachers in that area of Baluchistan.

1.4 Objectives of the study

- To identify the causes of insurgency and the perception of students, teachers, about insurgency.
- To explore the impacts of insurgency on school children's mental health.
- To identify damages to primary schools particularly infrastructural damages.
- To study the problems caused by insurgency in students learning process.
- To provide useful information to policy makers and government Organizations for the improvement of school

infrastructure and learning environment

1.5 Problem encountered in research

We have faced various challenges during our research. First problem which we have faced to find out data on international level for our study from various websites but we failed to obtain data in initial stages of research then we consulted with our supervisor and class mates then we collected data from various websites.

The second problem which we have experienced during data collection from various schools in effected area was the harsh climate. Third problem which frustrated me during collection was the distance among the schools was huge. Lack of facilities of proper roads and transport vehicles had tired me a lot. The fourth problem in my research study was the absence of teachers and students, because teacher unions from whole Panjgur launched protest against the government, so we felt difficulties in filling questionnaire from students and teachers. Fifth problem which we have faced was of feeling unsecure because some schools were far away from tehsil Panjgur (city) of Panjgur district headquarter

1.6 Organization of the study

In chapter 1 definition of insurgency, introduction of word insurgency, insurgency in Pakistan, insurgency in Panjgur Tehsil, introduction to importance of education, Education ratio in Baluchistan primary education ratio in Panjgur, statement of problem, purpose of the study, objective of the study, problem encountered in research. In chapter 2 literature review available on types of insurgency literature review also include about insurgency on global level, literature review available on Pakistan and also available on regional level, psychological impacts of insurgency globally, psychological impacts of insurgency in Pakistan and also available literature available on regional level. Chapter 3 include procedure of the study, introduction to the study area, Methodology, universe of the study chapter 4 consist of tabulation and analysis of data, Findings, Recommendations are made. And at the end References are made.

CHAPTER -2

LITERATURE REVIEW

Insurgency can be referred to as rebellious acts that did not reach the proportions of an organized revolution. It has subsequently been applied to any such armed uprising, typically guerrilla in character, against the recognized government of a state or authority. (Encyclopedia Britannica)

2.1. Politically Organized insurgency:

In politically organized insurgency insurgents focus on neutralizing existing structure of the authorities and demoralize the regimes but very little or no warfare is involved. "It is insurgency for the purpose of achieving political goals and objectives."

2.1.2. Militarily organized insurgencies:

It is armed rebellion by small and un-organized groups of militants against state country or authority, following on destroying existing region or their control by military intervention. It is mostly dealt with excessive force from the state or authority to overcome military insurgency.

2.1.3 Traditionally organized Insurgency:

Traditionally organized insurgencies draw on preexisting tribal, clan, ethnic, or religious affiliations. It has mostly weak economic and military base. There are conflicts for the leadership of insurgent groups. Subgroups also exist in the umbrella of a large group. This type of insurgency is mostly dealt with military aggression from the state because it lacks political roots.

2.1.4 Urban Insurgency:

This a type of insurgency that is present in a cellular structure of urban population. They have links and support in adjoining rural areas. Insurgents challenge state authority through urban unrest. It is localized to a small area of a city and hide in population to protect itself from aggression of the state.

2.2. Impacts of Insurgency on Global Education:

Since 9/11 cases of insurgency have risen which possess great threat to global literacy. No meaningful development can occur when there is no security of lives and property. Development can't be achieved in any nation where there are insurgencies, conflicts and wars. (Nawanegbo and Odigbo 2013 and Chandler. 2007). The ratio of children out of school has increased from 42% in 2008 to 50% in 2011. Conflicts like insurgency tribal conflicts are obstacles for children to get their education. (Amir Jnones Ruth Nylon 2014). According to U. N data there were more than 3600 attacks targeting education sector in 2012.Most effected countries includes developing countries like Liberia, Syria, Yamen, Palestine, Somalia, Pakistan, Afghanistan where a large number of educational institutions are targeted almost on daily basis. Even developed states like U.S.A has faced many insurgent attacks on schools. The situation is worst where there are organized armed conflicts, for example in Syria 93000 people have been killed, about 30% of them were children and 2200 were 10 years of age or younger. (U.N Report on Syria)

According to recent report of U.N, more than 4.25 million people are internally displaced in Syria, 50% of them are children. Not only these children are deprived of their right to education but grave violation against children have also taken place. The conflict parties occupy and use schools as barracks and hiding place. The situation has reversed the achievements of universal enrollment at both primary and secondary levels. By June 2013 more than 3.1 million children have been affected by the crises, more than 2.5 million are between ages of 4 to 18 years. Hundreds of thousands of refugees' children in the region are waiting to join schools. (Amera Hanfieh Aufia Dinnen 2015). According to UNICIF estimates 2.3 million children are affected by the crises in Central African Republic. There are 746000 primary school aged children in the Central African Republic (6 to 11 years). The education system in the democratic Republic of Congo has been influenced by armed conflicts in 2013 nearly 35% of children aged 5 to 17 were out of school. In a conflict which resulted in a split o fa group from Army give rise to serious violation against children. Six hundred schools are also affected in that conflict in 2012. Militant group in Afghanistan threated schools in 2010. During the year 26 students were killed and dozens of schools were attacked. "We warn you to leave your jobs as teacher as soon as possible, otherwise we 'll cut the heads off your children and set fire to your daughters" read a letter from Taliban. (Cursen Neff and Sheppard 2010). Of the 72 million primary school aged children not currently attending schools worldwide, more than half 39 million live in countries effected by insurgencies. In many of these countries armed groups threaten to kill students and teachers and bomb or burn schools as a tactic of conflict.

2.3. Psychological impact of insurgency in Baluchistan:

Baluchistan after a troubled pose lasting some 30 years, in once again in the midst of a full-fledged insurgency. Baluchistan has been the scene of violent protest in the form bomb blasts, random killings, target-killings, kidnaping and act of sabotage at vital installation including educational institution amongst other public center and property, has caused a drastic increase in the psychiatric disorders like depression, schizophrenia, bipolar disorder, drug and alcohol misuse and post-traumatic stress disorder. Being the least developed province of the developing country Pakistan. Baluchistan condition is miserable due to the terrorism, insurgency, weak law and order situation and incompetent social system. Thus, the exposure of the Bloch community to such unfavorable condition of the region is giving rise to psychological problems in women, children and students (Ahmad B, 2013).

On the other side, the health care systems response to these problems is in no way compatible to that in other province and developed countries. There are no enough resource and consistent polices to deal with mental health problem effectively. The number of psychiatrists and psychiatric beds per head of population is negligible and most people suffering from psychiatric disorder cannot afford the treatment expenses. (Zahid, 2014)

The operation in different areas of Baluchistan was greatly affected by insurgency and violence. People of the province got effected from psychological problems like PTSD. Amongst other are avoiding of activities places, avoiding of thought and falling, distressing dreams and irritating thought and anger out-burst, hyper vigilance and difficulty during sleeping and detachments from people (Tahir 2011).

Suffering from insurgencies violence and military operations, Baluchistan is symbol of chaos in addition people get affected in from of lives, economic, livelihood sources, social and psychological problems. According to Dr. Ghulam Rasul a psychiatrist based in Quetta, people are facing problems, like stress, anxiety, depression due to abnormal situation in Baluchistan. In addition, he said there are three main factors arousing abnormality of the psychological condition of victims. First one is the impact of conflict on the structure of society, second is the impact on social life and 3rd one is on the human health. (HRW Report 2010).

A woman said, “I have lost five members of my family within eight years in a bomb blast our family still live in fear.” 30 to 70% of people who lived in war zones bear a psychological disorder of post-traumatic stress disorder (PTSD) and depression. Director center for diseases control and prevention Dr. Rasul for added that “while millions of people have been effected psychologically by the insurgencies, conflict, violence, forced disappearance, only few can get treatment

Only 8 to 10% of the patients are treated locally due to lacking facilities and trained human resources. In order to address the psychological problems of the people the government shall set up psychiatric units at divisional, district and tehsil headquarters level throughout the province (Khundi, 2010)

2.4. Militancy and its consequences on Education in Pakistan:

After of American war on terror, there has been hardly any field that remained uninfluenced, same is the case with education at school colleges and university levels. Afghanistan and Pakistan have been on the spotlight. The tribal zone between Pakistan- Afghanistan on the both sides of border, extending for about 2200 km is the most severely affected by the surge of militant groups. Due to insurgency thousands of people were displaced, hundreds of schools were blasted/damaged. Co-education was banned, schools received threats, and girls were not allowed to attend the schools. In FATA the literacy rate was below 30% before 2001 and due to rise in insurgency it dropped to a level of 14% in 2012. Enrolments reached an all-time low and the enrolled children drop out of schools due to constant threats from insurgents. Teachers and students were afraid to return to schools. In 2009 TTP gained control of Swat valley. They were against girl's education”, they imposed a ban on girl's education and used a large number of girls and boys 'schools as their shelter places. In 2010 about 1000 public and private schools were closed following TTP threats, due to which 120000 school girls were restricted to their homes. In 2013 intelligence agencies submitted a report to apex court, according to the report 995 schools and 35 collages were destroyed in FATA and KPK province. The situation in other provinces is not better either. Baluchistan province is not only under the influence of TTP but other insurgent groups like BLA etc.

And other banned separatist moments have further marginalized already fragile education system. The province has the lowest literacy rate in the country. On August 18 local media reported that two girl's schools were burned in Pishin district. In the same month 12 schools were set on fire in Gilgit Baltistan reign of Pakistan. Pakistan faces significant education challenges with estimated 25 million children out of schools. (Human Rights Watch). According to HRW report Pakistani militants have destroyed school buildings, targeted students, teachers and terrorized parents into keeping children out of school.

2.5. Impacts of insurgency on Education in Baluchistan

Teachers, professors, and school administrators have found their lives increasingly under threat in Pakistan's western

province of Baluchistan. Between January 2008 and October 2010, suspected militant groups targeted and killed at least 22 teachers and other education personnel in the province. Militants have also threatened, bombed, or otherwise attacked schools, resulting in injuries, deaths, property damage, and curtailed education for Baluchistan's children and youth. In 2009, government schools were open for only 120 days, compared with around 220 days in the rest of Pakistan.

Fearing for their safety, many teachers—particularly ethnic Punjabis and Shiite Muslims and other targeted minorities—have sought transfers, further burdening what is already the worst educational system in Pakistan. Since 2008, more than 200 teachers and professors have transferred from their schools to the relatively more secure capital Quetta, or have moved out of the province entirely. Nearly 200 others are in the process of making such transfers. New teachers are hard to find, and replacements often less qualified than predecessors. In Baloch areas of the province, schools are often under or poorly staffed, and many remaining teachers say they are so preoccupied with declining security that their teaching has been adversely affected. A report, based on interviews with teachers, government officials, journalists, nongovernmental organizations, and school children, describes attacks on Baluchistan's educational facilities, teaching personnel, and students as part of broader political, religious, and cultural divisions. It also considers the consequences of such attacks for education in the region, including pervasive fear, fewer school days, and hemorrhaging of qualified teachers.

Killing people who have dedicated their lives to teaching only undercuts opportunities and outcomes in a province already struggling to educate its populace and achieve greater development, making a bad situation even worse. There is no acceptable justification for targeted killings of teachers and other education personnel, or attacks on schools. Beyond the killings' simple unlawfulness, the militant groups that are responsible demonstrate disturbing willingness to make the education of the province's children a pawn of their armed agenda.

Education falls in the crosshairs of three distinct violent conflicts in Baluchistan. The first is a nationalist conflict, in which militant Baloch groups such as the Baloch Liberation Army (BLA) and the Baloch Liberation United Front (BLUF) seeking separation or autonomy for Baluchistan have targeted Punjabis and other minorities, particularly in the districts of Mastung, Kalat, Nushki, Gwadar, Khuzdar, and Quetta. While individuals from all professions have been the victims of such "targeted killings," teachers and students constitute a significant proportion of victims because militant groups view schools and educational personnel, particularly ethnic Punjabis, as representatives of the Pakistani state and symbols of perceived Punjabi military oppression of the province. (Human Rights Watch 2010).

Often no group claims responsibility for attacks, and few perpetrators have been apprehended and prosecuted. Those that do claim responsibility for such violence often justify it as a response to perceived lack of Baloch control over resources, under-representation in the national government, and retaliation for abuses by state security forces against the Baloch community. For example, the recent surge in killings can be traced to the 2006 assassination of prominent Baloch tribal leader Nawab Akbar Khan Bugti, and the murders of three prominent Baloch politicians in April 2009 by assailants believed to be linked to the Pakistan military. (Human Rights Watch,2010) . Apparent militant nationalist groups have threatened school officials, demanding that they stop teaching Pakistani history, flying the Pakistani flag, and having children sing the national anthem. The BLA claimed responsibility for the shooting death of Anwar Baig, a senior teacher killed in Kalat in June 2009 because he supposedly opposed recitation of the Baloch nationalist and hoisting the nationalist flag instead of the Pakistani flag. (HRW,2010)

The second distinct conflict is a sectarian one, in which militant Sunni Muslim groups have attacked members of the Shia community, especially members of the Persian-speaking Hazara community. Such sectarian attacks appeared to increase in 2009, and occur mainly in Quetta and its neighboring districts.

The third conflict involves armed Islamist groups attacking those who act contrary to their interpretation of Islam. Armed Islamist militants have increasingly committed violence in opposition to the content and manner of local education, particularly that of girls and young women. There have also been several reported instances of demands that schools stop teaching girls and boys together, and that students and teachers adopt more local and conservative dress.

The armed groups in Baluchistan should immediately cease all attacks against education personnel, civilians, children and schools; on the provincial government of Baluchistan to bring to justice those responsible and to take measures to prevent such attacks and mitigate their impact; and on the federal government of Pakistan to support these efforts.

2.6. An over View of district Panjgur:

Panjgur (literally: Five Graves), is a district in the west Balochistan Makran division , the private co -education schools were targeted and threatened to shut down by militants, earlier this year in May. Parents were also intimidated into not sending their girls to school. A school van was burnt in Panjgur and teachers were warned not to pursue their profession. After this attack, schools remained closed in the district for days, the closure prompted Baloch nationalist groups to stage protest demonstrations to mount pressure on the government to re-open schools.

“We will not allow forced-closure of schools in Makran,” said Ghulam Nabi Marri, the Central leader of Balochistan National Party.

A similar pattern was seen in other districts of Makran division which include Turbat and Gwadar. Even though the government is aware of the threats, they have failed to arrange separate classes for girls or to find an alternative. (Dawn News Dec,2014).

The social and institutional fabric of Baluchistan is facing systematic destruction, leaving behind only the province's most radical elements. Private schools operating in Panjgur have faced attacks from radical Islamic groups for sending girls to co - ed institutions. “Private schools should stop girls' education – both co-education and separate education,” warned a letter from militants, adding, “We urge all van and taxi drivers to refrain from taking girls to schools. Otherwise, they will also be targeted”.

“It seems there has been a spill-over of Taliban culture into Panjgur,” remarked one of the heads of the language center, who spoke on the condition of anonymity.

CHAPTER 3

METHODOLOGY

3.1. Nature of the study

The present study is descriptive in nature an attempt to describe systematically situation of insurgency on school children's in Tehsil Panjgur. Data is collected and analyzed in various tables and interpretation of data in from of findings. Steps followed during the study and formation of this report are:

1. Formulation of the topic.

2. Developing research proposal.

3. Conducting review of relevant literature.

4. Questionnaires designing.

5. Data collection.

6. Data analysis

7 report writing

3.2 Universe of the study

Panjgur, is a district in the west Baluchistan province of Pakistan. Panjgur was one of three districts of Makran District until 1 July 1977, when the district became a part of Makran Division. The other two districts of Makran Division are Kech (Turbat) and Gwadar. Chitkan is the district headquarter. Panjgur has sixteen (16) Union Councils. It is home to several archaeological sites, including centuries-old tombs, an old dam called Band-e-Gillar, remnants of a fort at Khudabadan (the historical fort of Nawab Kharan) and some remnants of the old port of Issai. The seasonal Rakshan River flows right in the middle of Panjgur, dividing it into two parts, the northern and southern Panjgur. The district is administratively subdivided into three tehsils which contain a total of 16 Union Councils.

- Paroom
- Panjgur
- Gichk

3.3. Sampling methods

3.3.1 Sample size

Total 50 respondents interviewed by using purposive sampling method. 5 Schools was selected from study area and from each school 10 students were given questioners. A number of teachers from the affected schools were interviewed separately.

3. 3.2 Purposive sampling

For the data collection in study area, we have done purposive sampling among the primary schools in Panjgur and also children of the school. The sampling method was purposive in this context because we select effective primary schools and its students of 5th and 4th class from study area which suffered from insurgency.

3.4 Primary data

Primary data will be collected through the following tools.

i. The interview schedule

Exploration the impacts of insurgency education like a causes of insurgency, perception, impacts schools' infrastructure, mental health, experiencing in learning process children, in the tehsil Panjgur after the insurgency. Two questionnaires prepared for data collection, one for the students, and one for teachers of the affected schools. Then a successful effort was made to collect data from study area. The data collection through questionnaires will be fruitful and will boost up research study to achieve desired goals and objectives.

ii. Group discussion

Information for research study group discussions were conducted which community elders, educated members, children to identify the root cause, perception of the people about insurgency and to know about the various mental health problems and the problems in learning process of primary school children in the affected areas.

iii. Secondary data

The secondary data which we have collected from various sources education officers, books literature review, newspaper an article etc.

3.5 Data Analysis

For data analysis integration of data was done the whole data collected through questionnaire was entered into SPSS software. Then frequency tables on the basis of collected data were made. The frequency tables were then transferred from SPSS software to MS office. Major findings were drawn from the frequency tables.

3.6 Limitation of the study

Due to the shortage of time and resources the study was conducted with some limitations like the study was focused only on tehsil Panjgur of Panjgur district of Baluchistan although due to current situation of insurgency other fields of life in the study area like transport, economic and social sector was affected but education was affected in the in the worst manner that's why this study is confined only to primary schools.

Sampling was not random. Sample was small and generalizations of results and findings can't be made with such a sample.

3.7 Ethical consideration

During the research proper ethical code was followed. Information was obtained from each school after permission from the head teacher and elders of the communities specification of the school name and address of students were kept secret. We ensured the students and teachers of tehsil that we well keep your information confidential.

CHAPTER 4

DATA ANALYSIS

Number of respondents: 50 Age group: 12-15 years

Gender: Male Grade/ Class: 4th-5th

Table 4.1: knowledge about insurgency causes and perceptions

S.No		Answers	Frequency	Percent
1	Knowledge about Insurgency	Yes	50	100
2	Causes	Illiteracy	25	50
		Poverty	5	10
		Sectarianism	5	10
		Injustice	15	30
		Total	50	100
3	Perception	_	15	30
		It's against over Religion	25	50
		Insurgents were right in their own context	10	20
		Total	50	100

The two variables given in the above table show the knowledge and causes of insurgency in the targeted area on the bases of responses from the people included in the survey from that area. People replied to these questions such that 100% knew about the causes of insurgency, as 50% illiteracy, 10% poverty, 10% sectarianism and 30% declared injustice as the root causes of insurgency. While 30% perceived that insurgency is against law, 20% it's against the religion, and 50% claimed the insurgents were right in their own context.

Table 4.2: Inspired from Activities of Insurgents and its kind

S.NO		Answers	Frequency	Percent
1	Inspired from activities of insurgents	War tactics	10	20
		Education	10	20
		Did not inspired	30	60
		Total	50	100
2	Which kind of activities	War tactics	10	20
		Education	10	20
		Did not inspired	30	60
		total	50	100

60% people remained uninspired from insurgents while 40% claimed they got inspired such that 20% inspired from war tactics and the other 20% from their education.

Table 4.3: Insurgency Impacts and its level on Schools

S.NO		Answers	Frequency	Percent
1	Insurgency impact on schools	Yes	50	100
2	Levels of impacts	Completely	10	20
		Partially	20	40
		Little	20	40
		Total	50	100

The data collected from the students of the suffered schools, shows 100% schools were affected while amongst them 20% schools were damaged completely, 40% partially, while the other 40% claimed their schools were partially damaged.

Table 4.4: Physical injuries assistance and sort of assistance from Govt.

S.NO		Answers	Frequency	Percent
1	Physical injuries	No	50	100
2	Assistance from Govt	Yes	20	40
		No	30	60
		Total	50	100
3	Sort of assistance	Sport goods	10	50
		Financial assistance	10	50
		Total	20	100

Data regarding the students who got physical injuries when their schools were affected. The table shows 100% students did not receive any physical injury while getting education. When asked about the assistance from Govt, 40% replied in affirmative while 60% denied getting any kind of assistance from the Govt. Among those who received assistance from Govt. 20% got sport goods, while 20% financial assistance.

Table 4.5 Psychological Impacts and Causes

S.NO		Answers	Frequency	Percent
1	Any psychological impacts	Yes	50	100
2	Causes	War activities	20	40
		Religious slogans	5	10
		Enforcement of radical beliefs	5	10
		Nationalism Slogans	20	40
		Total	50	100
3	Major psychological impacts	Stress	10	20
		Depression	30	60
		Post-Traumatic Stress Disorder	10	20
		Total	50	100

From the data 100% students received Psychological impacts in which 20% fell victims to stress, 60% depression and 20% to the Post-Traumatic Stress Disorder. While the major causes of these psychological impacts were 40% war activities 10% religious slogans, 10% enforcement of radical beliefs and 40% nationalism slogans.

Table 4.6: Sort of Support received.

S.No		Answers	Frequency	Percent
1	Support received	Govt	25	50
		Relief organization	25	50
		Total	50	100
2	Sort of support	Psychological Support	15	30
		Emotional support	25	50
		Financial Support	10	20
		Total	50	100

The table contain data of the students who received any kind of psychological support according to which 50% of the students received support, in which 50% received it from Govt., while other 50% received support from relief organizations. Among those who received any support, 50% received Psychological support, 50% emotional support and the other received financial support.

Table 4.7: Difficulties in Education.

S.NO		Answers	Frequency	Percent
1	Any difficulty to continue education	Yes	50	100
2	Sort of difficulty	Infrastructural destruction of school buildings	20	40
		Economic problems	15	30
		Fear of insurgents	15	30
		Total	50	100

Students when asked about any kind of difficulty in continuing education, 100% replied in affirmative, among those 40%infrastructural destruction of school buildings, 30% economic problem and the remaining 30% declared fear of insurgents as the sort of problems, while continuing education.

Table 4.8: Impacts on life and major impacts.

S.NO		Answers	Frequency	Percent
1	Impacts on life	Yes	40	80
		Did not affect from insurgency	10	20
		Total	50	100
2	Major impacts	Education	20	40
		Pocket money	5	10
		Extracurricular activities	5	10
		Day to day life activities	20	40
		Total	50	100

The data regarding the impacts of insurgency on the life revealed that, 80% students' lives were impacted, while the lives of 20% students remained inert. The major impacts reported were such that 40% impact on education, 10% on pocket money, 10% on extracurricular activities and 40% impact on the day to day life activities.

Table 4.9: Compelled by insurgency to generate money and support received.

S.NO		Answers	Frequency	Percent
1	Compelled by insurgency to earn money	Yes	10	20
		No	40	80
		Total	50	100
2	Source of money	Work and workshops	6	12
		Begging	2	4
		Illegal activities	2	4
		Did not compelled to generate money	40	80
			50	100
3	Support received	Yes	10	20
		No	40	80
		Total	50	100
4	From whom	Parents	5	10
		Teachers	3	6
		NGSS/INGOS	2	4
		Did not get any support	40	80
		Total	50	100
5	Kind of support	Financial support	10	20
		Did not receive any support	40	80
		Total	50	100

Students when asked whether they were compelled by insurgency to generate money, 20% replied in affirmative and 80% replied in negative. Among 20%, 12% said workshops to be their source, 4 % begging, 4%illigal activities and 80% claimed they were not compelled to generate money. While in response to the question of any support received, 80% denied receiving any kind of support while 20% claimed they received support. 20% received financial and 80% received no support at all. When asked from whom they received support? 10% got it from parents, 6% from teachers, 4%fromNGEOS, while 80%did not receive any support.

Table 4.10: Education problems and its kinds.

S.NO		Answers	Frequency	Percent
1	Current education problems	Yes	50	100
2	Kind of problems	Financial problem	40	80
		Uncertain circumstances	10	20
		Total	50	100

To the question of problems in education 100% replied in affirmative, while 80% financial and 20% faced uncertain circumstances in the education sector.

Table 4.11: Impacts on teaching methodology.

S.No		Answers	Frequency	Percent
1	Impacts on teaching methodology	Weak	25	50
		Very weak	25	50
		Total	50	100
2	Current methodology	Traditional Methodology	10	20
		Mixed methodology	40	80
		Total	50	100
3	Satisfied from current methodology	Yes	10	20
		No	40	80
		Total	50	100
4	If no then reason	Lack of teachers	20	40
		No modern teaching technique	10	20
		Lack of qualified staff	20	40
		Total	50	100

Data shows that impacts of insurgency on teaching methodology was 50% weak and 50% very weak. Traditional methodology was affected to 20% and Mixed methodology by 80%. 20%wer satisfied with the current methodology while 80% were not satisfied with that. Reasons of these who were not satisfied with current methodology were 40% lack of teachers, 20% no modern teaching technique and 40% the lack of qualified staff.

CHAPTER 5

FINDINGS AND CONCLUSIONS

5.1. Findings

Majority of the students and teachers 100% declare they know about insurgency.

- Majority of students and teachers 50% viewed that Illiteracy is the igniting factor of insurgency.
- 10% see poverty 10% sectarianism and 30% declared injustice as cause of insurgency.
- 50% students and 60% teachers expressed his views that our religion strongly prohibited brutality of insurgency.
- 20% consider it against law and 20% consider insurgents were right in their own way.
- 60% of respondents were not inspired from insurgents 20% students were inspired from insurgent's activities like war tactics and 20% from education system.
- Over all 20% respondents, 30% students and 10% teachers mention that their schools were demolished. 40% partially and 50% claimed that their schools were little damaged. All students and teachers 100% stated that we were not present when insurgents targeted our schools.
- No one of the respondents received physical injuries.
- 100% students received psychological impacts due to insurgency 20% received stress 60% suffered from depression and 20% from Post-traumatic stress disorder.
- 40% replied that war activities, 40% nationalism 10% religious slogans caused these disorders.
- 40% of students received assistance while 60% didn't receive any assistance from government. 50% of those who received assistance got sports goods while 50% received financial support.
- Of those who received support 50% received it from government and 50% from relief organization.
- 30% received psychological, 50% emotional and 20% financial support.
- Majority of the students 100% stated we are receiving still difficulties in getting education.40% facing difficulty due to infrastructural destruction, 30% due to financial problems and 30% due to fear of insurgents.
- Students about 80% declare their life has affected from insurgency and 20% their life was not affected by insurgency.
- A number of students 40% mention that their livelihood has been influenced due to insurgency. 10% says we generate money, while 10 have reported that their extracurricular activities are affected 40 % told their daily activities disturbed.
- 20% students told they are compelled while 80% are not compelled to earn money.
- 4% generate money through begging and 4% generate through illegal activities, 12% through workshop.
- 80% claimed that they don't get support in this regard while 20% received it.
- 10% of students that receive support they received it from parents, 6% say they are supported by the teachers and 4% by the NGOs.
- Majority of the students 100% declare we are still facing problem in getting education. 80% due to financial problems and 20% due to uncertain circumstances.
- According to 50% of the students insurgency had a weak impact over the teaching methodology and 50% claimed the impact was very weak.
- Mostly teachers say the insurgency was provoked by insurgents through madrassa system 60% and 20% answered it was provoked through distribution of Islamic literature and 20% through enforcing of its own ideologies.
- Majority of the Teachers 40% declare that insurgency was enhance tendency of local people to religion,20% increased occur because of foreign intruption,20% increase of local seminaries and 20% increased due to less awareness about religion.
- Majority teachers 60% expressed their feelings that insurgency was big threat to their families, 20%thinking

about children education and 20% consider threat to their livelihood sources.

- Great numbers of teachers 80% declare that insurgents forced them to prevent from job and 20% told that did not face any prevention from insurgents, 100% teachers declare they were not present when school targeted by insurgents.
- Teachers mention 40% of school buildings were completely destroy and 60 percent were partially demolished.
- Majority of teachers 60% expressed we continue education for children in tent schools and 40% mention we continue education under shadows of trees after insurgency.
- Majority 60% of the teachers answered the question of when schools destroy I was thinking about education of children while 40% replied they were reached to the effected school building.
- Most of the teachers 60% declare insurgency was at peak during summer vacations and 40% told that insurgency was at peak during classes' time.
- 100% teachers stated that children effected as a result of insurgency mentally and socially 100% teachers mention no student was disabled or injured during school time
- Dropout ratio was 60% according to teacher's response and 20% respond it was medium level and 20% replied dropout ratio was low, while 60% mentioned, Cause of dropout ratio was migration and 40% replied security reasons were enhancing dropout ratio. Teachers answered that current dropout ratio is low and the dropout ratio effect the student life, and 60% children effects from psychological problems, 20° effects from child labour, and 20% effect from child abuse.
- Teaching methodology was traditional before insurgency 80% teachers replied and 20% replied it methodology was mix methodology, while 80% answered that teaching methodology was affected by insurgency and 20% answered methodology was not suffered as a result of insurgency.
- 20% students viewed teaching methodology is traditional, 20% told methodology is modern and 60% replied mix methodology which is affected by insurgency.
- 80% parents show positive response after insurgency and take interest in admitting their children in schools and 20% don't show give any response.
- Teachers replied 60% to the question that there was no role of education institutions after insurgency in capacity building process while 40% replied that government has played their role in community building processes.
- Impacts of insurgency continue 2 years 20% teachers replied, while 20% replied for 3 years 20% answered for 4 years and 20% replied that impacts of insurgency continued for 5 years.
- 60% teachers that exams of has children severely effected as a result of insurgency and 40% replied exams results were not improved.
- Teachers 60% replied to the question that they were strongly disagree that sufficient security was provided for schools during insurgency and 40% replied, they were simply disagreeing over security measures,60% teachers declare that provide security for schools,20% replied adopt proper counter insurgency measures, and 20% answered Prepare vigilance teams to overlook security.
- 60% teachers answered that the most appropriate way to curb the insurgency is to provide education while 20% mentioned empower peoples economically and 20% replied that provide employments opportunities to root out insurgency.

5.2 Conclusion

Education is a powerful weapon through which we can change ourselves and the world. Education provides basis for development of nations and it is obvious that primary education is key to later academic achievements and research. Contest every fight and change the whole world. No development is possible without education. but unfortunately, in Pakistan specifically in Baluchistan is under pressure from militants and attacks have been reported on various schools here already a vacuum has been present since the day of independence which lead to birth of various problems like religious insurgencies and the situation was further aggravated after US war on terrorism and attacks on Afghanistan. Insurgents' movements enhance the darkness of illiteracy which lead to serious educational crises in Baluchistan. These insurgencies have different foundations, some insurgencies are on the basis of nationalism, and some are religious. Due to insurgencies Pakistan also put considerable amount of losses in every sector of the country, especially education, economy, industry etc. When insurgency wrap the Baluchistan specially Tehsil Panjgur, insurgent's priory attacked on primary education and declares by the high clerics of Taliban, these are the centers where western education is nourished and propagating, demolishing of these schools

lead to deprived great numbers of children from schools which bring halt in the literacy ratio of children. The absence of education for these children created serious social and mental problems. During data collection from students and teachers according to these respondents, illiteracy and poverty were the two igniting stimuluses' which induce this giant monster. Second the target populations of this study also disclose that due to lack of awareness, unemployment, less knowledge about religion, and some foreign interruption also inflame the insurgency.

Due to the increased militancy children and peoples of Panjgur suffered from various psychological problems. These psychological problems were Post Traumatic Stress Disorder. Trauma stress and depression. These psychological problems worsen the mental health of students and teachers. When the insurgency erupt in Panjgur's education institutes were badly hampered due to targeting from insurgent groups. Destructions of these primary school trigger bundles of obstacles in student learning process. Dropout ratio leap to higher level and Massive gape was created in the studies of children.

To restore peace and education in volatile and shrinking parts of Pakistan especially in Baluchistan government should take concrete measures to curb the insurgency. Government must take productive measures to facilitate education on door step because education is the key to the problems like insurgency, radicalization, and it incorporate sustainable development for every sector. Government should rebuild the destroyed schools, also build new schools to lite again the gleam of ray of education in the darkness of illiteracy. Governments encourage students and teachers economically, psychologically, emotionally to focus their professions, at same time also supervise the education activities in schools and other education institutions so that primary education may flourish in Panjgur and Baluchistan.

5.3. Recommendations

In the light of detail earlier study following recommendations are made for the improvement of primary education in Tehsil Panjgur.

- First the government should ensure law and order situation in the region with the help of strong political reforms, education, and Jirga system.
- Pardoning and mainstreaming of militants through dialogue.
- Special development activities such as Aghaz i huqoq Baluchistan package to ensure economic stability.
- Government as soon as possible rebuild the demolished and ruined schools because children are studying in tents and open grounds to continue the provision of quality education for children in tehsil Panjgur area.
- Government should also build new schools in rural and remote areas of tehsil Panjgur to enhance literacy rate.
- Provision of security to schools and school buses and vanes because some cases of attacks on school buses have been reported.
- Standard training and workshop for awareness among parents and teachers
- Psychological assistance should be provided to affected students and teachers.
- Government should pay the attention to the scarcity of teachers in various schools. During the conducting of this study many posts of teachers were vacant so government must recruit new teachers and allocation of teachers to remote schools.
- Government should launch awareness programs in tehsil Panjgur about importance of education, financial aid and scholarships to poor and intelligent students.
- As result of insurgency dropout ratio reached to high level due to migration and security reasons. A large numbers of children are still out of schools due to child labor and other social problems, government should facilitate these children economically, emotionally and psychologically to restore the literacy rate in tehsil Panjgur.
- Government should arrange training sessions for teachers because most of the children claimed that teaching methodology is traditional and indigenous methodology, so to bring changes in the methodology and train teachers to enhance quality education.
- Government should minimize the causes of insurgency like unemployment, discrimination, poverty illiteracy, and Government must adopt counter insurgency measures with the help of security forces, law enforcement agencies and communities.
- Government educate local peoples about insurgency according to our religion that there is no place of violence in our religion and society.
- Government must establish their write to ban on poopy mafia because a lot of children are addicted hashish and other drugs, also government play their crucial rule and provide incentives to those children which are out

of schools.

- Government must facilitate sustainable security to the schools, students, and teachers so that the children will not further deprived from their basic education and the fear of abduction and violent activities not remain obstacle in getting education.
- Government provides psychological support for students and teachers in tehsil Panjgur Baluchistan which suffered from various mental problems and ensure these students and teachers now situation is all right and draw their attention to education. Government must also provide curricular activities or games to the children which suffered psychologically.
- Government must negotiate with local people and militants so that children should not be made the victims of conflicts.
- Pakistan has a very long border with Afghanistan and Iran through Panjgur so government should introduce proper boarder management system to control the illegal immigrants and terrorist entrance to Pakistan, this miss-management of boarder can lead to serious consequences.
- Infiltration of insurgents from Iran and Afghanistan should be minimized by establishing boarder check posts. Otherwise the issue will continue to affect not only education but other sectors like economy and drug trafficking.

VULNERABILITY ASSESSMENT OF FLASH FLOOD AND ITS IMPACTS ON AGRICULTURE AND PHYSICAL INFRASTRUCTURE IN BILPHOKE DISTRICT CHITRAL

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Chapter 01

Introduction

1.1 Background

1.1.1. Floods

Floods are natural and recurring events in a river or stream. Floods are usually described in terms of their statistical frequency. A "100-year flood" or "100-year floodplain" describes an event or an area subject to a 1% probability of a certain flood occurring in any given year.

The frequency of flood depends on the climate, the material that makes up the banks of the stream, and the channel slope. Where substantial rainfall occurs in a particular season each year, or where the annual flood is derived principle from snowmelt, the flood plain may be inundated nearly every year, even along large streams with very small channel slopes. In regions without extended periods of below-freezing temperatures, floods usually occur in the season of highest precipitation (United States Agency, 1991). In some areas floods occur because of exposure to the cyclones, hurricanes, big tidal waves or tsunamis.

Floods and flooding are two terms which are frequently mixed up, when topics concerning high water stage or peak discharge are discussed. Above are defining the terms as.

A flood is “defined as a temporary condition of surface water (river, lake, sea), in which the water level and/or discharge exceeds a certain value, thereby escaping from its normal confines;” this does not necessarily result in flooding (Douben, 2006)

Flooding is defined as the spilling over or failing of the normal limits for example river, lake, sea, stream or accumulation of water as a result of heavy precipitation through lack or exceeding of the discharge capacity of drains, or snowmelt, dams or dikes break affecting areas which are normally not submerged (Douben and Ratnayake, 2005).

1.1.2 Types of floods

A distinction can be made between the different types of floods. Coastal floods, river floods, flash floods and urban floods (MunichRe, 2007)

1.1.3 Flash floods

Flash floods are short-term inundations of small areas such as a town or parts of a city. They are caused by what are usually short periods of intense rain often occurring over a very small area and typically in conjunction with thunderstorms. The soil is not usually saturated. But as the rainfall intensity exceeds the infiltration rate, the water runs off on the surface and soon gathers in the receiving waters.

Flash floods can occur almost anywhere, so that nearly everybody is threatened. Sometimes they mark the beginning of a major river flood, but usually they are separate, individual events of only local significance, scattered randomly in space and time. Dams and levees are built for flood protection. They usually are engineered to withstand a flood with a computed risk of occurrence. For example, a dam or levee may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any year. If a larger flood occurs, then that structure will theoretically be overtopped. If during the overtopping the dam or levees fail or is washed out, the water behind it is released to become a flash flood (Perry, 2000)

1.2 Study Area

Chitral is the largest district in the Khyber-Pakhtunkhwa province of Pakistan, covering an area of 14,850 km^2. It is the northernmost district of Pakistan It shares a border with Gilgit-Baltistan to the east, with Kunar, Badakshan and Nuristan provinces of Afghanistan to the north and west, and with the Khyber-Pakhtunkhwa districts of Swat and Dir to the south. A narrow strip of Wakhan Corridor separates Chitral from Tajikistan in the north.

Chitral shares much of its history and culture with the neighboring Hindu-Kush territories of Gilgit-Baltistan, a region sometimes called "Peristan" because of the common belief in fairies (peri) inhabiting the high mountains.

The entire region that now forms the Chitral District was an independent monarchical state until 1895, when the British negotiated a treaty with its hereditary ruler, the Mehtar, under which Chitral became a semi-autonomous princely state within the Indian Empire. Chitral retained this status even after its accession to Pakistan in 1947, finally being made an administrative district of Pakistan in 1969, disestablishing the Princely state.

The district Chitral is situated to the extreme north corner of KP, Pakistan between 35 12-36 50 N latitude and 71degree 2-73-

53-E longitude and elevation ranging between 1,094m at around and 7,726m at Terichmir (IUCN,2004. Chitral district shares boundaries with Afghanistan on the north and west with Gilgit-Baltistan (firmly known as northern areas of Pakistan on the east and with district of Dir and Swat toward the south (AKRSP2007). Administratively Chitral is divided into 24 union council and two tehsils. Total population of Chitral is estimated to be 318,689; 162,082 males and female 156,607females which lives in more than 32 valleys with a density of about 21 persons per square km about 90% are rural and 10% urban. Chitral is the only urban settlement in the district (district census report,1998).The Chitral river and its early tributaries run through these mountains in narrow steep sided valleys and there are a great ecological variation at short distances .soil ,rainfall and temperature vary with topography ,elevation and other aspects ,shaping both the natural and manmade environment .Chitral is situated in the rain shadow of high mountains.it therefor does not receives the summer monsoon rains .The mean rainfall of Bilphoke and Chitral town (lower Chitral)is about 650 and 500 mm, respectively ,received mainly in spring and winter .Summer and autumn are dry, barely receiving 10 to 25 mm of rainfall per month figure six. In upper Chitral, the annual precipitation perhaps peters down to about 200mm, received mostly as snow at higher elevations. Temperatures in the valley button can vary from extremes of 35 to 40.

Table1.1 Annual Rainfall Data Summary

	Bilphoke		Chitral City	
Month	Total Mm	S/In Annual R Fall%	Total mm	S/Annual Rainfall%
Jan Feb	162	25	91	18
March April	245	37	278	54
May	62	9	41	8
Jun Nov	150	23	62	12
Dec	40	6	44	8
Total	659		519	

Source: Chitral Conservation Strategy (2004)

The Chitral valley and some thirty subsidiary valleys drained by the Chitral river is known by different names along various stretches ,and its tributaries .Originating the Chianter glacier the rivers enters Afghanistan at Arundo .Chitral main valley is 354 km long and various in width from 4800m at some location to barely 180 meters ,while the side valleys are narrower .The total land of Chitral is 14850 square km spare vegetation 38% which is dominated mountains having grazing lands 25%, glaciers and snow fields 23.9,forest 4.9barren lands and rivers beds 4.2% potential agricultural land 1.8%, agriculture 1.5% shrubs land is 0.8%(IUCN,2004).

The local economy depends to a great extent, on subsistence agriculture and livestock. According to the AKRSP study 2007 an average sample household derived about 58% of its income from on firms. Owing to limited rain crop production relies on irrigation using a system of channel that divert from springs and streams fed by melt water from the high mountains.

1.3 Research Problem

In this chapter, the research problem, its purpose and objectives has been discussed. This chapter also includes a brief description of the data collected its types and tools used for the collection of desired data. This study has been carried out with the help of primary and secondary data collection which had put the data analysis at ease and point out different kinds of vulnerabilities in the study area.

1.4 Selection of the study area

The study area was selected taking the following important factors into consideration.

1. There has been no study carried out in the study area so for to recognize different kinds of vulnerabilities, different elements vulnerable to flash flood and their causes.
2. The study area is exposed to flash flood and thus suffers damages.
3. The selected area is an important area to be studied with respect to flash flood because the study area experience severe and frequent flash floods, which has caused tremendous damages in the past, and a serious threat to human life and their property in the future.

1.5 Rationale of the study

Bilphoke is situated in district Chitral lower, which is about 20km from main chitral. Heavy rainfall is a natural phenomenon in this area, and its leads to flooding. After the huge amount of rainfall falls here it will convert in to flooding and disturb the whole community. Flash flood is recurrent phenomenon at Bilphoke UC, which effects the livelihood, settlements and agricultural land of people. Due to which roads are disturb and the basic needs are required of the people of village, they face the critical situations.

1.6 Justification of the research problem

Flash flood is one of the disastrous and recurrent phenomena in Bilphoke Area. During flood the water overflows the banks of the said torrent and causes damages to crops, houses shops and roads etc. thus it causes a huge economic loss as well as considerable loss of life in the study area. These damages are particularly great where the construction is on the bank of torrent or the nearby low lying areas. The study area `is also located in active flash flood plain where construction activities are still carried out in the way of the torrent, hence increasing the vulnerability. The only road to chitral, Chitral upper and Kohistan passes through this torrent and with the bridges. Many agriculture and economic activities are carried out in the area which are highly vulnerable to flash flood. That is why the damages occurred by floods in the study area are very severe and need adequate attention. However, no work has been carried out before to identify the elements at risk, their causes of vulnerability, and damages in the study area and suggest applicable remedial measures. The government participation is negligible, yet there is need of government participation of large scale remedial measures and public awareness programs to exert pressure on the government in this regard. Therefore, this study aims to identify the different elements at risk their causes of vulnerability and suggest remedial measures to reduce the vulnerability in order to safeguard human lives as well as their property in the study area.

1.7 Purpose of the study

The specific purpose of the study is to highlights the vulnerability in the study area and make flood hazard reduction policies effective in reducing the damages as a result of flash floods.

2.1 Topography and access

Chitral is counted amongst the highest regions of the world, sweeping from 1,094 meters at Arandu to 7,726 meters at Terichmir, and packing over 40 peaks more than 6,100 meters in height. The terrain of Chitral is very mountainous and Tirich Mir (25,289 feet) the highest peak of the Hindu Kush, rises in the north of the district. Around 4.8 per cent of the land is covered by forest and 76 per cent is mountains and glaciers.

Chitral is connected to the rest of Pakistan by two major road routes, the Lawari Pass (el. 10,230 ft.) from Dir and Shandur Top (elevation 12,200 ft.) from Gilgit. Both routes are closed in winter. The Lawari Tunnel is being constructed under the Lawari Pass. A number of other high passes, including Darkot Pass, Thoi Pass and Zagaran Pass provide access on foot to Chitral from Gilgit-Baltistan in Ghizer District.

- Arandu pass, on the border between Pakistan and Afghanistan
- Boroghol pass, on the border between Pakistan and Afghanistan
- Dorah pass, on the border between Pakistan and Afghanistan
- Darkot pass, on the border between Chitral and Ghizer
- Shandur pass, on the border between Chitral and Gilgit-Baltistan
- Lawari pass on the border between Chitral and upper Dir
- Lawari tunnel, uncompleted
- Thoi Pass on the border between Chitral and Gilgit-Baltistan
- Zagaran Pass, on the border between Chitral and Gilgit-Baltistan.

2.2 Climate and Precipitation

The climate can be described as mild temperate. It is characterized by cold frosty winters with occasional snow fall and warm to hot summers, mostly hot during May & June and warm to hot with increased humidity during monsoon season. The Northern parts are generally colder and receive more precipitation. While semi dry condition prevails in its southern parts. Annual average rainfall varies from 700 mm to 1200 mm. Generally, 55% of the rain fall occurs from December to April and 35% from July to September. Mean maximum temperature rises 38-c while mean minimum temperature falls to 0.

2.4 The study area and its vulnerability

UC Bilphoke is situated in district Chitral about 20 km from main city of Chitral. Vulnerability to flooding is very high in every aspect. Physical, economic and social are the in under vulnerability whenever, such situation of floods occurs. The reason is

that because of their high mountains with smooth side of the village. The soil is caused of floods due to swift rainfall because of two reasons.

First is the people are overgrazing their livestock up on mountains side and the herds of goats and other domesticated animals are being overgrazed at routine basis for many years. The people are unaware from centuries of such impact of flood risk and now they are reaping their incautious action in society

The second major caused of floods is deforestation. Due to which flash floods occurs and destroying the whole society, suddenly whenever rainfall starts in Bilphoke Chitral.

Now, due such destruction the people of this region is awarded and has taken positive step to anticipated such of risks and their occurrence.

2.5 Objectives of the study

Following are the objectives of the study.

1. To study the problem of flash flood, its causes and intensifying factors in the study area.
2. To assess what elements are at risk from flash flood.
3. To assess different kinds of socioeconomic and physical vulnerabilities in the study area.
4. To suggest some measures to reduce the vulnerability of the people, their property and livelihood assets.

2.6 Limitations

The following are the limitations of the study.

1. The most important limitation was that of time, as it was too short to carry out an extensive study of the study area.
2. There has also been difficulty in obtaining secondary data.
3. There was no proper data of climatic conditions and flood with concerned agencies.

Chapter 02

Literature Review

Disasters causes wide spread disruption in the functioning of a community which exceeds the capability of the effected community to cope with the consequences (UNISDR).

More specific medical definitions exist that define disaster in term of the magnitude of adverse consequences resulting from the exposure and the efforts required to correct these consequences. (Combs et al., 1999; de Boer, 1990). Occurrence of natural disasters causes huge loss of lives, properties, and physical infrastructure. It also causes socio-economic disruptions and environmental degradation in the affected communities. Disaster statistics indicate that the frequency and intensity of extreme natural events have increased in recent years (UNDP, 2004). The Least Developed Countries (LDCs) and coastal areas are particularly vulnerable to the impacts of natural and climate-induced disasters. The Asian Tsunami as well as the tremendous impacts of hurricane Katrina in New Orleans point out the special vulnerability of coastal zones, their inhabitants, economics, and ecological systems (Kaiser, 2007). Coastal areas are at great risk due to climate change, an accelerating sea level rise, salinity intrusion, erosion, an increase of extreme natural events, etc. The occurrence of disasters is almost unavoidable. However, timely and appropriate measures can help reduce the adverse effects and negative consequences caused by disasters. The consequences of a disaster event such as flood or cyclone depend on vulnerability of affected socio-economic and ecological systems (Cutter, 1996)

Almost all the countries in the world are prone to one or more forms of disaster. Frequent

Therefore, vulnerabilities of different socio-economic and environmental systems need to be properly assessed. In addition, vulnerability and risk maps based on proper vulnerability assessment may help decision makers to adopt appropriate policies and actions (De Bruijn and Kleijn, 2009). Though the assessment of vulnerabilities is essential, it is complicated due to the social, economic, political, and institutional patterns of societies (Villagrán, 2008). At present, no standard model/methodology exists to carry out spatial vulnerability assessment (Thywissen, 2006; Alwang et al., 2001; Brooks, 2003).

Different scientific communities follow different approaches for spatial vulnerability assessment. Additionally, vulnerability and risk assessments are not properly done and available in many disaster prone countries. For example, Bangladesh being one of the most flood prone countries in the world lacks proper vulnerability and risk assessment. In maximum cases, the analysis of disaster damages mainly focuses on the economic evaluation of tangible effects, and important social and ecological aspects of vulnerabilities are neglected. Therefore, it is a challenge to develop a wider perspective for vulnerability assessment including physical, social, i, ecological, and other important factors. (D.C. Roy, T. Blaschke)

A poor community may be economically vulnerable but at the same time may have social, cultural and political capacities to cope with disasters. Risk reduction strategies for the poor should work towards reducing economic vulnerability and at the same time capitalize on (and perhaps nurture) the inherent social and cultural capacities of the poor communities. It is imperative that while improving the economic resilience of such communities, the physical, social and political risks are also recognized and managed. There is another aspect of vulnerability of the poor people, which is frequently ignored, that it is often local in nature. Disaster statistics collected and aggregated at provincial and national levels, do not capture the miseries of the poor and the most vulnerable. The impact assessments capture only the formal and well-defined sectors of the economy. (Dr. Suvit Yodmani)

2.1. Disaster

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources (UNISDER). Disasters are often described as a result of the combination of the exposure to a hazard. The conditions of vulnerability that are present and insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts may include loss of life, injury, diseases and other negative effects on human physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation. More simply disaster is a situation which claims human lives, yield damages to human properties and degrades the environment for example 2010 flood which claimed about 1700 lives and estimated damages were 9.5 USD or the current war on terror in Pakistan both can be characterized as disasters.

2.2. Flood

Floods are natural and recurring events in a river or stream. Floods are usually described in terms of their statistical

frequency. A "100-year flood" or "100-year floodplain" describes an event or an area subject to a 1% probability of a certain flood occurring in any given year.

The frequency of flood depends on the climate, the material that makes up the banks of the stream, and the channel slope. Where substantial rainfall occurs in a particular season each year, or where the annual flood is derived principle from snowmelt, the flood plain may be inundated nearly every year, even along large streams with very small channel slopes. In regions without extended periods of below-freezing temperatures, floods usually occur in the season of highest precipitation (United States Agency, 1991). In some areas floods occur because of exposure to the cyclones, hurricanes, big tidal waves or tsunamis.

Floods and flooding are two terms which are frequently mixed up, when topics concerning high water stage or peak discharge are discussed. Above are defining the terms as.

A flood is “defined as a temporary condition of surface water (river, lake, sea), in which the water level and/or discharge exceeds a certain value, thereby escaping from its normal confines;” this does not necessarily result in flooding (Douben, 2006)

Flooding is defined as the spilling over or failing of the normal limits for example river, lake, sea, stream or accumulation of water as a result of heavy precipitation through lack or exceeding of the discharge capacity of drains, or snowmelt, dams or dikes break affecting areas which are normally not submerged (Douben and Ratnayake, 2005).

2.2.1 Types of floods

A distinction can be made between the different types of floods. Coastal floods, river floods, flash floods and urban floods (MunichRe, 2007)

1. Coastal floods:

They can occur on the coast and along the banks of large lakes (MunichRe, 2007). Floods usually occur when storms coincide with high tides and can include overtopping or breaching

of beaches. Coastal flooding can also be produced by sea waves called tsunamis, unusually giant tidal waves that are created by volcanoes or earthquakes in the ocean. Hurricanes and tropical storms can produce heavy rains, or drive ocean water into land. They have extreme loss potential and may cause hundreds of thousands of fatalities.

The accelerating rise in sea levels that is certainly to be expected as a result of climate change and variability will aggravate the risk of storm surges and coastal erosion all around the globe and this will be one of the most detrimental effects of global warming.

Coastal flooding levels (NYC Hazards, 2007) — categorized as minor, moderate or major are calculated based on the amount of water that rises above the normal tide in a particular area. Flooding of this type can be very destructive (Natural Environmental, 2007).

2. River floods

Floods along rivers are a natural event. Some floods occur seasonally when winter snows melt and combine with spring rains. Water fills river basins too quickly, and the river will overflow its banks. River floods are also the result of copious rainfall usually continuing for a period of days over a large area. The ground becomes saturated and cannot cope with any more water so that the rain flows into the rivers (Hoyt, 1955).

River floods do not occur abruptly but build up gradually – although sometimes in a short time. As a rule, they last from a few days to a few weeks. The affected area may be very extensive if the river valley is flat and broad, and the river carries a large volume of water.

River related flooding also brings to threats arising from food and drinking water shortage and the spreading of diseases (Douben, 2006).

3. Flash floods

Flash floods are short-term inundations of small areas such as a town or parts of a city. They are caused by what are usually short periods of intense rain often occurring over a very small area and typically in conjunction with thunderstorms. The soil is not usually saturated. But as the rainfall intensity exceeds the infiltration rate, the water runs off on the surface and soon gathers in the receiving waters.

Flash floods can occur almost anywhere, so that nearly everybody is threatened. Sometimes they mark the beginning of a major river flood, but usually they are separate, individual events of only local significance, scattered randomly in space and time.

Dams and levees are built for flood protection. They usually are engineered to withstand a flood with a computed risk of

occurrence. For example, a dam or levee may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any year.

If a larger flood occurs, then that structure will theoretically be overtopped. If during the overtopping the dam or levees fail or is washed out, the water behind it is released to become

a flash flood (Perry, 2000).

Flash floods are the deadliest and damaging kind of floods. This is because they happen without warning and deliver massive amounts of fast-moving water. Sadly, they are also the most common kind of flood. Flash floods are also much shorter in duration than river floods most of the water has disappeared again after a few hours.

Impacts of flash flood

1 Clearing a Path

The immediate noticeable effect of flash flooding is the incredible force of rapidly flowing water in places where it doesn't normally flow. Floodwaters have enough strength to damage or destroy buildings, sometimes washing them completely off their foundations. Some floodwaters can destroy roadways, wash out bridges and take out most anything in their path. This dangerous effect of flash flooding can trap people in their homes and make roads impassable, rendering victims helpless to escape from the danger. Air rescues are sometimes necessary to pull people to safety (American Red Cross).

2. Sewage

The sudden rise in the water level can often destroy sewer and drainage systems, making a potential health hazard anywhere that has been affected. Human waste and other hazardous materials can wash out into the streets and into homes and potentially contaminate drinking water supplies.

3. Eviction

Flash flooding can quickly evict people from their homes. Rising water may not even give residents time to save their belongings before they must evacuate. Family photos and expensive or sentimental possessions can be washed away or destroyed.

People who are forced from their homes must find shelter and may not be able to return to their homes for an extended period of time. Even when the water recedes, there are likely mold problems, which also pose a health threat. Rebuilding and treating homes damaged by flooding can take weeks or even months depending on the severity. In the meantime, the victim families must find alternative housing which will likely only lead to more stress and anxiety.

2.3 Flash floods in global perspectives and their impacts

In the developed country, most exposed populations are protected from flooding by various structural measures (e.g., UK, the Netherlands and Japan). In the developing world, flood defenses are less developed and the exposed populations are more often subject to flooding, resulting in loss of life, disruption, economic loss, etc. People in developing countries, have less capacity to adapt to change and are more vulnerable to environmental threats, floods and global change, just as they are more vulnerable to other stresses (UNEP, 2002).

Floods are the most common occurring natural disasters that affect humans and their surrounding environment (Hewitt, 1997). The world experienced between 1700 - 2500 (major) flood events between 1985 and 2003; more than 50% of the floods occurred in emerging countries (US$ 2,976-9,205 GNI/ capita), approximately 45% in Asia and about 25% in the Americas (Douben, 2006).

In Africa, early February 2000, exceptionally heavy rains with a return period of 200 years occurred over Mozambique, north-eastern parts of South Africa, Zimbabwe, Botswana, Zambia and Madagascar and caused severe flooding (Smithers et al., 2001; Dyson and van Heerden, 2001).

The floods in 2000 left a trail of devastation in Mozambique. The affected sectors were agriculture, infrastructure, including roads, railways, bridges and water control embankments, water intake and treatment plants and supply systems. Floods left over 700 people dead and half a million homeless (Mirza, 2003). The UN World Food Programed reported that Mozambique lost at least one third of its staple food maize and 80% of its cattle. In 2001, floods destroyed thousands of homes and 27,000 ha of crops. It also affected 400,000 people, 40 people were killed and 77,000 left homeless (WSWS, 2001).

Also in 2000 in Zimbabwe, more than 100 people have died, and an estimated 250,000 have been left homeless, exacerbating the country's worst economic crisis in 20 years. In Madagascar floods caused by two cyclones have forced 600,000 people from their homes, according to the United Nations, at least 130 had died.

In 2003, during the flash flood events in Ethiopia the floods killed at least 117 people and more than 100,000 have been left homeless; another 40 people have died in Kenya. In western Kenya some 60,000 have fled rising waters, according to Kenya Red Cross Society, and in Somalia 21 out of 33 nearby villages were abandoned because of the flash floods and people were

suffered from lack of food, shelter and medicine (BBC, 2003).

Throughout the history, the United States of America faced many flash floods, as in 1993 along the Midwest/ Mississippi area which was the worst flooding in recorded history, 38,000 homes damaged or destroyed and 20 million acres of farmland under water (Floods, 2005).

In 2005 in Central America Hurricane Stan triggered heavy rainstorms causing flash floods that have killed more than 2,000 people in Mexico, Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua. As many as 3.5 million people have been forced to evacuate their homes.

In Latin America in 2005, twenty-eight people have died and over 220,000 have been evacuated from their homes in the worst flooding in Paraguay, Argentina and southern Brazil since 1983. In 2002 a torrential rainstorm hit La Paz, Bolivia, killing 60, injuring 100 and leaving over 500 homeless. In north of Colombia in 2004, the heavy rains claimed the lives of 19 people and left over 200,000 homeless.

Asia and the Pacific regions are also vulnerable and flash floods affect the social and economic stability of various regions and countries. The worst flood in China in 1998 affected 223 million people, 3,004 people were reported dead, 15 million were homeless and the economic loss was over US$ 23 billion for that year. Due to heavy flooding in Cambodia and Vietnam in 2000, 428 people were reported dead and the estimated economic loss amounted over US$250 million. In 1991, 140,000 people across the world were reported dead and in 1998, it affected 25 million lives (UN, 2003). For the last 10 years due to frequent occurrence of floods, thousands of people have been affected due to flooding in India, Pakistan, Korea, China, and Bangladesh destroying their agricultural fields, residential areas; i.e. livelihood and food. Chaotic rainfall events in the 20th century in Western Europe have increased the occurrence of flooding. Floods in the UN European Macro Region caused 252 disasters during 1985-2004 (Hoyois and Guha-Sapir, 2005). The worst flash flood events occurred in The Czech Republic

(2002), France (1977 and 2003), Germany (1993 and 2002), Italy (1970, 1994 and 2000), Netherlands, Belgium, Poland (1997), Spain (1982), Sweden (1977, 1985 and 1994) and UK (2000 and 2004) and have affected many human lives and the environment.

Additionally, in 2005 high and medium flash floods in India, China, Serbia, Romania, Germany, Russia and Bangladesh caused enormous economic losses and high fatalities. Worldwide, water-related disasters claim about 25,000 lives and affect over 500 million others annually.

The annual costs of flood-related losses are more than $60 billion; by contrast, in 1950 these losses were about $10 billion. Floods often occur frequently, which means that reducing vulnerability and improving coping capacities is an evident need for people living along rivers (UNU – EHS, 2006a). Flash Floods are regarded as the most dangerous and harmful natural disaster. The number of affected people and lives lost due to floods exceeds any other natural disasters in the past few years. This trend is not new since the damages of floods are historical in many places.

Researchers and policy-makers are looking for possible solutions to mitigate the damages of flash floods. There are proposals to add a new Millennium Development Goal. To halve the proportion of human losses due to water-related disasters by 2015.

Many studies describe the possible causes and effects of floods in terms of loss of human lives and costly damages and possible counter measures that can be adopted to minimize its consequences (Hall et al., 2004; Sayers et al., 2002; Connor & Hiroki, 2005; Naess et al., 2005, Nicholls, 2004; Plate, 2002; Montz & Gruntfest, 2002; Mustafa, 2003). Roughly, the approaches for flash flood mitigation and defense can be divided into two: structural and nonstructural measures.

The structural measures consist of infrastructure development that modifies the river flow, like dams, barrages, dikes, levees, channeling, etc. that reduce flash floods from causing damages to the population or infrastructure in the flood prone area (Douben, 2006b). The basic principles consist of storing, diverting and/or confinement of floods. They usually consist of large investments for large engineering structures, which sometimes are inevitable to preserve the safety and development of a region. Some examples are: The Storm Surge Barrier in The Netherlands, Three Gorges Dam in China, dyke construction in several rivers.

The non-structural measures consist of several mitigation measures not modifying the river flow, such as preparedness, response, legislature, flood forecasting and warning systems, flood proofing, flood fighting, post-flood rehabilitation financing, and reconstruction and, rehabilitation planning (Andjelkovic, 2001). The aim is to reduce loss of life and damage to property. It may also include educating, training, regulating, reporting, forecasting, warning and informing, insuring, assessing, financing, relieving and rehabilitating. Some examples are the Flood Forecasting Program in Mozambique, Evaluation of Flood Vulnerability in Philippines, etc.

Community based flash Flood Mitigation Project in Cambodia

The Community-Based Flood Mitigation and Preparedness Project (CBFMP) was initiated in 1998 as an effort to reduce the vulnerability of rural villagers to natural disasters. The CBFMP project's objective was to establish sustainable, replicable

nongovernmental mechanisms for disaster mitigation and preparedness. The CBFMP program required that several agencies collaborate to oversee and implement the program, including a number of donor agencies that participated on a financial basis in order to ensure the completion of individual projects in the selected communities of the three provinces (Kandalz, Prey Veng, and Kompong Cham).

Each community relied on traditional community processes in order to complete their respective projects. These processes involved village leaders, what committee members, monks, and village elders taking advisory and/or organizing roles in order to mobilize community resources. However, the main constraint that faced each community in their effort to complete their respective flood mitigation projects was with respect to the community's scarcity of material and financial resources.

Thus, for each of the flood mitigation projects in each community, a large proportion of the financial support had to come from outside the community. The cost-sharing funds were obtained from a variety of NGOs/donor agencies operating in Cambodia. None of the communities had previously received any form of financial aid for a project of this nature and this served as new experience for the CBFMP participants. (AUDMP Briefing Notes (2000) and ADPC Web Site.)

Bangladesh Urban Disaster Mitigation Project

Under the Asian Urban Disaster Mitigation Program (AUDMP) of ADPC, CARE Bangladesh is implementing the Bangladesh Urban Disaster Mitigation Project (BUDMP). The project will begin with the establishment of community-based flood mitigation and disaster preparedness system in the two demonstration project sites – the municipalities of Gaibandha and Tongi. Through this process, the project aims to improve the capacity and skills of the communities to manage the risks and apply mitigation skills in the urban areas. It is expected that the best practices and lessons learned from the two demonstration project sites will be replicated in other municipal areas of Bangladesh. (AUDMP Briefing Notes (2000) and ADPC Web Site.

Concerned by the increasing number and impact of disasters, the International Decade for Natural Disaster Reduction (IDNDR) was initiated in 1990 to serve as catalyst for disaster reduction. One of its major goals was reducing vulnerability to natural disasters, “requiring concerted and coordinated efforts of government, UN-system organizations, the world's scientific and technical community, volunteer organizations and educational institutions, the private sector, the media, and individuals at risk. Vulnerability assessment….. essential” (United Nations IDNDR, 1992).

The international community was alerted to the fact that if we ever want to control and prevent disasters, we must be able to assess and identify vulnerabilities in order to design timely, affordable and effective strategies for reducing the negative effects of disasters (Anderson, 1995).

2.4 National Perspective

Pakistan is one of the Asian countries with highest number of people exposed to flash floods. Due to its topography, climatic and ecological condition, Pakistan constantly received flooding almost every year. Some of these flash floods take dangerous turn of becoming major natural calamity. The high mountains range, Himalaya and Karakorum with heavy snowfall in winter make Pakistan vulnerable to flash flood mostly in summer, also monsoon currents originating in Bay of Bengal and weather system from Arabian Sea and from Mediterranean Sea (westerly wave) are the main cause overflow in many river of the country. Pakistan has a long history of flooding from Indus River and its tributaries. Historical record shows that almost 67 times, Pakistan has been suffered from devastated flash floods since 1900. A few examples are flash floods of 1929, 1955, 1959, 1973,1976, 1988, 1992, 1996, 2005 and 2010 (Mustafa 1998; GoP 2000;Atta-ur-Rahman2010).Floods of 1928,29,55,57,59,73,76,88,92,95,96 and that of 1997,2005,2007,2010 and 2011 are flood events entailing tremendous damages to the life and property in the country(SAF,2010).in the year 1973,more than three million homes were destroyed and 160 persons lost their lives .the 1976 floods demolished over 10million houses while 425 lives were lost with losses amounting to rs.6billion.in 1988,an unprecedented flood occurred toward the end of September inflicting about rs.17billion worth of damages to the country(SAF,2010).the 1992 floods affected a total of 11948 villages ,6655450 persons ,and left 1334people dead (UNDRO,1992).The 1996 monsoon floods have damaged 4.5 million acres of crops.it displaced more than one million people and left at least 80 people dead(AFP,1996).During June 2007,the southern coast of Pakistan was hit by cyclone Yemini which gave way to torrential rains throughout the region. Due to the heavy rains in various areas of southern Pakistan, flash flood occurred in different districts of Baluchistan and Sindh provinces. The floods were among the worst registered in the past ten years and an estimated 2.5 million people were affected. Amongst them some 250,000 persons were made homeless. A total 22,344houses were destroyed in Sindh and 57,640 in Baluchistan (KRT, 2007). However, the 2010 flash floods surpassed all the previous records of floods in Pakistan. The flash floods affected 100,000sq.km, the death toll was near to 2000 and the number of injured person was 2946(NDMA, 2011). The flood of 2010 is one of the main devastating flood and ranked 1st in term of area affected, loss to physical economic and social infrastructure and deaths. The flood affected the entire length of the country for which the overall recovery and reconstruction cost associated with the floods is estimated at approximately US$8.74 billion to 10.85 billion, which include estimated costs for relief ,early recovery,

and medium to long term reconstruction(ADB/Word bank,2010).current flooding is blamed on unprecedented monsoon rain(petz,2010).the rainfall anomaly map published by NASA shows unusually intense monsoon rains attributed to phenomenon of La Nina (NASA,2010). The 2010 flood cause maximum damage in province of KPK, Punjab and Sindh. The 1st and 2nd monsoon spell starts from 26th July to 9thof august 2010 cause tremendous rainfall all over the country especially in northern in northern parts of the country.

2.5. Flash Floods in Pakistan

Baseline information on flash floods in Pakistan has been reviewed and it has been observed that flash floods occur predominantly in mountainous and semi- mountainous regions, and also in adjoining plains. The mountain ranges of the Himalayan region are young, unstable in geology, have steep slopes, and have a climate difficult to predict. Flash floods tend to occur more in recent years owing to changing weather patterns. The region is highly susceptible to natural hazards such as floods, flash floods, landslides, and earthquakes etc. Flash floods have wide vulnerability imprint as they have no early warning cover to warn vulnerable communities. Being a sudden onset hazard, flash floods pose a grave threat to lives besides accentuating socio-economic poverty. Following recent trends of flash floods have been observed: Flash floods generated by hill torrents are experienced in D.I. Khan, D.G. Khan, Kirther Ranges of Baluchistan and Sindh Provinces. Flash floods caused by tropical cyclone adversely affect coastal areas of Sindh and Balochistan. Flash floods are more likely to occur owing to the inconsistent rain pattern & cloud burst phenomenon. A cloud burst event was observed in Rawalpindi-Islamabad in July 2001 that caused record flash flooding in catchment area of Lai Nullah of Rawalpindi and Islamabad where 621 mm rainfall was recorded in Islamabad during a time period of 10 hours only. Flash flood events have become frequent especially in the Northern Areas and in Balochistan. The risk of flash floods associated with Glacial Lake Outburst Flood (GLOF) events has also increased. In Pakistan heavy concentrated rainfall in the river catchments, sometimes augmented by snowmelt flows, generally causes floods in rivers during the monsoon season. Occasionally destructive floods are caused in one or more of the main rivers of the Indus River System due to monsoon currents originating in the Bay of Bengal (India) and resultant depressions which often result in heavy downpour in the Himalayan foothills additionally affected by the weather systems from the Arabian Sea (Seasonal Low) and from the Mediterranean Sea (Westerly Wave). Exceptionally high floods occur due to the formation of temporary natural dams due to land sliding or glacial movements (GLOFs) and their subsequent collapse.

2.5.1 Province/Agency-wise Vulnerability to Flash Floods in Pakistan

Vulnerability is defined as the condition determined by physical, social, economic and environmental factors or processes, which increase the susceptibility

Pakistan Engineering Congress, 71st Annual Session Proceedings 705 of a community to the impact of hazards. Warning systems in Pakistan lack the basic capacities or equipment, skills, and resources. The continuous impact of climate change has further necessitated the need for enhancing the capabilities in the field of early warnings of flash floods. For example, unusual high temperatures in northern mountains during the month of June 2006, accelerated snow melt which caused high to very high flooding in Kabul, Swat, and Chitral rivers in KPK. Mountainous regions of AJ&K and Gilgit-Baltistan are vulnerable to flash flooding, landslides and GLOF at alpine altitudes. Flash floods occur in rivers Kabul, Swat and Local nullahs and cause severe losses to adjoining areas/abadies situated in KPK. Also hill torrents in Punjab cause severe damage due to flash floods. Coastal regions of Sindh and its districts along Indus in the north are vulnerable to riverine floods and tropical cyclones followed by the flash floods. Vast coastal belt of Balochistan is also prone to tropical cyclones and flash flooding. Out of 51 million acres of area in Punjab, 7.7 million acres lies in the active flood zone of 73.62 million population, 14.72 million lies in the flood zones. Besides riverine floods in rivers Indus, Jhelum, Chenab, Ravi and Sutlej heavy precipitation tends to cause serious hill torrents generated flash floods along the borders of Punjab and Baluchistan in DG Khan and Rajanpur. Flash flooding in the plains occurs through numerous seasonal water channels in Sialkot-Jammu region that tend to impact districts Lahore, Gujranwala and Shiekhpura. Heavy rains also tend to cause urban flooding in Rawalpindi, Lahore and other cities due to changing weather patterns causing rising incidence of flash floods and cloud bursts. Province of Sindh is traditionally vulnerable to precipitation generated flash flooding and urban flooding, primarily in the cities of Karachi and Hyderabad. Recent flood experiences indicate that some of the flood protection works were severely damaged this year due to flash floods. Flash floods tend to impact districts Larkana, Kamber-Shahdadkot and Dadu. Flash floods also result from heavy precipitation in Kirthar Range flanking Dadu district in the west. In Khyber Pakhtunkhwa Province, districts Chitral, Upper and Lower Chitral, Shangla, Swat, Charsadda and Mansehra are prone to flash flooding, cloud bursts and land- sliding activity. The peculiar physical configuration of the province makes it vulnerable as some densely populated districts constitute catchment areas of major rivers where minor tributaries multiply and create flash floods vulnerability. District Charsadda is vulnerable to flash floods along Jindi Nullah and Shobla Nullah, both seasonal water channels. In Peshawar, locals have trained the water course of River Kabul tributaries for agricultural and domestic use which causes spill over in populated areas after even moderate precipitation. Damage due to flash floods was most severe in KPK during 2010 floods.

D.I. Khan District is excessively vulnerable to flash flood along five nullahs, seasonal water channels, flowing into Indus off Koh-e-Suleiman ranges to its west. Balochistan faced Yemyin Cyclone in 2007 tinting its vulnerability to tropical cyclones and flash floods caused by heavy precipitation. Three regions of the province are vulnerable to such hazards: Makran region (district Kech and Gwadar), Kutchi plains (districts Sibi, Bolan, Jhal Magsi and Jaffarabad) and third region spans Kalat and Lasbela districts where flood water drains into the sea from higher regions. Flash floods bearing major seasonal rivers include Kech River and Nihange River (Kech), Pralli (Lasbela), Urnach (Khuzdar), Talli, Moollah, Bolan, Sukleji (Sibi, Bolan and Jhal Magsi districts) and Zhob nullah of district Zhob. Nearly all districts of AJK State are located within the summer monsoon zone in the catchment area of rivers Jhelum/Chenab and remain vulnerable to excessive/abrupt flooding even after moderate to heavy precipitation. AJ&K is extremely vulnerable to flash floods that occur without warning. Most households are located on higher ground but the communication infrastructure remains vulnerable to severance both due to flash floods and sliding activity, causing population isolation in remote region. Early reopening of roads to restore accessibility remains critical for response. Makri Nullah of Muzaffarabad City is a source of local emergency. District Neelum is excessively vulnerable to flash flooding as a consequence of rains. Flash floods tend to temporarily block Neelum. Nakdar, Shuntar and Shoai Nullahs have cause similar disruption in recent years. In Bagh District, Mal Nullah poses hazard to Bagh City after excessive rains. Poonch River and Ranger Nullah in Bandi Abbaspur tends to cause local flash floods in Poonch District. To a smaller extent, the southern districts of Kotli and Bhimber are also vulnerable to flash floods.

Local perspective of flash flood and their impacts.

Flash flood in the study area (Bilphoke)

The Bilphoke village lies at a distance of about 20km from main Chitral town. Its population comprises of 350 individuals.

June 24, 2010, was a normal day in the valley with sun shining throughout the day spreading its warm rays, Heavy rain and cloudburst began in the evening at 8;30 over the western mountain tops and comparatively over small expanse of the valley. A danger of flash flood event soon become evident as the shower was intense. Rapids runoff from the mountain slope soon, developed into a flash flood, and by 8; 45pm a wall of water was race down to the Bilphoke and other close area. Unfortunately, because the channel of stream would have carried such a large amount of water but the debris in the channel caused the water to overflow the embankments and change its direction towards the settled agricultural lands. Many people did not believe that they were in danger as such huge overflows are not very common in that area. The flash flood destroyed 10 houses and few human lives leaving injured .240 canal wheat crops were destroyed and 60 livestock were lost .the flash flood effected a population of 400individuals in few villages ,Soon after the event ,relief workers ,Government and NGO,s agencies with rescue and relief equipment's rush to the locality .the effected community were relieved with food and shelter .The devastating flash flood has now left a of the sense of insecurity on the population .(Focus Humanitarian Assistance 2010).

Population affected	400
Deaths	few
Injured	10
House damaged	9
Agriculture land loss	240 canal
Garages and Shops destroyed	5

Source: (Focus Humanitarian Assistance 2010).

Chapter 03

Research Methodology

3.1 Objectives of the study

Following are the objectives of the study.

1. To study the problem of flash flood, its causes and intensifying factor in the study area.
2. To assess what elements are at risk from flash flood.
3. To assess different kinds of socioeconomic vulnerabilities and physical infrastructure in the study area.
4. To suggest some measures to reduce the vulnerability of the people, their property and livelihood assets.

3.2 Data Collection

Two types of data were collected, primary and secondary data. Primary data was collected through questionnaire and personal observations. Questionnaire survey was carried out using the technique of random sampling. For this purpose, students, local people, and businessmen were selected.

The questionnaire was designed to collect information regarding occupation, education, damages from flash flood, remedial measures taken etc. Secondary data was collected, secondary main sources are websites of different concerned organizations such as Provincial Disaster Management Authority (PDMA), United Nations World Food Program (UNWFP), articles and researches of different scholars, annual reports of different organizations worked in flood of 2010.

3.3 Data Analysis

The collected information was analyzed through computer software, Excel, Microsoft Word, SPSS, GIS, then it made possible to represent the data in the form of tables, maps etc. The collected data were analyzed using the following techniques.

1. Statistical Techniques

The data collected was analyzed and presented in the form of percentages, ratios and averages and tables.

2. Cartographic Techniques:

Analysis of data was carried out using computer accessories like SPSS, MSWORLD GIS and Excel. The analyzed data was presented in the form of diagrams, maps and bar graphs. Finally, the collected data were interpreted and suggestion was given.

CHAPTER 04

Data Analysis

Introduction

The data obtained has been analyzed in detail in this chapter. The data obtained has been shown in tables for understanding the data easily using statistical techniques i.e. SPSS. Each table has been discussed briefly.

Gender		Frequency	Percent
	Female	7	23.3
	Male	23	76.7
	Total	30	100.0

Table 4.1

The table 4.1 shows data regarding the gender of the respondents. According to the above. Data it can be observed that the community in the study area is male dominated in which 76.7 percent of the respondents were males while the remaining 23.3 percent were women. It can also be observed that the women in the study area has less access to resources and information and hence they are more vulnerable.

Residence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chitral	30	100.0	100.0	100.0

Table 4.2

The table 4.2 shows data regarding to the residence both the respondents are the local people in the study area. 100 percent of the respondents are the local literate people as shown above the table.

Qualification

	Degree	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B.s	1	3.3	3.3	3.3
	M.A	5	16.7	16.7	20.0
	M.com	1	3.3	3.3	23.3
	M.Phil.	1	3.3	3.3	26.7
	MBA	2	6.7	6.7	33.3
	M.Sc.	20	66.7	66.7	100.0
	Total	30	100.0	100.0	

Table 4.3

The table 4.3 shows that the majority of the respondents were literate. The data indicates that literacy rate is too much high in the study area. All the respondents had complete sixteen years of education. They should be categorized with the levels of education. i.e. M.Phil. 3.3percent, MSc 66.7 percent, MA 16.7percent, MBA 6.7 percent, BS3.3 percent, M.com 3.3 percent.

Do you know about disaster?

Know about disaster		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	30	100.0	100.0	100.0

Table 4.4

The table 4.4 shows data regarding the knowledge about disaster. According to the data the majority of the people were well aware of disaster. Because the majority of the people are literate in the study area. So it is a positive step towards development.

Occurrence		Frequency	Percent
Valid	1	30	100.0

Table 4.5

The table 4.5 shows that which type of disaster occur in the study area. According to the data obtained 100 percent of the people were thinking that flash flood was the major hazard in the study area. The analyzed data in the above table shows that most of people in the area under study were aware of the major hazard which is flash flood.

Causes		Frequency	Percent
Valid	1	11	36.7
	2	6	20.0
	3	13	43.3
	Total	30	100.0

Table 4.6

The major causes of flash flood in the study area have been analyzed in the **table 4.6**. All the respondents have different opinion of the experience inside the study area i.e. 43.3 percent said that deforestation is the major cause of flash flood and 36.7 they argued that this was due to heavy rainfall in monsoon season is the main cause of flash flood, and 20.0 percent select snow melting is the main cause.

In the table 4.7 the intensifying factor of flash flood in the study area have been analyzed. The data indicates that majority of the people (63.3 percent) blame human activities of the Area as major intensifying factor of flash flood. Only 36.7 percent of the people were argued that topography is the main cause of flash flood.

The season of the occurrence of flash flood has been analyzed in the **table 4.8** which shows that majority (86.7 percent) of the people in study area were aware that flash flood occurs in monsoon season. And 10.0 percent argued that the people of the study area was face this phenomenon in spring and few respondents thought that they face it in winter season.

The elements at risk to flash flood have been analyzed in the **table 4.9**. According to the above table most of the respondents were considering roads as a major element at risk (47.7 percent) and 43.3 percent were considering

Bridges and (10.0 percent) were considered as public sector buildings. According to the respondents these were categorized in the above table.

Location of the houses have been analyzed in the **table 5.0**. It can be seen that majority of the houses (63.3 percent) was located away from the torrent and comparatively safe place in case of flash flood .and (36.7 percent) of the houses were located on the bank of the torrent and hence were more vulnerable and should be effected by a huge flash flood in the torrent.

The table 5.1 shows data that whether the infrastructure of the village has been damaged by flash flood or not. According to 83.3percent of the people, the village has been damaged by flash flood in way or the other. Merely 16.7 percent said that their village was not damaged by the said flash flood.

The level to which the infrastructure of the village was damaged by flash flood has been shown in the **table 5.2**. According to the data most of the people (50.0percent) was claiming that their village was not in full or neither nor low

Factors		Frequency	Percent
	1	11	36.7
	2	19	63.3
	Total	30	100.0

Table 4.7

Seasons		Frequency	Percent
Valid	1	1	3.3
	2	26	86.7
	3	3	10.0
	Total	30	100.0

Table 4.8

Element at Risk		Frequency	Percent
	1	3	10.0
	2	14	46.7
	3	13	43.3
	Total	30	100.0

Table 4.9

Location		Frequency	Percent
	1	11	36.7
	2	19	63.3
	Total	30	100.0

Table 5.0

Did the flash flood damage infrastructure of your area?

Damages to infrastructure		Frequency	Percent	Valid Percent	Cumulative Percent
	1	25	83.3	83.3	83.3
	2	5	16.7	16.7	100.0
	Total	30	100.0	100.0	

Table 5.1

If yes, what scale?

Scale		Frequency	Percent	Valid Percent	Cumulative Percent
	0	5	16.7	16.7	16.7
	1	6	20.0	20.0	36.7
	2	15	50.0	50.0	86.7
	3	4	13.3	13.3	100.0
	Total	30	100.0	100.0	

Table 5.2

but in between.20.0 percent was of the view that they were been fully damaged and 16.7 percent were in low damaged and 13.3 were partially damaged by the flash flood.

The table 5.3 shows that whether the livelihood assets of the respondents are damaged by flash flood or not. According to the data livelihood assets of 66.7 percent people have been affected by flash flood in one way or the other and 33.3 percent are not affected.

Does the flash flood damage your livelihood assets?

Damages to livelihood		Frequency	Percent	Valid Percent	Cumulative Percent
	1	20	66.7	66.7	66.7
	2	10	33.3	33.3	100.0
	Total	30	100.0	100.0	

Table 5.3

The scales to which the livelihood assets have been damaged by flash flood are shown in the **table 5.4**. 16.7 percent were effected in low scale and 33.3 were above the low scale and 40.0 were partially effected and 66.7 percent of the peoples were fully damaged by flash flood.

How much the flash flood effected the agricultural sector shown in the **table 5.5**. The data was analyzed that 93.3percent of the agricultural land were disturbed by the flash flood and 6.7percent of the land were not affected as shown above the table.

The flash floods have been effected the livestock of the people or not shown in the **table 5.6**. According to the data analyzed (76.7 percent of livestock were affected in the study area and 23.3 percent livestock of the people in the study area was not effected by flash flood as shown in table.

The flash floods have any impact on health of the people in the study area or not. According to analyzed the data that 70.0 percent of the people in the study area has been affected with health problems and 30.0 percent should not be effected by flash flood impact on their health shown in the **table 5.7**.

If yes, what scale?					
	Scale	Frequency	Percent	Valid Percent	Cumulative Percent
	0	10	33.3	33.3	33.3
	1	5	16.7	16.7	50.0
	2	12	40.0	40.0	90.0
	3	3	10.0	10.0	100.0
	Total	30	100.0	100.0	

Table 5.4

Does the flash flood have any effects on the agricultural land?					
Effects on agricultural lands		Frequency	Percent	Valid Percent	Cumulative Percent
	1	28	93.3	93.3	93.3
	2	2	6.7	6.7	100.0
	Total	30	100.0	100.0	

Table 5.5

Does the flash flood affects the livestock of the local people?					
Damage to livestock		Frequency	Percent	Valid Percent	Cumulative Percent
	1	23	76.7	76.7	76.7
	2	7	23.3	23.3	100.0
	Total	30	100.0	100.0	

Table 5.6

Does the flash flood have any impact on health?			
Impact on health		Frequency	Percent
	1	21	70.0
	2	9	30.0
	Total	30	100.0

Table 5.7

Which sector is most effects?					
Effected sectors		Frequency	Percent	Valid Percent	Cumulative Percent
	1	8	26.7	26.7	26.7
	2	1	3.3	3.3	30.0
	3	3	10.0	10.0	40.0
	4	18	60.0	60.0	100.0
	Total	30	100.0	100.0	

Table 5.8

The most effected sector was agriculture, forestry, infrastructure and both the sector was mostly affected after analyzed the data.60percent of these sector has been affected in the **table 5.8** as shown above. According to all the respondents these sector have been categorized into 4 sector with their percentage as shown above the table.26.7 agriculture land effected 3.3 percent were forestry and 10.0 percent infrastructure were affected in the study area by the flash flood.

The flash floods disturb the standing crops on how much after analyzed the data. We considered that 96.7percent of the standing crops were destroyed by the flash flood in the study area and 3.3 percent remained as shown in the **table 5.9**.

Does the flash flood have any effects on standing crops?					
Impacts on Crops		Frequency	Percent	Valid Percent	Cumulative Percent
	1	29	96.7	96.7	96.7
	2	1	3.3	3.3	100.0
	Total	30	100.0	100.0	

Table 5.9

Does the flash flood have any effects the government's infrastructure of the area?					
Effects on infrastructure		Frequency	Percent	Valid Percent	Cumulative Percent
	1	16	53.3	53.3	53.3
	2	14	46.7	46.7	100.0
	Total	30	100.0	100.0	

Table 6.0

The flash floods have any threat to a government institute or not. After analyzed the data as shown in the table we conclude that 53.3percent of the government infrastructure were effected by flash flood in the study area and 46.7 percent is would not have any destruction as shown in the **table 6.0**.

The **table 6.1** shows that after the analyzed the data (80.0) percent of the main cause should be flood and 16.7 percent suggest that it is due to landslide and 3.3 percent were earthquake in the study area as shown above the table.

Regarding the data analyzed in the table shows that 73.3percent of the respondents agreed that flash flood be managed through risk management and 26.7 percent were not favor of it in the study area as shown above the **table 6.2**.

The table 6.3 shows data regarding the preventive or mitigative measures taken. Half or more than 50 respondents have taken such measures (53.3percent) and 46.7 percent have not yet taken the desired measures in the study area as shown above the table.

The **table 6.4** shows data regarding the types of structural mitigation measures taken. It is shown that 33.3percent have constructed gabions walls and 36.7 have planted trees to minimize the damages from flash flood in the study area.10.0 percent argued that evacuation center and 20.0percent said that other technique should be adopted in the study area as shown above the table.

In your opinion what are the main factor that causes socio economic impact in the area?

Socio economic factors		Frequency	Percent	Valid Percent	Cumulative Percent
	1	1	3.3	3.3	3.3
	2	24	80.0	80.0	83.3
	3	5	16.7	16.7	100.0
	Total	30	100.0	100.0	

Table 6.1

Can flash flood be managed through risk management?

Management through RM		Frequency	Percent	Valid Percent	Cumulative Percent
	1	22	73.3	73.3	73.3
	2	8	26.7	26.7	100.0
	Total	30	100.0	100.0	

Table 6.2

Have you take any prevention or mitigation measures for flash flood?

Preventive measures		Frequency	Percent	Valid Percent	Cumulative Percent
	1	16	53.3	53.3	53.3
	2	14	46.7	46.7	100.0
	Total	30	100.0	100.0	

Table 6.3

What are the structural mitigation measures taken?

Structural mitigation		Frequency	Percent	Valid Percent	Cumulative Percent
	1	10	33.3	33.3	33.3
	2	3	10.0	10.0	43.3
	3	11	36.7	36.7	80.0
	4	6	20.0	20.0	100.0
	Total	30	100.0	100.0	

Table 6.4

What are non-structural mitigation measures taken?

Nonstructural mitigation		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	16.7	16.7	16.7
	2	21	70.0	70.0	86.7
	3	1	3.3	3.3	90.0
	4	3	10.0	10.0	100.0
	Total	30	100.0	100.0	

Table 6.5

The table 6.5 shows data regarding the non-structural mitigation measures taken. After analyzed the data in the study area (70 percent of the respondent have suggested that public awareness is the main purpose, (16.7 percent of the people in the study area argue that training is also necessary. (10.0 percent said that prepared plan for community based organization and 3.3 were suggest school education system is important in the study area as shown in the above table.

The effects of vegetation cover on the damage potential of flash flood have been analyzed in the table given above. According to the data 80 percent of the people were aware that vegetation cover could mitigate the impacts of flash flood but still remaining 20.0percent were not in favor of it. As shown in the **table 6.6**.

Can vegetation cover prevent or mitigate damages for flash flood?

Prevention by vegetation cover		Frequency	Percent	Valid Percent	Cumulative Percent
	1	24	80.0	80.0	80.0
	2	6	20.0	20.0	100.0
	Total	30	100.0	100.0	

Table 6.6

Does the government have any type of role to reduce the vulnerabilities of the local people?

Government Role		Frequency	Percent	Valid Percent	Cumulative Percent
	1	23	76.7	76.7	76.7
	2	7	23.3	23.3	100.0
	Total	30	100.0	100.0	

Table 6.7

Vulnerabilities of the local people can be reduced by the government or not. After analyses the data we got the point that (76.7percent) of the people argue that the government have a major role to reduce the vulnerabilities of the people in the study area and 23.3 were not in favor of it. **(Table 6.7)**

Chapter 5

Findings, Suggestion and Conclusion

5.1. FINDINGS

Following are the finding of the study, which have been found after the analysis and study of the area.

1. Majority of the people in the study area educated and literacy rate is quite high as compared to the surrounding population.
2. The community is male dominated and hence women have less access to resources and information.
3. Most of the people are aware of disasters.
4. 90 percent of the people in the study area aware that flash flood is the major natural hazard in the said area.
5. Roads are more exposed to flash flood. Public sector buildings, houses and 26.7 percent agriculture land are also at risk.
6. Women and children are more vulnerable than others in case of flash flood.
7. Most of the houses are comparatively safer from flash flood, but still there are some houses which are vulnerable to flash flood.
8. Lack of government departments' dealing particularly with flash flood hazard.
9. Lack of land use planning in the study area and no restriction on the construction of building in the torrent bank.
10. The increasing vulnerability of the study area is caused not only by its location in the active flood plan, but also the construction of buildings and other development in the flood prone area.
11. The protective structures such as embankment, spurs and levees etc. are improper.
12. The main cause of flash flood in the study area is torrential rainfall. However, flood hazard is intensified by many anthropogenic factors, such as the construction of buildings deforestation in the study area, thus reducing the cross sectional area of the torrent channel.
13. The flash flood occurring in the study area is mostly seasonal in nature i.e. occurring in summer season.
14. A considerable number of people in the study area are aware of the main causes of flash flood but only a few of them could appreciate the intensifying factors, triggered by them.
15. The most vulnerable elements exposed to flash flood hazard are houses and crops.
16. There is lack of adequate warning system to inform the people in time to evacuation.

5.2. SUGGESTIONS

In order to reduce the vulnerability and adverse effects of flash flood hazard in the study area some important and useful measures, have been suggested by the study, which are as under;

1. Land use planning should be formulated for the study area. Land use planning can play a very important role to reduce the adverse effects of floods. In this context the construction should not be allowed in the active flood plain, at least within 100 feet of the torrent.
2. Efforts should be made to remedy the factors, which intensify the flood, for this purpose deforestation and overgrazing in the catchment, s area should be controlled.
3. Roads and bridges should be constructed to improve communication with in the study area. They should be belt of strong material in order to withstand high water flows.
4. To prevent erosion of torrent bank, a viable solution is plantation along the torrent banks.
5. An efficient and effective flood forecasting and warning system should be established in district chitral lower which should be well equipped so that it may be easily disseminated.
6. Flood relief canal and bypass channels should be provided to reduce the volume of water during flood events but at the same time should also be taken for the proper utilization of flood water.
7. Small dames should be built in the upper course of the torrent for the accumulation of flood water, this water then can be used for a agriculture purposes.

8. Many houses in the study are made of stones and should be provided to the vulnerable households so that it may be replaced with concrete.
9. Incentives should be provided to those who are reluctant to migrate from flood prone areas.
10. Proper education and training should be provided to the community leaders and effectives, to enable them to respond in an effective manner to the flash flood hazard and to take various remedial measures by themselves.
11. For the quick assessment of the potential impacts of flash flood, flood hazard maps should be prepared using modern tools such as tools such as GIS.
12. There is an urgent need to adopt long term strategies by skillfully combining en engineering measures with proper land use management and regulatory policies.
13. To ameliorate the devastating effects of flash flood, those policies should be which can be accomplished with low capital investment, but at the same time are highly effective in achieving their objectives. For this purpose, it is very important to enhance community participation in these policies. Thus the efforts are needed to stimulate rather than constrain local initiatives.

5.3. CONCLUSION

Flash food hard is a destructive and frequently occurring phenomena in the study area and caused heavy economic loss in the past. Although natural phenomena such as torrential rain fall mainly causes, its effects are intensified to considerable extent by human intervention. Due to lack of proper information about the flood, the people living in the flood prone area are not communicated effectively. Due to lack coordination between tween government at agencies and people, land use planning, proper land use planning, proper embankments, bridges on main road, flood forecasting, evacuation plan and relief activities the damages are very high. Although there are some limited mitigative measures on both side of government and community level but these are not enough. There are some major construction projects in progress in active flood plain which needs immediate government attention.

The government needs to play a key role not only post disaster but also at pre-disaster stage. There is an urgent need of effective laws and regulations to stop encroachment, flood forecasting mechanism, public awareness, coordination and proper compensation system.

TECHNOLOGY MEDIATED DISASTER RISK REDUCATION IN DISTRICT PESHAWAR

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ABSTRACT

The study entitled “Technology Mediated Disaster Risk Reduction in Peshawar” was conducted in District Peshawar. The basic aim of the study was to explore technologies used by the government agencies for disaster mitigation, preparedness, response & recovery. The study is qualitative in nature and a total of 30 respondents were selected through Purposive sampling method. In-depth interview checklist was used as data collection tool. It was assessed that various types of tools & equipment are in use of different agencies in Peshawar for DRR i.e. Radar Satellites, Seismic Recording Station, Weather Satellites, Automatic Weather Satellites, Wet Snow on Run Way (WSR) and Doppler Radars, Fire Bikes, Snarkle, Multi Loader, Cranes, De-Watering Pump, Geographical Information System (GIS) etc. All these technologies play a very important role in reducing disaster risk in the study area.

CHAPTER-1

INTRODUCTION

1.1 BACKGROUND:

Technology affects every aspect of human life. Daily routine of a man is dependent on technology. Technology helps human beings in different ways. Technology and the ongoing data revolution are going to change the Disaster Risk Reduction (DRR) landscape & afford new opportunities for efficiency & better decision making. This is a point made by United Nations Institute for Training & Research (UNITAR) also in its official statement at the World Conference on Disaster Risk Reduction (WCDRR) plenary session.

Since 2005 satellite technology has evolved tremendously, bringing to the open market solution and imagery resolution levels that would have been hard to imagine only fifteen years ago.

Similarly, geographic information system (GIS) is today's smarter, better & more comfortable in the cloud than ever before . To support the building of society that are more resilient to disasters, concerted & coordinated international action is necessary to insure that all stakeholders, including policy makers, practitioners, private enterprises and community groups, understand disaster risks are able to access and utilize the latest scientific knowledge and applicable technology. Technology can offer innovative solutions for increasing their resilience .

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources .

Disaster risk reduction and management is the concept and practice of reducing disaster risk through systemic efforts to analysis and manage the casual factors of disasters through reduce exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment & improved preparedness for adverse events .

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

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

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

Risk Factors that increase vulnerability and contribute to the severity of disasters in Pakistan are:

1. Poor infrastructure and limited enforcement of existing building code
2. Lack of timely warning systems
3. Limited awareness and education on disasters and response
4. Limited manpower and coordination among various government disaster response agencies
5. Large number of impoverished communities susceptible of disaster.

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

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

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

Peshawar is a disaster prone area, facing man-made & natural disasters of different intensity. Although floods are more frequent in the district, the death tolls of 2005 earthquake were worse even than floods 2010. Provincial Disaster Management Authority (PDMA) Khyber Pakhtunkhwa (KP) has listed Peshawar as one of the severely affected district, during floods 2010. The PDMA reported that KP typically gets 962mm of rain annually, but from July 28 to August 3 the province received 3,462mm of rain. In Peshawar, during 2010 floods out of 6.4 million populations, 33,867 numbers of HH were affected, while in 2011 pre-monsoon contingency plans of KP, 10,000 HH were likely to be affected but there were no such damaging floods in 2011 .

1.1 PROBLEM STATEMENT:

The existing technologies are not able for their functioning position as well as there is not as much expertise in the field of disaster management to functionalize the existing technology for emergency.

1.2 PURPOSE OF THE STUDY:

The purpose of this research was to analyze technologies being used by government agencies or disaster management authority & to identify gaps and challenges in the existing technological application of DRR in District Peshawar.

1.3 OBJECTIVES:

- To provide a brief disaster profile of the study area.
- To explore various technologies used for disaster mitigation, preparedness, response and emergency coordination.
- To analyze the effectiveness of these technologies in DRR in District Peshawar.
- To find out gaps and challenges in technology mediated DRR.

1.4 SIGNIFICANCE OF THE STUDY:

Our finding tells us the use of technologies and their effectiveness and also gives us clues to solve the challenges facing by relevant department. This study focused on the variables that are in over range & area as well as focus on the variables that effect over technology to use & to implement. It also identifies those technologies which is necessary for our study area. The result of this study gives us the ideas about how to overcome and reduce the gaps and challenges related to technologies and all the equipment using in disaster relevant department. This study might be helpful in achieving the sustainable development goals i.e. in accessing the affordable, reliable, sustainable and modern energy, in promoting descent work and economic growth, in building resilient infrastructure promote sustainable industrialization and in making sustainable cities and communities which will be beneficent for government department or agencies which is related to disaster management.

1.5 ORGANIZATION OF THE STUDY:

This study is composed of following chapters.

Chapter one deals with background of the study, furthermore it also explains the research problem, purpose of the study, objective of the study, significance of the Study and justification of the study. Chapter two furnish data on the relevant studies already published by various sources in international, national and local level. Chapter three is composed of different methods used for the purpose of data collection and the tools of study to collect data. Data analysis has been summarized in Chapter four. Chapter five is composed of summary of major finding, conclusion and recommendation.

CHAPTER 2

LITERATURE REVIEW

2.1 RATIONALE OF THE CHAPTER:

This chapter presents a review of selected relevant literature and research from published and unpublished work with the purpose to make understanding with the body of existing knowledge related to Technology Mediated DRR. The research was conducted in Peshawar. The objectives of the study are (a) to provide a brief disaster profile of the study area. (b) To explore various technologies used for disaster mitigation, preparedness, response and emergency coordination. (c) To analyze the effectiveness of these technologies in DRR in District Peshawar. (d) To find out gaps and challenges in technology mediated DRR. The aim of the study is to identify existing technologies, gaps & challenges & all the experts in the field of DRR.

2.1 DISASTER:

Disasters are characterized by the scope of an emergency. An emergency becomes a disaster when it exceeds the capability of the local resources to manage it. Disasters often result in great damage, loss, or destruction .

It is a well-known fact that natural disasters strike countries, both developed and developing, causing huge destruction and creating human sufferings & producing negative impacts on national economies. Due to geo-climatic conditions, different types of disasters like floods, earthquakes, cyclones, landslides, droughts, etc strikes according to the vulnerability of the area. Pakistan is considered as the world's disaster prone country. It has witnessed devastating in recent past like floods, earthquake, droughts, landslides, avalanches, terrorism etc.(Thorave, n.d.)

2.2 DISASTER RISK REDUCATION & MANAGEMENT:

Disaster risk reduction and management is the concept and practice of reducing disaster risk through systemic efforts to analysis and manage the casual factors of disasters through reduce exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment & improved preparedness for adverse events .(Khaliq & Shah, 2013)

2.3 COMPONENTS OF DRM:

Integrating the all aspects of the disaster risk management into all parties of the development processes leads to sustainable development and lessens post disaster loss of life, property and financial solvency. Successful disaster risk management requires the implementation of all these phases of the disaster management cycle.

2.3.1 PREVENTION:

Disaster prevention seeks to reduce the vulnerability of societies to the effect of the disaster and also address their man-made i.e. anthropogenic causes. Early warning is especially important for short-term prevention. Advance warning of famine facilitates relief operations, advance warning of storms and floods allow people to move out of harm's way in time. Improvements in wide area satellite surveillance technologies are revolutionizing the collection of early warning data relevant to disaster prevention. While the World Meteorological Organization (WMO) provides support for tropical cyclones forecasting & drought monitor(Sinha, 2006)

2.3.2 MITIGATION:

Measures taken to reduce the impacts of any disaster causing phenomenon, whether natural or man-made, are called disaster mitigation. Remote sensing can play an important role in flood hazard monitoring and its potential can be used for information integration by GIS technology, in the areas of mitigating natural and man-made disasters. Flood frequently destroy or collapse houses, bridges, interrupt telecommunication & loss of communication between the disaster region & outside world. In this situation the use of remote sensing is the usually the only effective way to know the disaster site and state and to obtain development.

2.3.3 PREPAREDNESS:

Preparedness lessens the severity of disasters by preparing people for disaster, developing plans to ensure an effective response & recovery & training people to implement plans after a disaster occurs. Preparedness includes:

- Education, training & public awareness (social media, banners, pamphlets, door to door campaigns etc.).
- Prediction & warning for different disasters (Ceiling Projectors, barometer, AWS, hygrometer, seismometer, satellite phones, glucometer, sphygmomanometer).
- Emergency Preparedness (D-watering pumps, fire bikes, cranes, multiple loaders, vaccinations etc.).

2.3.4 RESPONSE:

To be ready for response with capability to provide rapid and efficient medical, rescue & emergency supply & equipment to those in need.

- Rescues and evacuation (searching camps, sensors, mobile vehicles etc.).
- Emergency Assistance (medical care, shelters, protection of food & water).

1. Medical Care (Oxygen masks, fibrillator, vaccination, oxygen tank).
2. Shelter (medical camp, tents)
3. Protection of food & water (filter, water purification tablets, food tablets.)

2.3.5 RECOVERY:

Recovery is the implementation of actions to promote sustainable development following a disaster, including new building code standards and land use planning controls. Recovery consists of:

- Rehabilitation
- Reconstruction (during reconstruction it is absolutely necessary to consider mitigation measures including relocation, land use zoning etc)
  - Rebuilding of houses and building
  - Financing for rebuilding
  - Repairs of roads, bridges, water system etc.
- Psychological counseling
- Long term assistance to rebuild the community is critical to survival

2.4 APPLICATION OF TECHNOLOGY IN DRR:

Technology affect every aspect of human life; daily routine of a man is dependent on modern technology. Some debates show that technology makes a man paralyzed and according to theory of evolution man will ultimately loss hiss limbs because of not using it. But our concern is with technology and disaster. Technology helps a man in various situations. Technology can save money, time and even lives. The most important challenge for man is to reduce catastrophe and the consequences resulting due to catastrophe.

Technology in this context is certainly the technology of communication and that is cell phones and internet. By this technology we can trace the location of an affected area and get information immediately. The increased availability and affordability of mobile infrastructures and services and the rapid growth in subscriptions to cellular mobile services open a new set of opportunities for the dissemination of alerts. Such expansion is occurring at faster pace in developing countries, including in rural areas, providing means of communication to people who were previously not connected. Mobile telephony provides remote communities with access to constantly updated weather information &is helping to create endogenous early warning systems. Some cellular handsets, in addition to telephony, may also be used to achieve two other important disaster communication functions: receiving short message service (SMS) text messages and positioning locations through embedded Global Positioning System (GPS) functions.

During the past decades, the Asia-Pacific region has experienced tremendous growth in the area of ICT, including related infrastructure and services. Access to mobile & fixed telephone lines & the internet has expanded rapidly. At the end of 2008, in Asia and the Pacific, there were about 676 million fixed telephone lines, as opposed to 1.3billion worldwide, and 2.1 billion mobile cellular subscriptions, as opposed to 4.0 billion worldwide. The proportion of mobile cellular subscriptions in Asia and the Pacific increased from about 32.9 per cent of the total in 2000 to more than 47.0 per cent in 2006 & 51.6 per cent in 2008.

The above finding shows that with change of time & increasing the availability of mobile phones & internet reduces the damages of disaster.

Accurate and timely information on the extent and impact of damage in areas affected by disasters plays a critical role in planning response and mitigation, in particular in the most affected areas, where immediate mitigation measures are necessary, as well as in recovery and reconstruction. For emergency response, data from a variety of sources are needed. Remote sensing and supporting GIS databases are key tools for providing a quick assessment of the situation when it is needed for response and urgent mitigation efforts .(UNESCAP, 2010)

In the past few years, social networks have played growing roles in successful communication during disaster. From location missing loved ones to coordination of the ground opelrations, social media serve as a hub for sharing important information with the public. There is no question that the convergence of social media and new technology is now an important part of preparedness planning.

2.5 RELEVENT WORK ON INTERNATIONAL LEVEL:

2.5.1 INFORMATION TECHNOLOGY & NATURAL DISASTERS (JAPAN CASE STUDY):

Japan is among one of the most disaster affected country in the world. The Great East Japan Earthquake occurred on March 11th, 2011, at 14:46. With duration of approximately 6 minutes, its epicenter was located about 130km ESE off Oshika Peninsula of Tohoku, on the Pacific coast. It was a mega thrust earthquake of magnitude 9.0, the strongest ever to hit Japan and one of the worst five earthquakes ever recorded. According to data released by the National Police Agency, as of February 17th, 2012, more than 19.000 thousand people were killed or are still missing, more than 6.000 people were injured and about 125.000 buildings were destroyed. The earthquake, followed by tsunami, led to flooding, landslides, fires, building and infrastructure damage, as well as nuclear incidents. The Japanese Cabinet Office estimated in March 2011 that the cost of damaged houses, factories and infrastructure in the 7 most affected prefectures can reach a value between 19 and 25 trillion yen.

EARTHQUAKE EARLY WARNING SYSTEM:

One of the most important systems used in Japan in case of an earthquake is the "Earthquake Early Warning System" (EEWS), provided by the Japan Meteorological Agency (JMA). This system (started on October 1st, 2007) offers advance announcement of the estimated seismic intensities and expected arrival time of the principal motion of an earthquake. These estimations are based on a prompt analysis of the focus and magnitude of the earthquake, using waveform data observed by seismographs near the epicenter.

Earthquakes can be recorded by seismographs situated at great distances, because of the travelling of seismic waves. There are 3 main types of seismic waves, which travel with different velocities: longitudinal P-waves, transversal S-waves and surface waves. P-waves represent the initial set of waves produces. They can travel through gases, elastic solids and liquids. They can be twice as fast as the S-waves (the principal motion in an earthquake).

The EEW system automatically calculates the focus and magnitude of the earthquake and estimates the seismic intensity for each location by detecting the P-wave (the preliminary tremor) near its focus. If a P-wave is detected by any two or more of the seismographs, an Earthquake Early Warning is given in a matter of seconds (i.e. a few seconds to a few tens of seconds) before the arrival of strong tremors.

The earthquake early warnings are deployed on television, radio, as well as on mobile phones. Japan's three major mobile phone carriers have provided the phones with this service since 2007. All 3G cellular phones after 2007 have mandatorily received this service (not all overseas manufacturers are supported, though). Following the 2011 devastating earthquake, Apple's iOS 5 iPhone platforms supports early warning notification. A specific chime sound alerts about the impending earthquake; the alarm sound was developed by the NHK, Japan's national public broadcasting organization.

TSUNAMI WARNING SYSTEM

Another important warning system is the Tsunami Warning System, used to detect tsunamis in advance and issue warnings to prevent loss of life and damage. This system consists of two equally important components: a network of sensors to detect tsunamis and a communications infrastructure to issue timely alarms to permit evacuation. Warning is issued using radio, television, sirens etc. Tsunami warnings take longer than earthquake warnings, because more complex calculations are involved.

In Japan, the tsunami warnings are issued by the Japan Meteorological Agency. When an earthquake occurs, JMA estimates the possibility of tsunami generation from seismic observation data. If a damaging tsunami is expected in the coastal regions, JMA issues a Tsunami Warning/Advisory for each region. If tsunamis are generated by seismic events far from Japan, JMA communicates and coordinates with the Pacific Tsunami Warning Center (PTWC) in Hawaii and issues warnings for long-propagating tsunamis.

On March 11th, 2011, JMA issued a “major tsunami” warning, only 3 minutes after the earthquake. While the earthquake started at 14:46, a 12m high wave struck Sendai Airport at 15:55. The tsunami reached levels of 40.0m in Ofunato, Iwate prefecture.

The tsunami damage was much more destructive than the earthquake itself, with an unexpectedly large size of the water surge. The wave was so strong that it broke icebergs off the Sulzberger Ice Shelf in Antarctica, 13.000 km away. Chile, at 17.000km distance, experienced a 2m tsunami 22 hours later. It is important to emphasize that no system can protect against a very sudden tsunami, where the coast is very close to the epicenter. One example is the Hokkaido, July 12, 1993 earthquake, followed by a tsunami, which claimed 230 lives. The wave reached Okushiri between 2 and 7 minutes after the earthquake, insufficient time to evacuate, even though a tsunami warning was given by the JMA 5 minutes after the earthquake.

OTHER SYSTEMS

There is a wide range of technologies that can be used before, during and after a natural disaster. In this section we would like to mention the role of several other information technology systems in this context.

Geographic Information Systems (GIS) are systems that integrate, store, edit, analyze, share and display geographic information. They can help emergency planners to easily calculate emergency response times and the movement of response resources (for logistics) in case of a natural disaster. Global Positioning System is a satellite based navigation system that provides location and time information, anywhere on or near the Earth, regardless of the weather conditions. It is maintained by the United States government and can be accessed freely by anyone with a GPS receiver. It can be very useful in search and rescue operations; this is particularly true in recent years when many mobile phones are equipped with GPS. Disaster relief/emergency services depend largely upon GPS for location and timing capabilities.

Communications systems can be effectively used in all phases of disaster management. They include the internet and e-mail, mobile phones, radio and television, HAM radio etc. Immediately after the March 11th, 2011 earthquake in Japan, mobile and land lines were overloaded or simply stopped working. There were areas without any electricity (and/or water); nevertheless, the internet connections were functional. People were using their mobile phones or other mobile devices to connect to the internet and this allowed them to communicate with their relatives. By updating their information on the Facebook social network, this information could reach concerned friends or relatives, both in Japan and abroad. The internet, along with social networks, proved their importance as a means of communication post-disaster.

Last, but not least, information technology can support medical response during/after disasters. To give only two examples, wireless local area networks are crucial in hospitals with disaster medical response capabilities, while electronic health records can be life-saving in case classical, paper-based records are destroyed and medical personnel need immediate information regarding the patients' records .

2.5.2 HURRICANE KATRINA CASE STUDY:

Hurricane Katrina was the costliest and one of the deadliest hurricanes in the history of the United States. Nearly 2000 people lost their lives in the Hurricane and in the floods that followed. Hundreds of thousands of people were displaced and many still remain unable to return to their homes and their neighborhoods.

One of the hallmarks of disasters is the breakdown of communication and the lack of information both for the victims themselves and those, whose friends and loved ones may be affected. Disasters are marked by a dearth of relevant information when infrastructures are damaged and common communication technologies, such as phones, fail.

It stated that getting in touch with friends is crucial, to find out what had happened unusual and unwanted (Hurricane Katrina) in Orleans. The author added that there was extensive coverage of media, especially TV and newspaper-sensationalizes the disaster cover area by providing specified information to the affected people." Information technology such as mass media and web participate greatly in emergency. It not only helps in rescuing but also a good source of awareness of further foresight.

Along with this technology there is necessity of trained individual who know the effective and efficient use of technology. As in the same article the author said "one of the respondent show his frustration to say that in 24- hour news they didn't tell anything, they only show these devastated damage areas, and have no knowledge about the situation. In fact, the information they provide lead to misinformation. Without proper training the technology is not used to full fill its purpose. People that are caught in the fray of emergencies and disasters have a heightened need to communicate and obtain information and are willing to creatively adapt familiar technologies and to rapidly adopt and use unfamiliar technologies. Despite these interpersonal communication efforts, many people were difficult to locate. As word of who was alive and who was where traveled via text messages and email, some people found themselves inundated with messages, while others fretted over the fate of their friends and family. While some watched media coverage in hopes that media would interview friends or family who stayed behind in New Orleans, others searched for those that had evacuated and, sometimes, took matters into their own hands. Several of our respondents who found themselves in the position of information centers had both access and technological know-how to create websites with lists of people who have "checked in".

Although mobile technologies, such as laptops, were useful during evacuations, many of the respondents did not own laptops before the hurricane. Yet as the length of the evacuation increased and the uncertainty over what, if anything, survived at home, many reported buying laptops as way to become mobile. Even those that had taken their desktops with them during evacuation reported feeling compelled to "become more mobile." One of the respondents put it this way: "I wasn't aware of if my house was flooded or not. I thought it was, because I'd heard that everybody's house was flooded. As soon as I got my FEMA check, I went to the Apple store in Chicago, and I bought a laptop, and I had them move my system over to my laptop. So it's not new technology, but it was new to me – new to go wireless, to be mobile". A number of respondents

who did not have laptops pre-evacuation and who were able to obtain government support during or soon after evacuation reported spending their "FEMA money" on

laptops. Many remarked that purchasing a laptop to replace lost equipment suddenly seemed more appropriate: "I bought a laptop, it just seemed better." Though the hurricane had passed, the respondents repeatedly pointed out the likelihood of something similar happening in the future. People who live in hazard-prone areas and who have experienced disasters are likely to adopt practices that help mitigate future hazards. Many of the respondents openly admitted that there will be "the next one" and explained many of their actions as forms of disaster preparedness. Adoption of mobile technologies such as laptops and cell phones was seen as practical and relevant to disaster preparedness. Even if these technologies were not optimal for their purposes, they were a necessary step given the dread of the next hurricane season .

2.6 RELEVENT WORK ON NATIONAL LEVEL (KASHMIR EARTHQUAKE 2005):

The Kashmir earthquake occurs on 08 October 2005, having a magnitude of 7.6, which lead to a huge catastrophe left over 75,000 people dead and 3.5 million homeless, just before winter on the foot of the Himalayas from low to high altitude. Technology makes the unwanted situation easy to handle and relatively got control over it. Some overview had taken from the Kashmir earthquake.

Demand of mobile phone increased to a high level during emergency and disaster in the affected area. The recovery of the masts is necessary during the time of catastrophe and the coverage need to be expanded. People purchased cell phone during emergency at any cost because mobile phone helped the people to find their family members and beloved one who are dispersed or undergoing medical treatment. Mobile phones are used to contact relatives for remittances to get better prices and organize transport for materials, and to be contacted for damaged and stage inspections".

Cell phone is the basic need for the modern world; today using cell phone is inevitable. On one hand if it creates social violence and conspiracy but on another hand it makes a revolution to control the situation no matter what the situation is whether it is emergency, disaster, catastrophe, violence, conspiracy. If it creates a bad situation, cell phone has the ability to resolve it as well.

Cars: Private car and small truck ownership also increased as more people and goods needed transportation.

Movement: Individuals and extended families took several paths to recovery, including members moving for work, for education, or for family reasons. Households may need to clear debts, or borrow, or work in sequence with some of the family completing a stage helped by others, before returning the help themselves.

Avoid information vacuums: Using radio and other media in various local languages was vital to communicate decisions as soon as they were taken and at scale. This mitigated expectations, speculation, misinformation and misinterpretation.

Two way communications: An equal effort was made from the first few weeks to identify and answer the frequently asked questions, establishing two way communications between decision makers and the affected population. Communication was not based on one way 'messaging', but also on listening, discussion and responsiveness.

Communities: To complement and reinforce the media based communication activities, over 3000 village committees were mobilized to facilitate sharing information, promote training, and for people to directly access officials to take and answer questions

2.7 RELEVENT WORK ON DISTRICT LEVEL:

FLOOD RISK ZONATION USING GIS TECHNIQUES: DISTRICT CHARSADDA, 2010 FLOODS PAKISTAN:

Farish, Munawar, Siddiqua, and Alam (2017) carried a survey on the flood of 2010. The flood is a common disaster in Khyber Pakhtunkhwa due the heavy rain of monsoon, most commonly in the month of June and July and sometimes extended to August. Monsoon rain started on July 27, and continued till July 29, 2010 that caused a destructive flood in the district Charsadda. Flash floods during summer season are a recurrent environmental hazard in Charsadda. In 2010 floods, KP was the worst affected province in Pakistan. District Charsadda in KP is exposed to risks from flooding in river Kabul and river Swat. In the surrounding areas of Peshawar, Charsadda, and Nowshera, approximately 200-280 millimeters rainfall occurred. Kabul River remained in the high to very high flood stage (221,000 Cusecs) till August 8, 2010. In Charsadda, flash floods occur when the water discharges go beyond the waterway capability; therefore, within hours, flash floods occur. Intensive agriculture has resulted in stacking of immense deposit in the drain. Accordingly, water carrying ability of the drain has decreased and recurrent overflow has been observed. Similarly, population stress on the land resources has led to encroachment towards the drainage system. As a result, the watercourse has become limited and constricted with passage of time and the drain cannot pass complete discharge. Another big obstruction in the easy flow of water is the construction of narrow bridges across the drains at different locations.

This study formulates a GIS based methodology for flood risk assessment. Flooded areas of district Charsadda has been evaluated using weighted overly analysis and multiple ring buffer analysis. Flood hazard risk zone maps of District Charsadda

have been prepared using GIS tools. Al-Saud used Digital Elevation Model (DEM) with 30meters precision to analyze drainage system in flood occurrence of Jeddah city in Western Saudi Coast. Riaz also used 30 meters DEM for district Charsadda flood risk assessment of monsoon 2010 floods. The study also processed 30 meters DEM to make flood hazard map using ArcGIS 10.2. By giving ranks and weights to these, the weighted maps were created. Weighted Overlay Analysis method was adopted to prepare the flood hazard risk zone map. By preparing the risk zone maps, we can propose measures to reduce the risk of these repeatedly occurring floods in district Charsadda. The reference map of Charsadda was created from the shape file using ArcGIS 10.2 software, obtained from Population Censes Organization. The geological data was obtained from Geological Survey of Pakistan and geological map was created using ArcGIS 10.2 software to study the characteristics of different soil layers to judge the flood water infiltration rate in the study area. The DEM of 30meters resolution was taken from ASTER GDEM in order to extract aspect, slope, flow length, flow accumulation, flow direction, basin classification, drainage points, drainage lines, catchments classification and water bodies (streams) of the study area. Multiple ring buffer analysis of streams is performed for flood hazard zoning and weight age overlay is performed for flood risk analysis of study area. As there is no weather station in district Charsadda so to get rainfall data was difficult; therefore, research articles and reports are used to estimate the rainfall and discharge data of the last week of July to the first week of August, 2010 and compare these with the previous rainfall and discharge data of the study area. The Annual Monsoon Discharge (1000 cusecs) for River Kabul was recorded at Nowshera for a period of ten years (2001-2010) from Report-Flood Forecasting Division; Pakistan was used in the study area and plotted.

Software used

The following software was used in the present study:

Arc GIS 10.2

Arc Hydro Toolbar

Microsoft Office

Flood hazard zones

Hazard zones have been calculated using the digital elevation model (DEM) and historical floods experienced by the district. Flood 2010 has been mapped and three categories have been drawn based on distance from flood inundation. The elevation o the district has been extracted from DEM and categorized accordingly low lying areas overlapping with the areas near to the historical flood inundations has been considered as potentially high hazard zone, others areas are categorized as high, medium, low and very low potential hazard zones.

DEM along with geological data is used for flood risk assessment which suggests that GIS techniques can be effectively used to monitor and measure flood risk. The non-availability of rainfall data has been compensated by discharge data and buffer zone along the stream network. DEM can be effectively used to extract flood risk assessment parameters such as stream network, slope, flow direction, catchments etc. Pre-collision intrusive rock in the study area has very low infiltration capacity that has increased the chances of flash flooding. Intense rainfall in the monsoon season is the major cause of flooding. GIS techniques are helpful for all stakeholders for disaster management, rapid risk assessment, flood damage assessment, hazard zonation and evacuation planning. Weight age overly analysis can be successfully used for mapping flood risk zones. The research indicates that there is very high flood risk in the large catchment area and along the banks of stream network . (Farish, Munawar, Siddiqua, Alam, & Alam, 2017)

CHAPTER-3

RESEARCH DESIGN

3.1 NATURE AND PROCEDURE OF THE STUDY:

This chapter explains the methodological framework, sampling method, sample size, tools of data collection and data analysis procedure. A proposal was submitted in favor of this research topic & then relevant literature was study which later became a threshold to the research. Data was collected from those organizations which are linked directly & indirectly with disaster management & then was analyzed. These analyses of data were summarized in paragraphs. At the last a complete report was compiled from both primary and secondary data.

3.2 UNIVERSE OF THE STUDY:

Peshawar is the capital of the Pakistani province of the Khyber Pakhtunkhwa. It lies between 34.0778̊ North latitude and 71.2245̊ East longitude. The city is located in the generally level of base of the valley, known as the Gandhara Plains. Peshawar features a hot semi- arid climate, with hot summers and cool winters. It also serves as the administrative center & economic hub for the Federally Administered Tribal Areas. The city of Peshawar has a population of 1,970,042 according to the 2017 census, making it the largest city Khyber Pakhtunkhwa & the sixth-largest in Pakistan, while Peshawar District has a population of 4, 269, 09.

3.3 METHODOLOGY:

A qualitative method of data collection was adopted for primary data collection in the study area.

3.3.1 SAMPLING METHOD:

For data collection Purposive Sampling technique was opted. According to this method, sample members were selected on the basis of their knowledge and skills regarding as a research subject.

3.3.2 SAMPLING POPULATION:

The sampled population contained from emergency organizations/ departments. The total size of the population in the study area was almost 21 organizations/ departments, which has about 164 employees. Population selected as sampling size was 20% as per sampling size selection rules.

3.3.3 SAMPLING SIZE:

A total of 30 respondents were selected through Purposive sampling method.

TOTAL SIZE OF POPULATION AND SELECTED SAMPLING SIZE:

Population	Number of population	Selected sampling size
Employees	164	30

Source: (Field survey, September, 2017)

3.1 TOOLS FOR DATA COLLECTION:

In-depth interview checklist was used as tool of data collection. In this study data was collected from two sources, primary and secondary data.

3.1.1 PRIMARY DATA:

IN-DEPTH INTERVIEW:

The in-depth interview checklist were design to collect information regarding the current position of existing technology, brief disaster profile, explore various technologies used in disaster phases & emergency coordination, analyze the effectiveness of existing technologies, identify gaps & challenges in technology mediated DRR.

3.1.2 SECONDARY DATA:

Secondary data was collected from the newspapers, research reports, books, journals & articles.

3.2 DATA ANALYSIS:

For data analysis, all the data which was collected through in-depth interview checklist. All the data was summarized in paragraph & composed in the MS word.

3.3 ETHICAL CONSIDERATIONS:

Following the research ethics, proper dress code was followed and permission was obtained from concerned authorities to ensure the confidentiality of the respondents and objectives were properly explained. In case of any difficulty the questions were explained to the respondents. Respondents were also briefed in order to ensure that all the information they provided will be kept confidential. Keeping in mind the busy schedule of the respondents only required, relevant and important questions were asked that were already mentioned in the in-depth interview checklist.

CHAPTER-4

DATA ANALYSIS

4.1 RATIONALE OF THE CHAPTER:

This chapter present detail of primary data collected from respondents and summarized in paragraph.

4.2 KNOWLEDGE ABOUT DISASTERS:

A disaster can be defined as an unusual and dramatic event that, in a relatively short time span, courses enough death and destruction as to disrupt normal patterns of living in a community, regions or society. Peshawar is exposed to both hazards, natural and man-made. There is a huge list of disasters which affected the Peshawar including Urban Floods, Thunderstorms, Noise Pollution, Hailstorms, Epidemics diseases, Terrorism, Fire Hazards, mini Cyclones, Over Population, Poverty, Smoke issues, Car Accidents, IDPS, Environmental Pollution or Insurgency as shown in figure 1. In future, Peshawar will face the water crisis problem.

(a) Urban flood

(a) Urban flood

(b) Fire hazards

© Earthquake

4.3 IMPACTS OF DISASTERS:

There are adverse impacts of disasters on the lives and livelihood in District Peshawar. Earthquake caused damages to many buildings and other infrastructure in the city. Most of the people become injuries, loss their lives, relatives, while some are disabled.

Urban Floods causes epidemic diseases which affect the lives and livelihood of people. In urban areas, storm water causes nuisance to the residential areas, destroy our agricultural lands, crops and livestock.

As we know that Peshawar is over populated city. So now a days the people in Peshawar suffer from high level of stress & depression, because when they outside from their houses so they face a lot of hurdles in reaching to their destination. Due to the congestion of traffic, noise pollution and the ongoing project bus rapid transport which creates more hurdles for the people. Noises can numerous psychological effects that is irritability, stress, sleep disturbance, insomnia, in fact some people exhibit different annoyance reactions to some noise levels.

Peshawar is also affected by the terrorist activities. Terrorisms affect our life and livelihood in many different ways. Terrorism has negatively effect on provincial economy. The government income from tax collection is reducing particularly in in-secured areas. In insecure areas investors cannot invest because o threat to their life and assets which directly destroy economic structures.

Terrorism increases the cost of making public infrastructures. Let's to say about 40% cost of making infrastructure is due to security reason because it increased the cost o procurement, transportation and man power recruitment. And restriction on trade and business increase at the living cost of the majority of the population can't afford it.

Educations have address affected by the disasters. These all can reduce our work performance in Education, reduction of productivity in agricultural irregularity of the health workers in department. Due to these issues outsiders didn't come to Peshawar. As a result, our economy will be down.

4.4 RULES OF BUSINESS OF ORGANIZATIONS IN DM:

Figure 2: Provincial Emergency Operation center

(Source: Field Visit at PDMA)

The rules of organizations in business for disaster management are to keep economically balance between the organizations and people, to set up goals and achieve them. Before implementing any project, the department co-ordinate with all other department for the purpose of sustainable development. During implementing the project, the department will take care of the property and privacy of people's. Monitoring the work of during project is in progressive conditions. Provide the better lifestyle for the people. Make the contingency planning. Enhance the capacity building of the different people who lived in the vulnerable areas. Transfer of improved Agricultural, Medical, Information, and Assistive & Engineering Technology. Adopting the different management tools, techniques, standards, rules & regulations etc. strengthen EWS (early warning system) in the country under the umbrella of all organizations. Warning and advisors to the national news media and concerned functionaries. Monitor the customer satisfactions regularly. Give quick response in order to mitigate the disaster impacts.

4.5 TECHNOLOGY USED IN DM:

4.5.1 PREVENTION:

To prevent the disaster PDMA contains a slate of the art control room having internet, phones, along with vehicle mobility (figure 2). Education and awareness about clean water, clean environment, and vaccination are powerful tools for public health. Print and electronic media, social media, stories, pamphlet (figure 3) can be used to play a role in sensitizing and

(a)Awareness through posters about saving of water on Water Day

(b) Awareness through stories for kids

Figure 2 (Source: Exhibition at CDPM Department)

informing people about health hazards assisted with unsafe drinking water, unsafe environment and not to the vaccination. All organizations are linked directly and indirectly with disasters, introduced new plans and policies in order to prevent the disasters (figure 4). The new plans then share with all people through social media, print, electronic etc.

Co-ordination Flow chart of provincial emergency operation center (PEOC)

Figure 4 (Source: From Gallery of CDPM Facebook page)

4.5.2 MITIGATION:

For reducing the effects of disasters the organizations have to coordinate with the sister organization or department in order to investigate and to provide information with the objective of citizen's safety in air, on lands and sea.

For this purpose, every department work on their own level like, Irrigation Department working for managing the flood and reducing the effect of flood by planning many schemes i.e. construction of irrigation channel, diversion channel, dams and mitigative walls etc. as shown in figure 5.

For reducing or activating the people for every type of disaster Pakistan Meteorological Department play most important role. This department monitors the climatic-related events through satellite images, radar images as shown in fig in order to alert the people for coming hazardous situation. By predication & modification of weather, forecast through satellite phones (working on EWS), ceiling projectors (measuring the heights of clouds) etc. To provide information on meteorological and geophysical matters with the

Construction of Irrigation Channel & Scheme, Mitigative Walls, Dams

Figure 5 (Source: From Irrigation Department KPK Websites (http://www.irrigation.gkp.pk))

objective of traffic safety, mitigation of disasters due to weather and geophysical phenomena, agriculture development based on climatic potential of the country, prediction and modification of weather forecast. Some images taken through radar are mention in figure 6.

Health department arranged the Awareness campaigns, workshops, seminars about newly emerging diseases i.e. water borne diseases as a result of flood, diseases emerged as a result of drought situation or due to the deficiency of water. All these programs were arranged for increases their knowledge about the advantages of properly giving vaccination to the people and harmful effects of not properly giving vaccination, as well as the knowledge about using appropriate medicines, healthy food through multimedia, ads on TV, posters, sign board etc. as shown in figure 7.

Images Taken from Satellite & Radar to identify the coming or current hazards

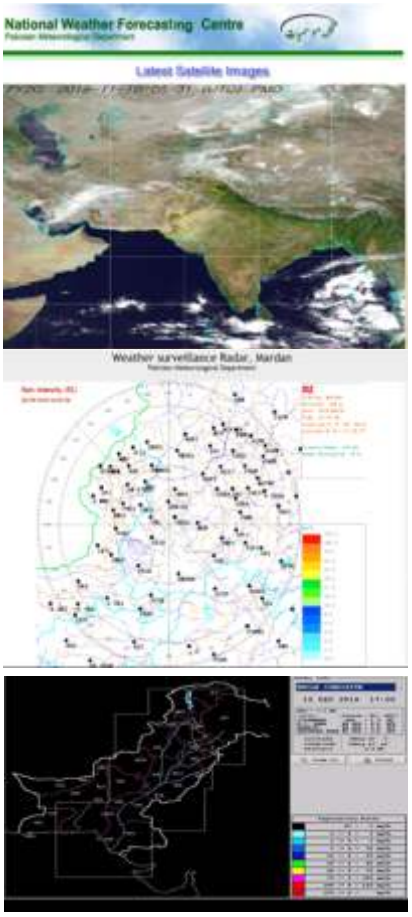


Figure 6

(Source: Website of Pakistan Meteorological Department (http://www.pmd.gov.pk/))

(a) Training and awareness campaigns about vaccination and disease control

(a)Indoor surveillance & Awareness sessions regarding prevention and control of Dengue disease

Figure 7 (Source: https://www.facebook.com/HealthKPGovt/)

Rescue department provide the mitigative plans, arranges the seminars, workshops in order to reducing the effects of disaster for every district by ensuring that the first aid box, fire extinguishers, oxygen tank, is present at every house of the community and also give description about using these tools. Rescue 1122 has initiated community safety program to ensure community participation in emergency preparedness, response and prevention. Community training leaflets have been developed in this regard to impart training of basic lifesaving skills and emergency evacuation procedure to the citizens. The content of the training material includes, management of airway, breathing & circulation (figure 8).

Agriculture department work for maintaining the economy balance by providing and forming many plans and policies. The policies and plans includes many agriculture practices and technologies beneficial to food security resilience and productivity i.e. knowledge about the seeds gown in drought area, flood prone area for the sake of

Pamphlets showing the first aid rules & all other activities helped in saving the lives

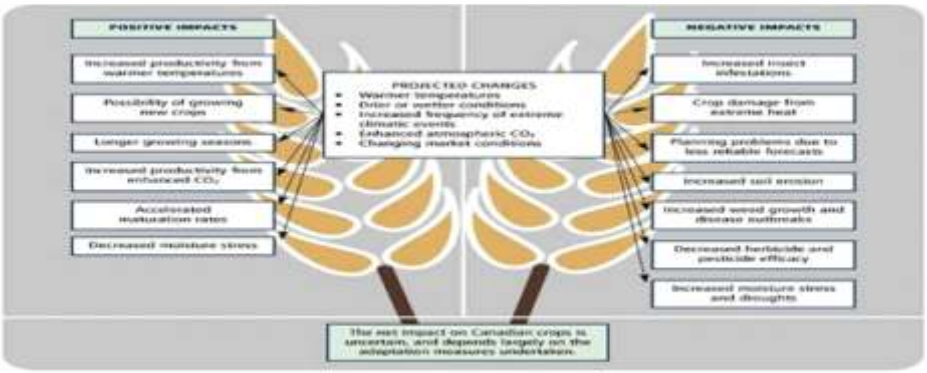
Figure 8 (Source: Rescue1122 Official Websites Files)

saving the water and utilizing those water where the ater table is low. Make the plans for agro-forestry practices; it will balance the water issues and problems (figure 9). As well as mention the knowledge about diseases related to crops and find out mention the mitigative measures for reducing the effect of these diseases.

SUPARCO department plays a very active role in providing space based information for rescue/relief activities, early recovery and rehabilitation efforts during the natural hazards. SUPARCO has developed considerable expertise in application of remote sensing and GIS Technologies for disaster management. The plans contain the programs related to rapid regional coverage of disaster events, Rapid/emergency thematic mapping for Rescue/Relief activities Monitoring of snow melting and Glaciers depletion in the context of climate change through GIS technology.

(a) Agriculture Plan for Peshawar District

(a)Chart Showing Climate Impact On Agriculture



(Source: Gallery of agriculture department KPK)

Figure 9

SUPARCO is mandated to conduct R&D in space science, space technology, and their peaceful applications in the country. It works towards developing indigenous capabilities in space technology and promoting space applications for socio-economic uplift of the country (figure10).

Logo of SUPARCO

Figure 10

4.5.3 PREPAREDNESS:

In order to reducing the impacts of disasters we have to prepare for it by using the technology or equipment for the predication.

Technology like Ceiling Projector (measuring the heights of the clouds at night),AWS (automatic weather station), Barometer to measure the air pressure, Ceiling Balloon for releasing Radio Stone Transformer, Hygrometer (detecting and measuring humidity),Lightning- Detector (detects lightning),Barograph that records the Barometric pressure overtime, Ammeter, Seismometer Record Motion of the ground caused by Earthquake, Rain gauge, Wind vane, Pak met department can provide all the early warning information through all the above mention technologies and also spread this through social media. It helps the people of the community by making alert them for the coming hazard or disaster. So, the community people can prepare themselves for any type of hazard. sometime people can evacuate from the hazard prone area or sometime they can face the hazard. Sometime people can evacuate from the hazard prone area or sometime they can face the hazard very easily without any losses because they prepare for any type of hazard as shown in (figure 11).

(a) Ceiling Projector

(b) Automatic Weather station(AWS)

© Hygrometer

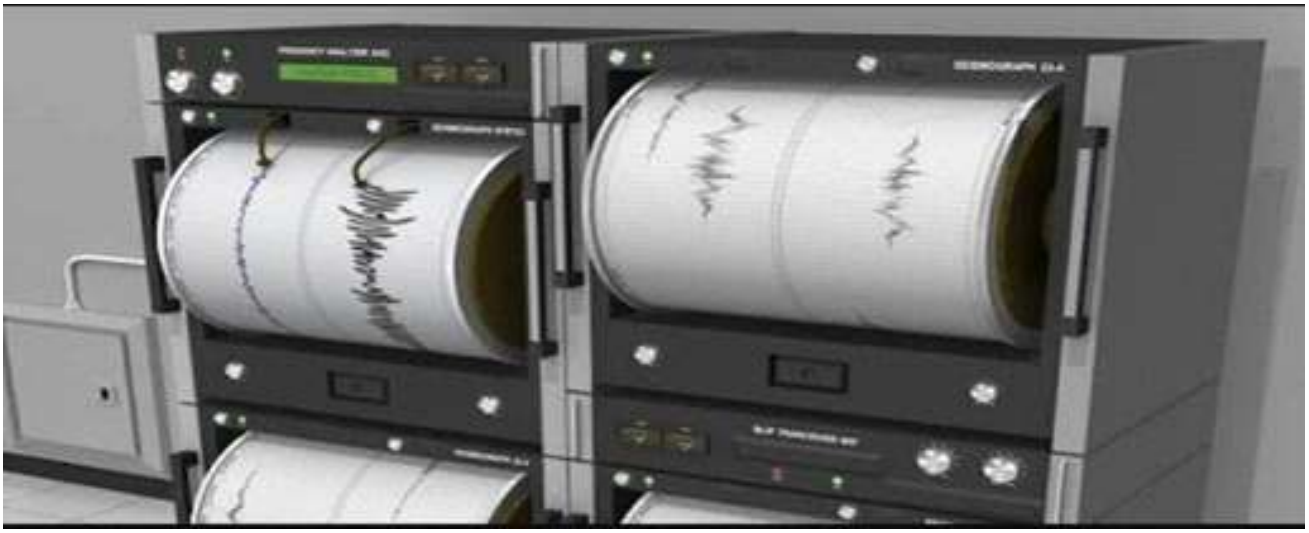
(d) Barometer

(e) Seismometer

(f) Anemometer

(g) Rain gauge

(h) Wind Vane



(I) Seismograph

Figure 11 (Source: Field Visit at Pak Meteorological)

For sustainable development different organizations like PDA , C&W & Fire Services used the technology which give us the best quality result, like for preparation of road and building codes used the Tractors, Bulldozers, Aggregate Distributor, Hot Mix Plant, Concrete Mixer, Aggregate Spreader, Vibrator, Batching and Mixing Plant, Concrete Spreader, Finisher. For cleaning the roads from debris and water organization used D-watering pumps, Fire tanker, Snarkle, Fire Bikes, Multiple Loader, Cranes etc. as shown in figure 12. These all machines work best at their own level and also it is time saving agents. These machines were prepared by skillful engineer for the better and effective work, every week these machines were properly checking so, that it can work properly during response.

(a) Tractor

(b) Aggregate Distributor

© Multi Loader

(d) Hot Mix Plant

(e) Concrete Mixer

(f) Aggregate Spreader

(g) Batching And Mixing Plant

(h) Finisher

(I) Concrete Spreader

(j) Snarkle

(k) De-Watering pump


(l) Fire Bikes

(m) Excavator


(n) Bull dozer


(o) Fire Brigade Vehicle

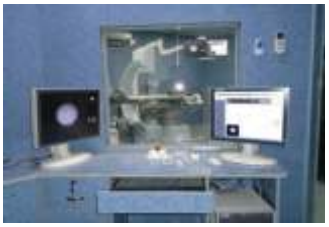
Figure 12 (Source: Field Visit at Fire Brigade and Communication And Work)

Rescue 1122 and health department prepare the community for saving the health of the injured people or the hazard affected people and the victims. They give awareness to the community about Vaccination, Bandages, Medicines, using of sphygmomanometer (BP apparatus), Glucometer (sugar test devices).Train the people of the society about first aid training and the medical staff about all the machines or medical equipment i.e. MRI machine, X-Ray machine, microscope, Endoscopy suite, mammography suit, CT Scan, Cardiology Echo & holder Lithotripsy unit, Lasers or eye surgery, lasers for dermatology Unit, EEG or psychiatry ultrasound machine, incinerator, Cussed, laparoscope, anesthesia machines, ICU monitors and ventilators (figure 13).


(a) Operation Theater Devices


(b) Microscopes


(c) Slit lamp


(d) TV microscope


(e) Running Machine (body mass index checking)


(f) ICU Monitors and ventilators

Figure 13 (Source: Field Visit and www.facebook.com/HealthKPGovt/)

Rescue department also arranges the workshop trainings for the sake of polishing the skills of the community so, that they can be show their best performance during response time i.e. during disaster when they are acting first responders. At that time all existing technology which are present with them will be utilize by them very quickly and effectively. As we know that in any disaster the technology or machines, like social media, lifesaving machines can reduce the risk of disasters. So these departments can also play very important role in risk reduction by providing training or workshops about the method of using their field related technology in disaster.

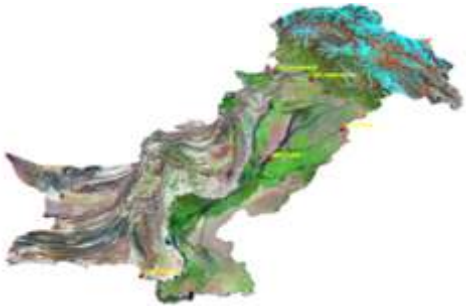


Rescue 1122 giving training and addressing their equipment, mobile medical services etc. to the trainers

Figure 14

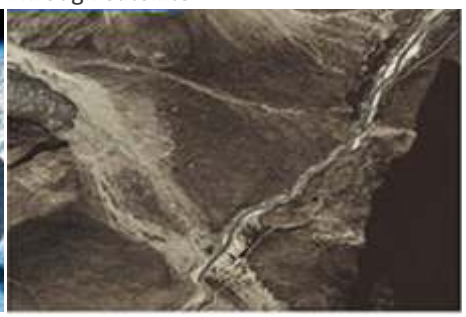
(Source: Training Held at CDPM Department)

SUPARCO department have also play active role in preparedness for minimizing the disaster impacts. This department collect data through GIS and satellite which give us the information about our country from the space after environmental monitoring i.e. (drought monitoring, snow covered mountains and snow melting on mountains, flood and earthquake rapid damages). This department also works on remote sensing of earth, geographic information system and satellite telecommunication system. By using all these technologies, we can easily monitor the hazard like drought and snow melting event so, we will be preparing and make the plans for coming hazard. SUPARCO department give us the map of our country taken through GIS technology and many other events as shown in figure 15.



Pakistan Map Image Taken

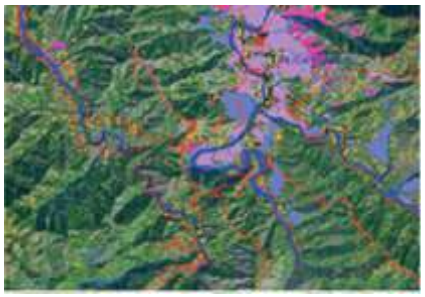
(b) Satellite technology in Atmosphere Through Satellite



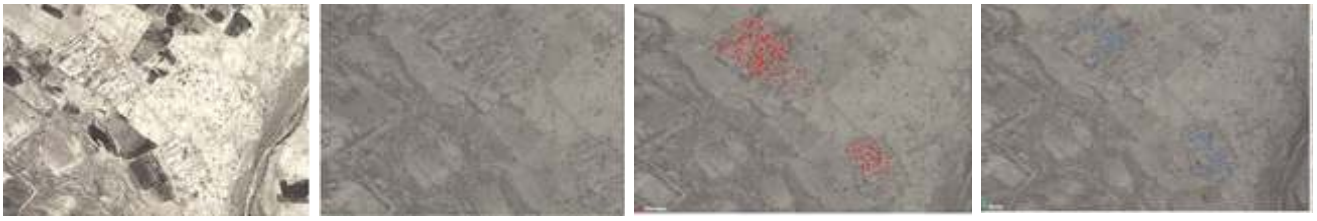
(c) Pre-Avalanch monitoring

(d) Post-avalanch monitoring

(e) Rapid Map After Flooding



(f) Damage Assement Map Of Flooding



(All Above Images Taken through sattellites)

(g) Drought Monitoring

(Source: Official websites of SUPARCO)

Disaster Watch showing vagetation and Temperature context in droughtmonitoring

Figure 15

(Source: disasterwatch.sgs-suparco.gov.pk/map=drought)

4.1.1 RESPONSE:

`During response the first responder which is present on the front line have been responses quickly by saving the people's health. Response phase totally depend upon the preparedness phase. If we done our preparedness activities properly and without any flaws so our response phase will be very affective and during response, we will be done more work in short time due to using the technologies accurately. No matter that we are present with many technologies but if our preparedness phase is skipping our response phase will be of no use. Because we are unable to use the technologies which is used for risk reduction.

During response the PDMA will work as a leading organization. The PDMA will pass the order to the entire relevant department through WhatsApp & SMS services. The entire department will start the operation by using their technology and equipment in order to save the people from severe injuries. PDMA work as a communication bridge between all the departments so that the entire department can coordinate with each other during performing response activities. PDMA also pass or disseminate their information through the android Application i.e. Emergency Alert PDMA-KP. This app helps us in many ways about knowing the current information of disaster and precautionary measures which is adopting during disaster condition as shown in figure 16.

(a) Android Application for Emergency Alert About Disaster

(b) Dengue Alert App

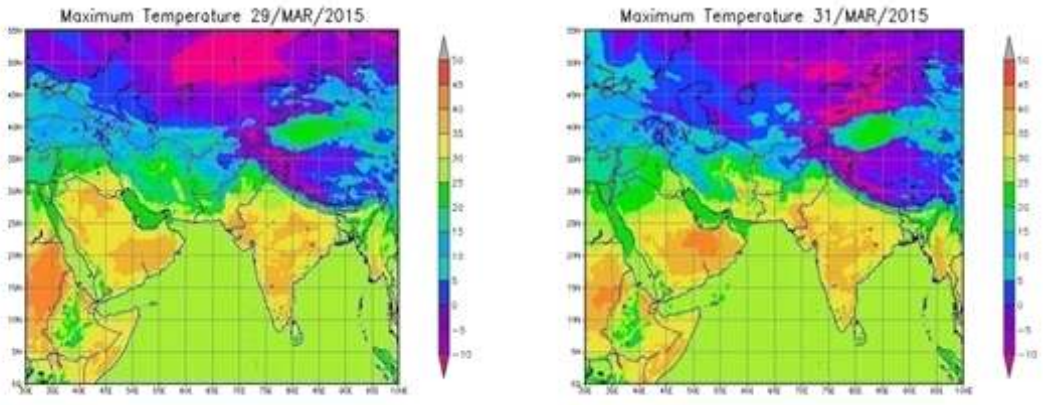
Figure16 (Source: Android Application)

Rescue and health department can start their operation in response phase when disaster strikes the community area or country. They specially focus on the human health and all those hazard which is directly or indirectly threat to human life. These department or organization work for reducing the effects of diseases, pollution and all other hazards which is harmful for human health. They can protect the human life by operating or using their technology during disaster phase.i.e. mobile medical services, injections, oxygen mask, cardiac monitor, drips, chemicals (used as a sterilizer) as shown in figure17. In order to rescue the people which are injured due collapse structures with the help of cutters, search cams, sensors, as well as in flood conditions rescue the people from high intensity of water used cement slabs, water bone vans, water suits & trained divers etc.

Response Activities during Disaster

Figure17 (Source: Images Collected from Relevant Department Through Field visit)

SUPARCO and PMD department can used their technology for providing the accurate current data about coming and present hazard as well as also provide the latest map of current condition of country. So that the relevant department can work very efficiently and within time. The information also tells us about the weather alerts all over the country these all can do through the weather forecast system and GIS technology. Some of the recorded data pictures shown in figure 18.



Graph Showing Maximum and Minimum Temperature
Figure 18 (Source: Images Collected During Field Visit at Pak Meteorological Department)

Irrigation department provide us information of water inundation on daily basis with the help of manual gauges which is situated at on the pillar of bridges. To make more effective their response phase irrigation department with the collaboration of PDMA working on the electronic gauges for the more accurate result of water inundation. Electronic gauges provide us the result after every one hour. Most hopefully to say the new technology i.e. electronic gauges will be save our time and give alerts of natural hazard very early.

4.1.1 RECOVERY:

During the short term recovery, a temporary road, bridges must be building to handle the traffic while the construction of the main road is under way. Providing logistic support, health worker, monitor the victims on daily base, programs like work for cash & work for food.

In long term recovery, the department minimizes the root causes of all hazards, by providing healthy environment, monitoring and assessment of each council by the entire relevant department are linked directly or indirectly with disaster management, on household level we will send a female volunteer for the awareness session by give pamphlets, Ads in newspaper, TV, social media. The PH of water will tested of each area on monthly bases, Rapid response team for the emergency situation, monthly plans for most hazardous area. During recovery improved or work all the strategies which we found weak in previous disaster during preparedness & response time.

4.2 EFFECTIVNESS OF MENTIONED TECHNOLOGY IN DM:

The mentioned technologies are effective & we seen its effectiveness in 2015 floods because we see less damages in 2015 as compared to previous disasters (2010 floods). These technologies reduce the risk hazards. These technologies help in controlling the diseases during disasters. It improves health of the people. It always indicates the common diseases. In Agricultural sector, the mentioned technologies are 30% to 40% effective because in the natural disaster they have unable to manage the crops due to over hitting. The resistivity of building, roads & infrastructure to the urban floods, Earthquake etc. Lack of financial resources leads us to very less effectiveness of the above interventions. PDMA provide the effective technologies i.e. boats, D-watering Pumps, Lifesaving jackets, first aid kits etc. to the entire relevant department.

4.3 GAPS & CHALLENGES OBSERVED IN TECHNOLOGY:

We are still face with gaps & challenges. We face hurdles in approval of funds i.e. emergency fund & contingency fund from central govt. for adoption of advanced central technologies. There is no capacity building of the operational staff in use of advanced technologies. Due to lack of communication & coordination between Disaster Management Authorities results in showing less response. Specialized Doctors are less in numbers, lack of technical instruments to find out the symptoms of new emerging diseases, doctors are unable to find out the reasons for those viral diseases who effects the people whole years, although in past these are only attack the people in summer or in winter. Insufficient number of or absence of skilled staff, meteorological expertise & professional services to carry out necessary information.

The building codes are not strictly implemented. There is no focused on the mitigation phase. Latest technologies aren't available and the existing technologies are unable to fulfill the need of affected areas. The organizations are facing with

ineffective EWS (early warning system), lack of task force, mocks, drills etc.

4.4 SYSTEMIC & EXECUTION FLAWS IN DISTRICT PESHAWAR:

There are various systemic & execution flaws in Disaster Management in District Peshawar.

In Peshawar Govt. has started initiative in the form of provincial Disaster Management Authority, which manages any disaster & takes steps to prevent any disaster on whole provinces, but sometimes due to lack of coordination between all those organizations who linked with PDA aren't give quickly and effective response.

The absence of proper communication, coordination& miss management leads the community affect one's too harsh condition. Because the department gives late response or sometimes gives response twice which results in wastage of time. First responders are unaware about emergency & they also don't give good response. Their weak coordination & communication can be clearly seen during disaster that no organization clearly knows that this problem by which department.

CHAPTER 5

FINDING, CONCLUSION & RECOMMENDATION

5.1 SUMMARY OF FINDINGS:

- Disaster is a condition in which the day to day patterns of life are totally disturbed and the people are unable to use their own resources.
- Peshawar is exposed to different hazards i.e. urban flood terrorism and noise pollution.
- The impacts of the disaster showed in the form of disease, fear, anxiety, injuries, loss of infrastructure etc.
- The rules of organizations in business for DM are too. Keep economically balance between the organizations & people, to set up & achieve them.
- In order to prevent the disaster, the PDMA coordinate with the sister organization through social media for the accurate & active work.
- To reducing the effect of disaster all those technologies used in the space will provide us data before the hazard strike or the community.
- The department collects data through existing technology like GIS, remote sensing, ceiling projector, hygrometer, seismometer to prepare the communities & people ready to face the disaster.
- To minimize the consequences of the disaster, organizations works on the latest technology to make them more effective than the existing technology for preparing their self to fight with the disaster situation in future.
- In response phase the most active department are rescue 1122 due to presence of every type of technology on the basis of health, fire services & rescue services.
- C&W can show their best performance by utilizing their technology in response phase i.e. during flood the D-watering pump is used for removing the water, after earthquake the Bulldozers, multiple loaders & cranes were used for removing the debris or cleaning the roads.
- Fire Bridge can play very important role in response phase by reducing the risk hazard with the help of fire bikes, fire tanker, & for saving the peoples life the snorkels have been used.
- Irrigation department with collaboration of PDMA works on electronic gauges for the more accurate result in reducing the risk of flood hazards.
- During recovery the disaster related department's works on the all those strategies which we found weak in previous disaster during preparedness & response time.
- The technology effectiveness shown from all the present newly resistant construction of infrastructure, road, bridges, embankments etc.
- There is no capacity building of the operational staff in use of advanced technologies.
- Due to lack of communication & coordination between disaster management authorizes result in very inactive result & show delayed response.
- There is no focus on mitigation phase.
- Lack of financial resources makes us unable to afford latest & large no of technology.

5.2 CONCLUSION OF THE STUDY:

On the basis of study findings, it is concluded that technology has positive impact on our daily life activities. But due to lack of expertise its impact becomes the negative.

The reduction of risk is not possible by using technology because during the time of disaster the people get puzzle & they cannot communicate with each other for help, but we can easily communicate in puzzle condition with any other asking for the help by using radio, television & mobile phone etc.

Before the disaster GIS, gauges, ceiling projector & many other technologies can be used for giving the data & latest information about the hazard etc. According to that we can prepared ourselves for facing the disaster by arranging trainings, seminar & workshops etc. but on the other side if the expertise cannot operate the technologies appropriately so, they will be definitely give us the wrong information & we will not be preparing or managing the disaster in a good manner.

On the other hand, due to low budget allocation for the technology we are having with less number of technologies which is

insufficient for our disaster management activities.

5.1 RECOMMENDATION:

The following recommendations are:

- Technology & their resources should be well organized; they should properly be used & they should according to burning problem.
- Teachers and experts should be well educated & they should have properly trained themselves & their students.
- Training should give about different technological instruments, their use & their importance in different fields of technology.
- Different resources of technology should be encouraged & they should be enhanced in various fields in Peshawar.
- Funds should be given for latest technology & for their better performance.
- Pakistan should make itself internationally strong so that we can get various technologies from them & their use.
- Disaster management should get worked in different sector at district level so that complete efforts are done and use technology at their best.
- Development & improvement of new techniques in seismic design of structure & proposing design guidelines for earthquake resilient structures.
- The latest technology should be very effective and efficient to give the accurate result.

Leading organizations have to use technologies to get in touch with different departments to work together on time & efficiently.

LANDSLIDE HAZARD ASSESSMENT IN DISTRICT CHITRAL

Submitted By:
Mr. Zahid Ali
&
Mr. Masroor Ahmad
M.SC.(final)

ABSTRACT

The core of the thesis is the examination of the process and the nature of landslide hazard, determining its essential features, degree of severity, and duration extent of landslide prone areas. Researchers assessed the landslide hazards in the study area. It is identified that landslide is caused by earthquake, deforestation, cutting of mountains, heavy rainfall, improper irrigation channel and river cutting in the toe of mountains. The data was collected through questionnaires by visiting households of the landslide prone areas. Some of the stakeholders like Focus, Meteorological Department, DCO office were also interviewed. After studying it is assessed that Shogram village is very prone to landslide. In the month of March and April landslide usually occur in district Chitral. The community people say that the government should provide funds to make check dams, retaining walls, plantation and also make the water channel in proper way in the affected areas. The Government and Non-Government organizations which are working in the disaster management are needed to assess and monitor the landslide affected areas and give awareness to the local people about the effects of landslide, precautionary measures and their reduction.

CHAPTER 1

INTRODUCTION

1.1 Back ground of the Study

The mass-wasting events where large amounts of weathered rocks material slide down a mountain side primarily by the gravity related erosion is called landslide.

Landslide also define as the movement of rocks, debris and other earth materials slide down from the slope due to the external stimulus such as heavy rainfall, earthquake, soil erosion by rivers and flash flood on the toe of the steep slope. Landslide is one of the major natural as well as anthropogenic hazard occur each year and causes damage to property, infrastructure and other assets in term of both direct and indirect costs. Large number of Casualties and huge economic losses in mountains area of the world have caused by landslide.

1.2 Types of Landslide

Landslide have the following types, falls, creeps, debris flows, slumps, mudflows. Falls landslide is the rapid movement of materials detached from step slope moving by free fall bouncing. Creep landslide is slow downslope movement of soil and rock. Debris flow is the rapid mass movement in which loose soil; rocks and organic matter combine with air and water. Slumps are fairly common form of mass wasting where the rocks collapse each other break off and move downward from the hill and rapidly flowing mass of wet material that contain at least 60 percent sand and clay sized particles.

1.3 Factor Causing Landslide

Landslide is a common hazard which occurs naturally as well as human activities. Landslide occurs very quickly with incredible speed and destruction. Landslide often removes everything in their path and causes destruction to property, infrastructure and other assets.

1.3.1 Natural Factors

Natural factors contributing to landslide include slope morphology (shape), slope material (soil), bedrock geology, vegetation and climate. Generally, a steeper a slope is, the more prone it is to slide. The general shape of the slope also influences the likelihood of landslide. On concave slope (e.g. hollow, swale, gully), water and debris tend to concentrate, making landslide more likely. Conversely, on a convex slope (e.g. ridge, nose), water and debris are less likely to accumulate. The slope surface materials and their underlying geology also determine landslide hazard. Landslide events is generally dependent on material weakness. For example, if an impermeable layer exists, sub surface water will accumulate there, leading to reduce slope strength and a potential failure plane. The underlying and adjacent geology often influence the chances of landslide by controlling the movement of ground water. Vegetation contributes to slope stability in two ways. First root increases the shear strength of the slope material. Second vegetation removes water from the hill slope by evapotranspiration. Therefore, burned watershed are particularly prone to landslide. The climate determines the frequency and magnitude of precipitation events. The size and timing of participation event also has a great impact on landslide hazard. Both temperature and rainfall are also the main sources of landslide. In case of dry and wet climatic conditions such as monsoonal climate when rainfall occurs, the weathered material washed away. Vibration is also the cause of landslide. Earthquake shaking has triggered landslide in many different topographical and geological setting. Rock falls, soil slides and rockslides from steep slopes involving relatively tin or shallow dis-aggregated soil or rock or both have been the most abundant types of landslide triggered by earthquake. Intense rainfall for periods as short as several hours or has a more moderate intensity lasting several days have triggered abundant landslides. Heavy melting of snow in the hilly areas also results in landslide.

1.3.2 Man-made Factors

Human activities are also the main agents of landslide. Such as in mountainous side improper irrigation water channel, improper side selection for construction, rapid cutting of forests, traditional agricultural practices, mining of mountains for the construction of roads, buildings and mineral resources like limestone etc., can trigger landslide. Massive overgrazing on steep slope can also the major anthropogenic cause of landslide.

1.4 Impact of Landslide

Landslide has been major natural disaster that strike life and property and causes direct and indirect losses.

1.4.1 Direct Losses

Landslide causes direct losses to life or injury, property and asset damages, loss of infrastructure and lifeline facilities, social and economic disruption, or environmental degradation, disrupted water channel, blockage to watering channels, decrease water level in reservoir, ponds etc. loss of farm land, loss of places of cultural importance. Landslide can also affect large of resources. For example, water sanitation, fisheries, drainage system, man-made and natural forests, dams, roads can be affected by landslide every year.

1.4.2 Indirect Losses

Landslide can also cause indirect losses, such as lost in output generation from forest and agricultural land due to excess deposition of debris. Reduced property values due to reluctance of people to buy disaster prone land. Loss of income due to loss of productivity, transport accidents, etc. Future landslides preventing and mitigating costs also increase. Negative effects on clean drinking water such as streams, reservoirs, storage tanks, etc. Secondly it directly and indirectly effects physical income and cost. Reduction in the quality of life because of demolition of personal belonging. Landslide also causes mental suffering and inconvenience. Landslide can be reduced by giving awareness program to avoiding activities causing landslide, avoiding deforestation, launching afforestation projects, increase tree component on farm land through farm forestry, avoid road on sensitive areas, construct retaining wall on cut slope, integration slope stabilization method of road construction projects in mountainous areas, in construction, irrigation canal etc. proper care is to be taken to avoid blockage of natural drainage, total avoidance of settlement in prone zone, avoid earth work that trigger landslide, avoid disposal of sewerage water in sensitive areas, engineering measures such as retaining wall or gabion wall, soil nailing, flyovers etc. biological method such as planting, sowing etc.

1.5 Landslide Hazard Assessment

Landslide hazard is a function of susceptibility and temporal frequency of landslide triggers and its assessment may be done on local, regional, national, continental, or even global scales. The most appropriate method in each scale depends on the extent of the study area and on the available data.

Landslide can be assessed qualitatively or quantitatively. Whether qualitative or quantitative assessment is more suitable depends on both the desired accuracy of the outcome and the nature of the problem, and should be compatible with the quality and quantity of the available data. Generally, for a large area where the quality and quantity of available data are too meager of quantitative analysis, a qualitative hazard assessment may be more applicable. While for sit-specific slope that are amenable to conventional limit equilibrium analysis, detailed qualitative hazard assessment should be carried out. There are number of hazard assessment of landslide. Verity of approaches that can adopt to assess landslide hazard can result in significant difference in outcome if the same problem considered separated by different practices. Continuously an assessment leads to significant change due to increase data a different changing curriculum. The inability to recognize a significant hazard and the consequential underestimation of hazard. The results of an assessment are rarely verifiable, through peer review can be useful the methodology is currently not widely accepted, and thus there something is an aversion to application. The cost of assessment may outweigh the benefit of technique in making a decision.

1.6 Study Area

Chitral valley located in the northern region of Pakistan is one of the most remarkable Place in the world. When it comes to natural scenic beauty its picturesque mountains, fresh springs, green forests, friendly people and rivers teeming with the famous trout fishes are truly spell binding. The peaceful environment and unique culture add to its beauty.

Chitral is the largest district of KP in the term of area 14850sqkm and population 447362. Chitral is surrounded by district of Dir, Swat and Gilgit in the east. In west located Nuristan the area of Afghanistan in its north Wakhan of Afghanistan and in south district of Dir.

Chitral is among the highest place of Pakistan and containing mountains 5 to 8 thousand meters. In 1969 it was merged into Pakistan as a district. Due to the presence of these mountains' landslide hazard is very high. Today the introduction of CPEC route has added to importance of Chitral to further extend and one cannot deny the role of Chitral that it has been playing and can be play in further perspective.

1.6.1 Climate of Study Area

Chitral is influence by the local steppe climate. During the year there is little rainfall. July is the hottest month and the temperature up to 26 degrees averagely. January is the coldest the average temperature of January is 3 degrees. In winter the whole northern area covered by snow the harsh weather and heavy rainfall leads to different disasters in Chitral.

1.6.2 Mineral Resources of Study Area

Chitral region surrounded 1200km long rang of Hindukush. The region consists of thick Paleozoic and Mesozoic. Rural area northern area consists of a vast and complicated history of crustal evaluation. Major minerals in the district is marble. The

resident of Chitral get advantages from these resources. The production of marble per year is 3066 tons. Further mineral resources should have exploited with the china Pakistan economic corridor as we are lacking financial and technical resources.

1.6.3 Some Major Landslide in Study Area

Chitral is one of the most landslide prone district of Khyber KPK. Chitral is one of the districts that every year landslide phenomenon occurs and damages lots of property and infrastructures and also risk to human settlement and to their lives. Some of the landslide prone areas are given below.

1.6.4 Shershall Landslide, Tehsil Lotkoh District Chitral

Shershall village is settled on a moving overburden mass which is home for all most 60-house holders with approximately population 480 individuals. The village is located NE side of Chitral town at ground distance of 32 km and accessible by jeeps.

The problematic area is slope varying from 35 degrees to 70 degrees. The slope is maximum on the NW side while it is minimum on the SW side. Highly foliated, fractured and shattered slates rock outcrop is observed from the head of the toe of slope, which is overlaid by an overburden. The rock exposed at the toe of the slope is highly joined and foliated. Random joint sets are observed throughout the toe of the slope.

Shershall village is an adulatory area. Although the minor movement was there in the overburden mass, but the landslide became active after the sanitation project in 1995 conducted by WASEP. The reason for the activation of the slope was due to improper drainage system as the sanitation water directly goes into the overburden mass and saturates the slope decreasing it resistive strength. A major movement occurred after the heavy rains in July 2010 and the vertical displacement was almost 3.7ft and the average is almost 7ft and the width varies from 7 inches to 12 inches at different stations.

1.6.5 Herth Landslide, Tehsil Lothoh Chitral

Herth is located at a ground distance of almost 50km NE of Chitral town and juristically it falls under the Lotkoh tehsil. Herth is a cluster and composed of almost 7 villages and the landslide active villages were Ajrandeh, Orlagh and Shah. In Herth almost creep type of landslide usually occurs and due to which damages to house, water channel, government school and other basic facilities of life disturbed.

1.6.6 Shogram, Soro Zom landslide

Soro Zom landslide is one of the most destructive landslides in Shogram district Chitral union council Kosht. In 2015 a massive earthquake strikes Chitral district and due to this earthquake, some landslides occur in different parts of Chitral district. Soro Zom landslide is one of that landslides in which large part of the mountain slides into the river Chitral and a large dam made due to the blockage of river by the debris and rocks. Many areas were washed away by the river. After that the particles of soil and debris from Soro Zom daily move down to the river Chitral and a massive dust originate due to the movement of debris and rocks. The dust affects the area of Shogram, Reshun, Lon and near areas. According to the local community member's different consequences occur such as health problem, agricultural loss, crops, fruits and livelihood of the people of the area were totally disturb. (Sardar Ahmad, and Bashir Ahmad 2018)

of roofs and walls of houses. The depth of water was estimated to be 1m. The rainfall also resulted in the disruption of power supply and telecommunication lines (Australian Broadcasting Corporation [ABC], 2015). The flash flood resulted in washing away of significant number of houses and severe damage to the communication infrastructure. The residential sector was affected the most with the total of 48358 houses damaged.

Landslide Prone Villages in Chitral				
S#	**Name of Village**	**UC**	**Tehsil**	**Sub-Tehsil**
1	Khatinj	Shoghore	Chitral	Lotkhow
2	Parsan	Karimabad	Chitral	Lotkhow
3	Madashil	Karimabad	Chitral	Lotkhow
4	Hearth	Karimabad	Chitral	Lotkhow
5	Shot Beshgram	Karimabad	Chitral	Lotkhow
6	Beshgram	Karimabad	Chitral	Lotkhow
7	Shershal	Shoghore	Chitral	Lotkhow
8	Dryan	Charun	Mastuj	Mastuj
9	Lone	Owir	Mastuj	Mulkhow
10	Gohkir	Owir	Mastuj	Mulkhow
11	Drungagh	Kosht	Mastuj	Mulkhow
12	Kosht	Kosht	Mastuj	Mulkhow
13	Mordare	Kosht	Mastuj	Mulkhow
14	Gaht	Mulkhow	Mastuj	Mulkhow
15	Uthol	Mulkhow	Mastuj	Mulkhow
16	Saht	Mulkhow	Mastuj	Mulkhow
17	Kushum	Mulkhow	Mastuj	Mulkhow
18	Madak	Mulkhow	Mastuj	Mulkhow
19	Nishku	Mulkhow	Mastuj	Mulkhow
20	Melp	Shahgram	Mastuj	Torkhow
21	Rabat Khot	Rech	Mastuj	Torkhow
22	Yakhdiz	Rech	Mastuj	Torkhow
23	Khot	Rech	Mastuj	Torkhow
24	Sharastoon	Rech	Mastuj	Torkhow

(Focus Humanitarian Assistance, 2018)

1.7 Statement of Problem

The problem in the area is that people in the area does not make their houses and roads according to proper land use planning. The local people are totally depending to use wood for the fuels and also depending on livestock for the economical being. Due to which usually deforestation and overgrazing increase in the area and leads to landslide. Mostly the

people living in rural area are illiterate and lack of awareness about precautionary measures during landslide and other natural hazards.

1.8 Purpose of the Study

Purpose of this research is to assess the frequency, root causes and nature of landslide in the study area. This research will also help to aware the local people and line agencies to control future landslide.

1.9 Objectives of the Study

1) To identify the causes of landslide.
2) To study the spatial distribution of landslide in the study area.
3) To analysis frequency of landslide of the study area.
4) To identify the month of landslide in study area.

1.10 Problem Encountered

The location of the area is steep mountains slope and the people are living near the mountains sits which increase their vulnerability to landslide events and it is very difficult to reach there in the slope areas. The second problem which we faced is that, the community members supposed that the researchers are from the Government's agencies or any NGOs persons therefore they were responding as they were deprived from the relief aid. Thirdly no one work on landslide before in the study area that is why the researchers faced problem in data collection. Fourthly most of the community people were illiterate and can't aware about the landslide. So that the researchers conduct FGDO for these issues. This also create a little barrier during gathering information. Fifthly major landslides occur in the mountainous areas it is very difficult to reach there.

1.11 Organization of the study

This report consists of five chapters, a list of reference and annexure. These five chapters include Introduction, Literature Review, Research Methodology, Data analysis, Conclusion and Recommendations. Chapter one comprises of background of the study, types of landslide, factor causing landslide, impact of landslide, landslide hazard assessment, study area, statement of problem, purpose of the study, objectives of the study area, problem encountered and organization of the study. Chapter two provide a relevant literature. It gives overview of landslide hazard assessment, globally, nationally and locally. Chapter three consists of research methodology, sample method and sample size, tools of data collection, data analysis and delimitation of data collection. Chapter four represents analysis of the data and results of the study conducted. Chapter five provides research findings, conclusion and recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Literature review is the work on a particular topic before carrying out research on it. In the literature review the approach and perception about the under-consideration problem is very significant. In the review of literature, the following aspects of the problem are very crucial to be considered minutely.

Source of information, method of collection of information, through questionnaires and sampling method of summarization of information, known exactly what has been already done. Landslide hazard assessment is studied in three phases. First studied and reviewed in global context, then national context and finally on study area.

2.2 Global Context

Landslide is common happening seen frequently in the north Thane district of Maharashtra, particularly along communication routs in Ghat section across the Sahyadri mountain range. Here an attempt was made to happen a landslide occurrence from 2004 to 2011. The records related to the landslide were gained from public works department and each single event was drawn on the district road map. According to the research the intensity of rainfall had a direct intensifying effect on the landslide. The result shows that the north and north eastern parts of Thane district were more prone to the landslide. Various previous records of landslide in that area were minutely examined and it was found that maximum landslide happens from June to September and in August it reaches to its climax. The maximum landslide happening was witnessed in the year 2007 followed by 2010 and 2011. (Sumant E, 2013)

The 2006 rockslide-debris avalanche is one of the several catastrophic landslides to have occurred in the Philippines in the last twenty years and highlighting it as one of the most prone area for landslide in the world (cf. Nadim et Al). The Guinsaugon rockslide-debris avalanche was one the most devastating incidence of landslide to have happened across the world in respect of human loss since the Casita volcano rock avalanche-debris flow which was actuated by Hurricane Mitch in Nicaragua in 1998.

Eventually the study carried out on the landslide signifies the role of readily-avalanche optically space-borne imagery and orbital-collected digital terrain data in the rapid characterization of the major catastrophic landslide in support of detailed field work.(Evans, 2007)

The most damaging historical landslide was witnessed during the 1980 eruption of Mount St. Helens, a volcano in the Cascade Mountain Range in the State of Washington USA. The volume of the material was 2.8 cubic km. The world's biggest prehistoric landslide, Saidmarrh landslide, was discovered in Southwestern Iran. The landslide is located on the Kabir Kuh anticline in the Southwest Iran at 33-degree North latitude 47.65-degree east longitude. The landslide has a volume of about 20 cubic km with a terrifying depth of 300 meter, and has a travel distance of 14 km and a width of 5 km. Accordingly there is a possibility of about 50 billion tons of rock to move in a single event. (USGS Science for a change of world)

Romania is a European country with maximum incidence of landslide happenings as compared to other countries. Landslide hazard maps are drawn by considering the interaction of several factors which jointly affect the equilibrium state of natural slopes. The purpose of the paper is to study the hazards of landslide in Romania using the methodology provided by the Romanian national legislation and it is a globally used statistical method. The final results of these two analyses are quantitative or semi-quantitative landslide hazard map, created in geographic information system environment. The data base used for this purpose include: geological and hydrogeological data, digital terrain model, hydrological, land use, seismic and an inventory active landslide. The GIS landslide hazard models were built for the geographical area of the Lasi city, located in the north east side of the Rumania. (Cristina, 2017)

A new model has been developed to examine potential landslide activities changing around the world. A global landslide hazard assessment model for situational awareness has been developed to provide a clue of where and when landslides may be likely around the world every 30 min. This model uses surface susceptibility such as slope, vegetation, road links, forests, geology etc., and satellite rainfall data from the global perception measurement missions. This visualization shows that the landslide results leveraging nearly two decades of tropical rainfall measurement mission rainfall over 2001-2016 to identify a landslide climatology by a month at a 1km grid call. The average now casts values by month highlight the key landslide hotspots, such as the South-east Asia during the monsoon season in June through August and the U.S pacific North West in December and January. (Visualization by Helen. Nicole Kostis August)

Due to the growth of population and caretaking of the flat areas under agricultural mountain they have been intensively mastered, producing increase of natural and technological processes in Uzbekistan last years. The landslides are the most threatening phenomenon and 7240 of them occurred during the last 40 years. More than 50% have been taken in the term of 1991-2000 years. The situation is aggravated because this region is situated in zones, where catastrophic earthquakes with M> 7 occurred in the past and are expected in the future. Contusing seismic gap in Uzbekistan during the last 15-20 years and last dipterous earthquakes occurred in Afghanistan, Iran, Turkey, Greece, Taiwan and Indian further aggravate our worries. On the basis of long-term observations, the criteria of observations, the criteria of landslide hazards assessment (suddenness, displacement interval, straight-line directivity, kind of residential buildings destruction) are proposed. This methodology was developed on two graphical levels: local and regional. Detail hazard analysis performed on local scales and extended to the regional scale. Engineering geologic parameters content of hazard estimation of landslide and mud flow also is divided into regional and local levels. Four degrees of danger of sliding processes are distinguished for compiling of small scales medium and large-scale map. Angren industrial area in Tine-Shan Mountain is featured by initial seismic intensity of 8-9. Here the human technological activity has initiated the forming of the large landslide that covers more than 8 square km and corresponds to a volume of 800 billion cubic meters. In turn the landslide influence can become the source of industrial emergencies as the example of Angren industrial mining region. The different scenarios on safety control of the residing people, motion of transport, regulation of technologies, definition of field improvement and exploitation of mountain were examined.

2.3 National Context

The 2005 earthquake in Pakistan is one of the most disastrous natural calamities not only in our own history but in history of the whole world in general and it proved to be a mega doom both for the people and nature. The disaster caused mega destruction in several parts of the Azad Jammu Kashmir, Hazara region and even the capital Islamabad came under its effect. After that it was visited by various national and international teams to examine the nature and intensity of the destruction. These visits were pre-determined, focusing the most effecting areas of the regions, particularly Muzaffarabad, to collect data on debris-flow patterns, vegetation, instability of the surface of the buildings, impacts on the social structure etc. influences of pre-existing activities, both natural and man-made, on the pattern of landslides and triggering factors were investigated. (Journal of geography and Natural disaster 2017)

The 8th October 2005 earthquake had a magnitude of 7.6 and it caused a huge landslide of 3.5km upstream the Hattian Bala town in the state of Azad Jammu Kashmir of Pakistan. The debris deposited blocked tributaries of the Karli branch of Jhelum river forming Karli lake and Tang lake. The landslide dam became a major headache for the people living along the lower areas of both the Karli and Jhelum rivers. Dunning et al. 2007 and Schnider 2008 discuss the geological feature of the landslide dam and its surrounding mountain terrains and the potential hazards caused by landslide dam. Sattar et al 2010 discussed the potential risk of flood following from such landslide dams, breaching and absorbed deformation / erosions that had been occurring to the debris deposit since the debris dam were formed. The dam was sustained over a period of about four years and four months, and finally the water of Karli Lake broke the north western part of the dam on 9th February 2010 following a continuous rainfall. Later on, the water of Tang Lake also breached the north eastern lobe of the dam in the divesting monsoon rain of July and august of 2010. (Konagi, 2012)

A series of landslide took place in Hunza valley Gilgit Baltistan on 4 January 2010, approximately 700km north of Islamabad. According to the local authorities, 19 people have lost their lives while 43 houses were completely destroyed. The inhabitants of the worst effected village Atabad were relocated. Families from two adjacent villages (Sarat and Salmanabad) were relocated due to the hazard of further land sliding. A total of 191 house holders from the 3 villages are residing in the small town of Altit and Aliabad, either with relatives or in schools. Among these 191 householders Atabad villages had103 householders, Sarat village had 33 householders and Salmanabad village had 55 householders. (Information bulletin, international federation of Red Cross and Red Crescent society).

Return period scenarios taken for the landslides are 5, 10, 15 and 20 years. The spatial probability of landslide occurrence was estimated for the three substantiality classes. Spatial probability was determined by calculating cumulative landslide are in each substantiality class. The results show that the landslides with a return period of 1/i5 years and 1/20 years have the highest spatial probabilities in high hazard class. In moderate hazard class, 1/20 years return period landslides have been the highest spatial probability. The analysis is due for the estimation of highest spatial probabilities in each hazard class for the study area of Balakot shows that the landslides having 1/15 and 1/20 years return period have the highest spatial probabilities in high hazard class. With increase in return period the landslide induced hazard also increases. Total building losses have been estimated for different return period sceneries. The required results were achieved by multiplication of the spatial probability of landslide occurrence (return period) with the building vulnerability. (Author Muhammad Shafique University of Sargodha)

Unconsolidated overburden lies on the bed rocks in the form of glacio-fluvial deposits ranging in the thickness from 3 to 12m. These deposit from the terraces and back-slopes of the affected area. Clay and silts constitute major properties of the overburden at the back slope and terraces. A fault is passing through the affected area heaving strike NS and crossing the river. A huge landslide developed across the river. This landslide is associated with the fault. The movement along this fault has weakened the shearing strength of the rocks and decreased the angle of repose.

In eastern Abbottabad the major triggering factor is high angle slope. From 30 degrees to 40 degrees the angle of slope at the terraces is ranging and 35 degrees to 55 degrees the back-slope and the toe of the terraces is vertical. Due to tectonic activity the bedrock is highly fractured and sheared in the area. At in some places rock falls or blocks of rocks started to slide down in the form of wedge failure. The basis is weakened by mass movement and the result is the widening and vertical settlement of cracks and expending the sliding phenomena in the area. The slope failure of the area is further increased by hydrological conditions. In the cracks and fissures, water from the source is infiltrating. In many places' mechanical behavior of the failure planes is damaging due to infiltrating of water into the cracks and fissures. It appears as surface failure due to the acceleration of underground movement. (Author Tahir Hayat)

2.4 Study Area

The year 2015 was the most catastrophic year in the history of district Chitral. The region was hit by the most destructive historic flood in mid of July and August. The misfortune of the local inhabitants was further aggravated by the following horrible earthquake of 26th October 2015. These successive disasters have affected most parts of the region in various ways. The mega destruction caused by these incidents are either the loss of precious human as well as livestock's lives, destruction of infrastructures, instability of geology of several villages. Landslide and other such coincidences caused visible damage and loss of life. Landslide and other types of ground failure are natural phenomenon that would occur with or without human interference; however, researches have shown that human land use lead to the increase in these disasters in many ways.

Most of the villages in Chitral are located on steep gradient on hill sides and on mountain toe which make them highly vulnerable to natural and geological hazards, especially snow avalanches, landslide and rock falling. Khatinj village, situated on the right hill side of Utrai Gol has been badly affected by the recent disasters. Landslide of khatinj is a complex type landslide but more typically rotational occurring along a curve slip surface providing slump blocks which in turn have topographic benches and a hummocky at the lower reaches. The slope at the base of the villages have undergone through frequent landslide after July and August flash floods followed by the October 26th earthquake. The erosion along the toe of the slope along the main Utrai Gol stream has significantly destabilized huge mass of land above. Thus, major portion of village will be affected in case of heavy rainfall, imminent flash flood and earthquake and the destruction level would be immeasurable. According to the local inhabitants the area has regularly experienced low intensity landslide. However, in 2010, a landslide triggered at Charantek side, followed by July flash flood during the summer, barricaded the road for weeks. Small scale landslide also hits the top part of the village every year and damages the roads, houses, castle sheds and crop land. In the recent year the huge July-August flash flood has again eroded the base of the slope along the main Nala due to which slope has loosed its support and due to it the lower part has also begun to experience sliding. However, the frequency and intensity of the land sliding has increased after 26th October and December earthquake. Beside landslide Charantk site is also facing rock falls. Boulders embedded in the over burden are loosened along the scar and roll down causing fear to the house below. (FOCUS, Landsliding assessment report of Khatinj Lotkhov Chitral, 2015)

FUCUS Pakistan has carried out slope stability survey in Gilgit Baltistan and prepared an inventory of unstable slopes. A base map of unstable slopes in Gilgit Baltistan and Chitral dust developed for further planning and landslide monitoring in active landslide reasons. In 2011 to 2012 Focus, Pakistan carried out a rapid visual assessment of Herth cluster. Geomorphologic, geological and geochemical researches have provided basis for assessment of landslides and the finding stated that for slope which are already in movement, monitoring is the only simplest tools for prevention and prediction of landslide. Therefore, the assessment in Chitral recommended the same approach. Monitoring of movements along the crakes, detection of unstable slope etc., can provide the crude data to predict the volume of mass movement and to create awareness in the community so they can be prepared for any an unforeseen event. Landslide monitoring carried out through extensive engineering tools, mathematical models and high complicated equipment but unavailability of recourses and human capacities hinder such interventions. Therefore, community plays their role in such situations and monitors mass movements and variations with very simple tools and techniques. In this regard Focus Pakistan developed landslide monitoring model through community-based approaches. (FOCUS, Report on monitoring of Herth,Tehsil Lotkhov Chitral, 2012)

A Shershall village is located in tehsil Lotkoh, at a distance of about 30 kilometers from Chitral town. It is located in the north of Chitral town. There are about 60 villages with approximately 400 inhabitants. The village is accessible by a rough and dangerous jeepable road. The village remains inaccessible mostly during winter season due to heavy snow fall and also

during rainy season which frequently damages the road. The village is settled on terrain having an extremely contrasting relief. The relief is not the same at all localities in the village. At lower reaches the relief is very high, which decreases as we move from toe to the upper portion of the village. Highly withered and shattered slates are present in the village. These at large portions of the village are covered by overburden. This overburden consists mainly of unsorted residual material formed as a result of weathering of slates. An active stream is flowing along the toe of the village in N-S direction. The highly fractured, joined slate outcrop is exposed mainly at a lower reach of the villages. The gradient of the slope in the northern side of the village is very high where movement in the ground is very active. Crakes in the ground are developed at many localities in this part of the village. These cracks are running in N-S direction. Cracks are also developed in houses and other structures in this part of the village due to continuous movement in the ground. The slope in this part of the village is very unstable. Oversaturation of water in the ground accompanied by high relief of the area in the main is the cause that destabilizes the slope. The destabilization is also contributed to the presence of highly withered, shattered and fractured bedrock underneath. Water from irrigation channels finds its way into the cracks because these irrigation channels at many localities are intercepted by irrigation channels. These causes oversaturation of water in the ground which ultimately results if slope failure. (FOCUS, Report of Shershall landslide monitoring visits Lotkhov Chitral, 2012)

After the monitoring visits to assess the geological setting, geotechnical conditions and landslide features and statements of the local community observers, the following result can be concluded. Shershall village is settled on an unstable slope, and the central and lower portion and highly active. Circular failure and off sets, tilted tress, damages irrigation channels are dominant features on the northern side of the slope where three houses are already damaged and shifted to alternate places. (Focus Pakistan: first monitoring visit of Shershall landslide, tehsil Lothkoh Chitral 2012)

Soro Zom landslide is one of the most destructive landslides in Shogram district Chitral union council Kosht. In 2015 a massive earthquake strikes Chitral district and due to this earthquake, some landslides occur in different parts of Chitral district. Soro Zom landslide is one of that landslides in which large part of the mountain slides into the river Chitral and a large dam made due to the blockage of river by the debris and rocks. Many areas were washed away by the river. After that the particles of soil and debris from Soro Zom daily move down to the river Chitral and a massive dust originate due to the movement of debris and rocks. The dust affects the area of Shogram, Reshun, Lon and near areas. According to the local community member's different consequences occur such as health problem, agricultural loss, crops, fruits and livelihood of the people of the area were totally disturb. (Sardar Ahmad, and Bashir Ahmad 2018).

2.5 Conclusion

landslide is becoming one of the devastating and frequent disaster throughout the world, Pakistan is also prone to landslide where high mountains are present destruction not only physical and environmental assets but also had done huge losses to human life throughout the globe. Landslide is considering as the most sever hazard which result serious damage to agriculture, property, infrastructure irrigation channels, communication networks. The frequency of natural hazard particularly landslide has increase year after year.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research design and methodology is representing the study design sample section and size of the chapter also represents the study methodology data and data analysis. Finally, it presents a brief discussion on ethical considerations the research fits well as a description research design.

The study is descriptive as well as quantitative and qualitative in nature. Questionnaire was also used as interviews schedules for most respondents. People were illiterate and some literate people were unable to understand most term related survey was conducted through field observation.

3.2 Sample method and Sample Size

Sampling means taking to an interview schedule any proportion or universe as a representative. The researchers conduct data through the following ways. The researchers use purposive and snow-ball sampling method for data collection in the study area. In order to achieved the objectives of the study a sample size of respondent selected from the targeted areas of district Chitral.

3.3 Tools of Data Collection

Researchers personally visited to all relevant organization such as Focus and DCO Office. Questionnaire was filled directly from the respondent. Structured questionnaire was used to collection the data from the relevant government and non-government organization to obtained information on landslide hazard. The data collection process completed within 10 days. Primary data was collected through questionnaire which was modified into an interview schedule and ask question directly in local language for batter understanding and clear result.

3.4 Primary Data

Ensuring precision and detail information through questionnaire and interview.

3.5 Secondary Data

Journals, books, Focus, District Commissioner Office, communication and work department and Meteorological department.

3.6 Data Analysis

Both descriptive and inferential statistics was used for data analysis. Descriptive statistics such as percentages which help in summarizing the bulk of data to determine the respondent trend and also organization patterns. Data analysis consists of data coding, data classification, data tabulation and diagrammatic information, result and finding of the study presented. Most convenient day that is easy for reader and easy for this purpose. Data is presented in the form of percentages, computer-based software. MS excel is used for analysis of data and finally displaced in MS word.

3.7 Delimitation in Data Collection

Due to limited time and burden the researchers complete their research in limited prospective. The respondents are Government organization, local people, NGOs that is why due to office work and busy schedule the respondents can't support the researchers. Much more as the main cause of delimitation of the study of researchers are economic constraint and short time period due to which researchers can't further improve the research work. The situation was still crucial in our study area because people were fear from the additional disaster. There was still vulnerability to land sliding and flooding. Some basic facilities of life were not available over there. The researchers have received approval from the center for disaster preparedness and management (CDPM) university of Peshawar institutional board for study. The interview was conducted in free and friendly environment. The researchers should have culture sensitive so that they easily collected data from the local people by following the typical tradition of that society.

CHAPTER 4

DATA ANALYSIS

4.1 Introduction

The target of our study was to identify the landslide hazard assessment in district Chitral and also identify the causes, spatial distribution, frequency, and month of landslide hazard of the study area. 40 respondents were selected from the whole areas and gathered data through purposive and snow-ball sampling. Analysis the collected data through MS office in the form of bar graph. This chapter is about finding and result of study area which is based on primary and secondary data.

4.2 Description

The researchers collected data and show the collected data in the form of bar graph, with the help of MS excel. The first 7 graphs show the causes of landslide in the study area. 9 graphs show the spatial distribution, frequency and month of landslide in the study area.

Causes of Landslide in the Study Area

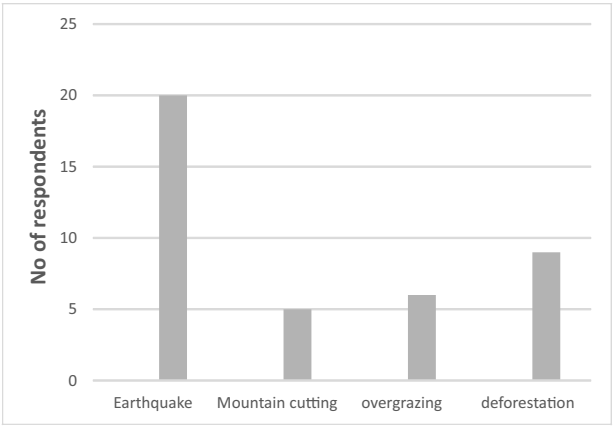


Figure 01

Explanation

Many of the landslides are natural phenomenon that occurs independently or any human action. There is also landslide that have been introduce by various actions taken to make land suitable for some human purposes, under cutting of the foot of the hill slope due to river erosion, excavation for canals and roads, external loads such as building highway traffic reservoir etc. freezing of rocks and soils and also material properties such as compressive strength shearing strength of earth material is the cause of landslide. Majority of the villages in Chitral are situated on steep slope on hill side and on mountain toe which make them susceptible to natural and geological hazards more commonly snow avalanches, landslide and rock fall. Researchers collected data from different villages of district Chitral 22 respondents. Out of 40 gave their opinion that earthquake is the main cause of landslide in district Chitral. 5 responders said that mountains cutting, 6 overgrazing and 9 gave their opinion that deforestation is a cause of landslide in Chitral.

Poor Water Management is a Cause of Landslide

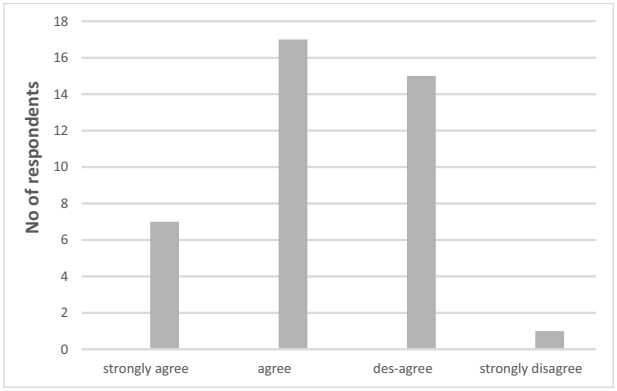


Figure 02

Explanation

Pakistan has largest system of canal irrigation in the world. 72% of Pakistan's population is associated with agricultural as the main source of income. Some areas of Pakistan covered by mountains like Northern areas, the people living in these areas making canals in the steep slope in improper manner due to these most of the landslide occurs in these areas and destroy the property and infrastructures. The data was collected from 40 respondents about poor water management is cause of landslide. 7 respondents were strongly agreed, 17 respondents were agreed, 15 were disagreed and 1 respondent was strongly disagreed.

Cutting of Mountains is a Cause of Landslide

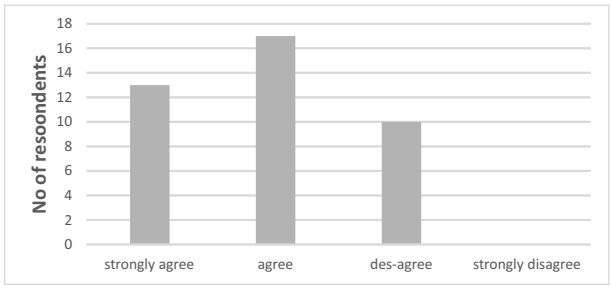


Figure 03

Explanation

Large area of Chitral is covered by mountains. Construction and Work Department and community people cutting the steep mountains for making roads or mining the mountains for marble and other natural resources, these phenomenon leads to landslide in the study area. In the above figure 32% of 40

respondents were strongly agree that cutting of mountains is a cause of landslide in the area, 42.5% were agree and only 25% respondents were disagreed.

Explanation

The people of the study area can't use DRR measures to make their houses in proper way. Therefore, the houses are weak and easily collapse, when earthquake strikes in the area. In district Chitral, when we visited landslide effected areas, we took 40 respondents. In the above graph it is shown that in case of earthquake out of 40 respondents 15 respondents were strongly agree, 17 were agree, 6 disagree and only 2 respondents were disagreed that earthquake is cause of landslide.

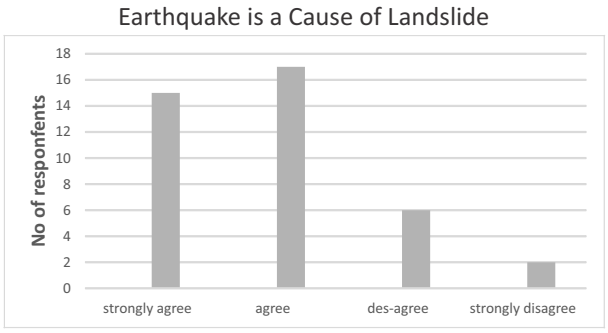


Figure 04

Explanation

In 2004 a major landslide was striking the country of Haiti and affected a lot of properties and livelihood of people. The landslide occurred due to massive deforestation by the people for fuels, due to which soil erosion occurred and leads to landslide. Massive deforestation also affected biodiversity of Haiti. The plants and vegetation were totally diminished and the area prone to flood. The water level decreased and extinction of species increased frequency of droughts. When the researchers collected data from 40 respondents. 72.5% said that deforestation causes landslide. 15% said that deforestation is not the cause and 12.5% don't know about the causes.

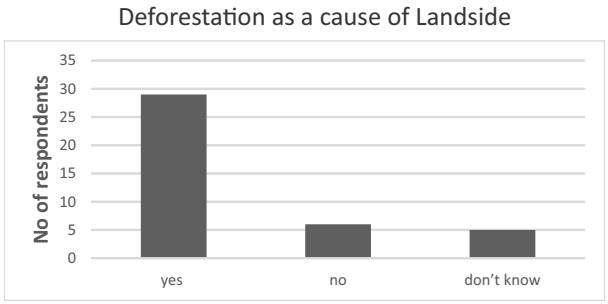


Figure 05

Explanation

The researchers visited the landslide affected areas and took 40 respondents for identifying that overgrazing is a cause of landslide or not in the area. 19 respondents said that landslide occurs due to overgrazing because the economy and livelihood of the community depend upon livestock. The people graze their cattle's and goats in the mountain sides. They make the soil fragile and soft so when heavy rainfall occurs that leads to landslide and some of the respondents said no because they didn't agree that landslide caused by overgrazing.

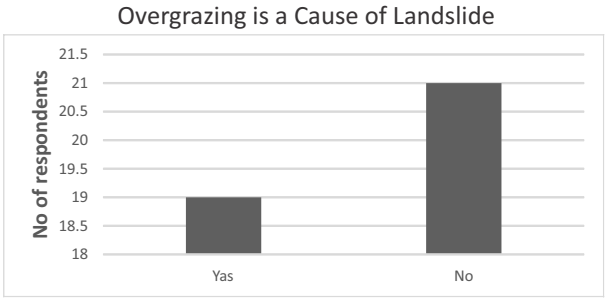


Figure 06

Explanation

This figure shows that 16 respondents replied yes that live stocks increase landslide probability in the area because most of the community people economically depend upon live stocks. 14 respondents replied No because they did not agree that live stocks increase the probability of landslide and 10 respondents did not know about that live stocks increase landslide probability in the study area.

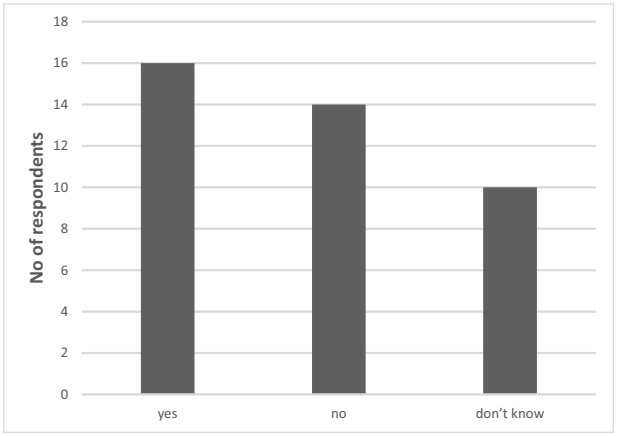


Figure 07

Explanation

In order to identify the landslide hazard assessment, it is important to know the most prone areas to landslide. For this we have collected data from 40 respondents. Out of 40 respondents, 12 respondents said that Shogram is very prone to landslide now a day because the landslide

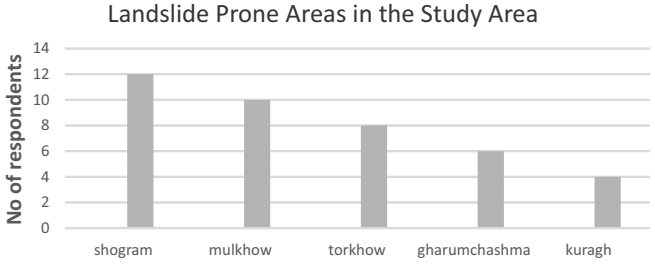


Figure 08

affected almost 500 populations and their agriculture, 10 respondents said that Mulkhow is prone to landslide because creep landslide occurs in Mulkhow in every year, 8 respondents said that Torkhow is prone to landslide, 6 respondents said that Garam Chashma is prone to landslide and according to 4 respondents Kuragh is prone to landslide.

Explanation

Different types of landslides occur in Chitral like rock avalanches, debris flows creep etc. Because Chitral is mountainous as well as situated in earthquake zone region. People of Chitral depends on wood for the fuel which causes deforestation due to which it is also causes different types of landslide. When the Researchers visited the study area, 20 respondents said that debris flows landslide occurs in their area because they are living in sedimentary mountain sides. When we visited the village Shogram and involved the affected community people for (focus group discussion) the respondents said that the debris flows landslide affected almost 500 communities and their agriculture and a lot of disease spread in the community.

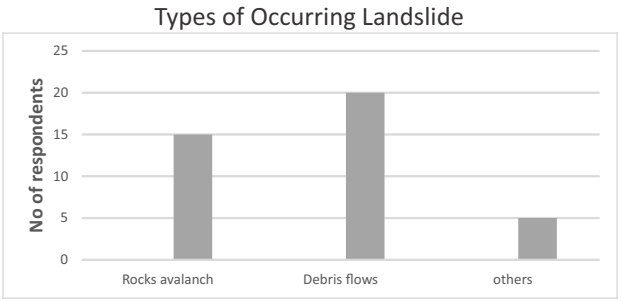


Figure 09

Explanation

Chitral is mountainous area. To identify the landslide hazard assessment in Chitral we collected data from 40 respondents about the high mountains of the area.18 respondents strongly agreed that because of the high mountains and hilly area Chitral is more prone to landslide. Out of 40 respondents, 14 are agreed, 8 are disagreed and 8 are strongly disagreed that due to high mountains Chitral is more prone to landslide.

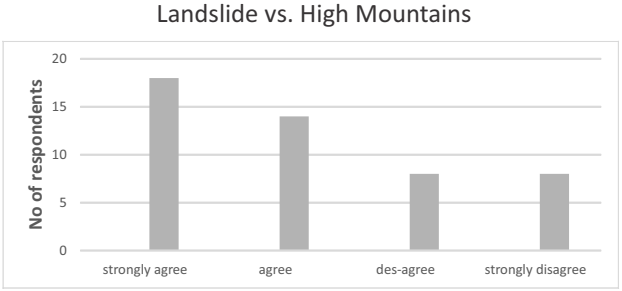


Figure 10

Explanation

While a landslide can theoretically occur anywhere there is elevated terrain and high mountain. Some areas of the nation are more prone to landslide phenomenon like mountainous and Northern areas of Pakistan. Landslide occurs in these areas and destroyed lots of infrastructures and properties and in some areas the people also lost their lives due to landslide. To find out the occurrence of landslide in the study area it is important to know about the people perception and past landslide events in the study area. For this purpose, we gathered data form 40 respondents throughout purposive sampling. Out of 40 respondents, 15 said that landslide occurs daily basis because in Shogram's area, the landslide occurs throughout the year and affect the people on daily basis. 8 people said that landslide occurs monthly basis. 6 people said that the time period between landslide are 3 months and 11 people said that the time interval between landslide are 6 months.

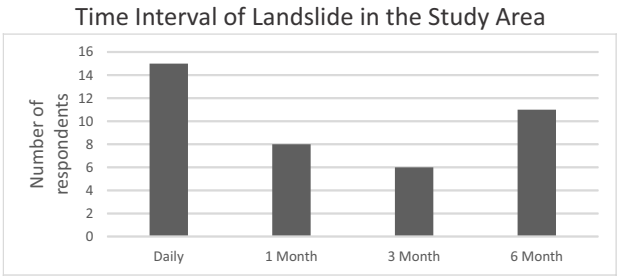


Figure 11

Explanation

The above figure shows that 40 respondents said that majority of landslide occurs in the month of April due to snow melting, rainfall and improper irrigation system for irrigation in steep slope. Some of the respondents said that landslide occurs in the month of March due to melting of snow in mountainous areas. Some of the respondents said that January and some said that February is the month of landslide.

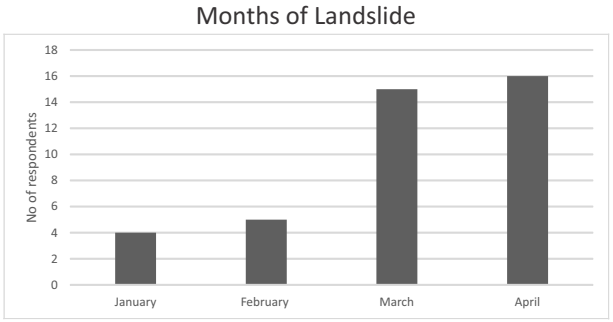


Figure 12

Explanation

The most valuable goal of DDR is to make the community strong to disaster hazard. This platform should have the layout and ability to interact with the people of national and international community. This local platform is also aware and conduct an interactive program with the people to reduce the effect of disaster. It also exchanges information, experiences and knowledge between members and local people. When we visited

the study area and collected data from different respondents. 22 people said that local level plantation is more effective local mechanism to reduce landslide hazard in the community.10 respondents said that gabion wall is effective local mechanism to reduce landslide hazard and 4 respondents said that cement bag, and 4 respondents agreed that check dam is local mechanism to reduce landslide hazard.

4.3 Conclusion

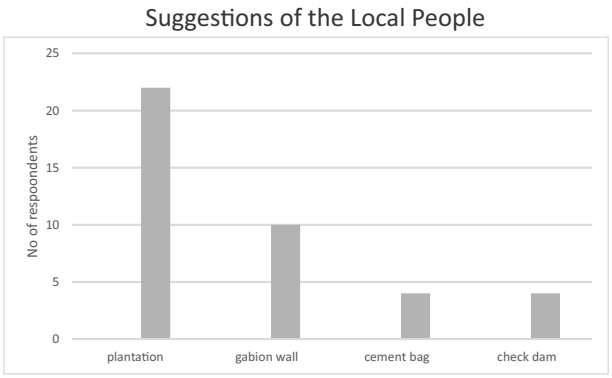


Figure 13

This data showed that majority of the people replied that deforestation, earthquake and high mountains were the causes of landslide in the study area. The perception of different people was different. Majority of the people said that March and April are the month of landslide. When the researchers surveyed different areas of the study area and gathered data from 40 respondents. Majority of the people said that Shogram and Mulkhow are more prone to landslide. After the detail surveyed when researchers collected data. It is identified that debris- flows landslide usually occurred in the study area. At the end when the researchers got people suggestion that how to control landslide hazard. The perception of different people is different. Some of the people said that plantation control the landslide hazard. Some people said that making gabion walls control landslide hazard in the study area.

Explanation

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CHAPTER 5

FINDINGS, CONCLUSION AND RECOMMMENDATIONS

5.1 Introduction

The aim of this chapter is to summarize the research report and suggest research findings, conclusion and also recommendations made as an outgrowth of the study. The main purpose of the study was to identify the causes. To study the spatial distribution, analysis frequency and also the month of landslide in the study area.

5.2 Findings

- The main causes of landslide in the study area are as a result of heavy rainfalls, deforestation, overgrazing and earthquake.
- The district Chitral is covered by high mountains and steep slopes.
- 60% people replied that many household's damages due to landslide per year.
- Debris flow is the sever landslide in the study area.
- Chitral is prone to landslide and the area of Shogram is most affected by landslide about survey.
- The increase of vulnerabilities is as a result of location of the area, lack of awareness and lack of mitigative measures.
- The sanitation and irrigation channels are not properly managed. Due to which the irrigation water run off the soil.
- The infrastructure and agricultural are more prone to landslide in the study area.
- Different kinds of diseases spread in some areas due to landslide.
- The severity of landslide in Chitral is high.
- The community members of the landslide prone areas are not aware or less aware about landslide.
- The district Chitral has been facing landslide hazard from many year ago.
- The district Chitral is one of the most prone places to landslide.
- In the month of April and March most of the landslide occurs in the study area.
- No Government organization is properly working to overcome the landslide in the study area, only Focus Humanitarian Assistance is working in some areas of district Chitral. Monitor the landslide prone areas and make strategies to minimize the impact of landslide.

5.3 Conclusion

The conclusion achieved from the current study is that the district Chitral is prone to landslide. Prone to different disasters like earthquake, flood, avalanches etc. Landslide is one of the devastating and frequent disaster throughout the world. Where there are high mountains and steep slopes are present landslide usually occurs. In the study area there are high mountains and terrain are present, due to which the area is prone to landslide. In the study area frequency of landslide is very high and the month of April and March majority of landslide occurs. The landslide has negative impact on socio-economic condition of the community people. Debris landslide considered one of the most sever hazard in the study area about local community. As a result of landslide huge mass of mud, debris and rocks reaches to the downstream, which result serious damages to agricultural, infrastructure, livelihood, irrigation channels, communication networks and roads. The study achieved that most of the respondents have lack of knowledge about landslide and there is no proper mechanism to reduce landslide and their impact in the community. Earthquake, deforestation and overgrazing are also the leading agents of landslide. There is no proper legislation for deforestation and overgrazing in the study area. Improper land use planning and cutting of mountains for the construction of roads and building is also the major causes of landslide in the study area.

5.4 Recommendations

- Red zone especially steep slope and mountains side should be avoided for any type of constructions.
- Afforestation is the best method to control landslide in some area of the study area.
- Cementation of all irrigation channels in mountains side of the area is also overcome landslide hazard.
- There should be make proper retaining wall after cutting of mountains for roads construction, to control landslide hazard.
- Bioengineering technique such as retaining walls, vegetated soft gabion walls, vegetated loose check dam, vegetated

concrete block walls and live brushwood walls etc. should be made in the steep slope to overcome the landslide hazard in the study area.

- The area is usually suffering from landslide. So, the provisional Government is responsible to provide required equipment and also provide funds for construction of retaining walls, gabion walls, check dams in the landslide prone areas. It is also the responsibility of the Provincial or District Government to monitor weekly or yearly the landslide prone areas and also give awareness to the community about the landslide mitigation measures.

ASSESSMENT OF THE IMPACTS OF MARBLE INDUSTRIES ON LOCAL ENVIRONMENT

A case study of village Darmangi Warsak Road, District Peshawar

Submitted by:
Ibadur Rahman
&
Firdous khan
M.SC(Final)

ABSTRACT

This study was conducted under the title of to assess the impacts of marble industries on local environment. In the present study, the researcher assess the impacts of marble industries on local environment in Darmangi Warsak Road, District Peshawar, Pakistan. Pakistan is blessed with large reserves of high quality marbles which can have a significant impact on its gross domestic product. Marble industry is one of the most environmentally unfriendly industries, cutting the stones produces heat, slurry, rock fragments and dust. Although marble waste, in generally, includes non- radioactive by- products and thus it does not induce climate changes, but it destroys plant life. The dust particles usually contains CaCO3 resulting in visual pollution, Therefore it is very harmful to the road users and surrounding local people. Marble industry is also one of the most labor intensive industry. In Pakistan even material handling in marble industries is done by labors. Unsafe working environment affects the worker's decent and reduces the productivity and quality to an alarming level. Protection of labor increases their physical honor and ultimately reduces the social costs associated with safety. The researchers collected the required data from concerned respondents. Total of 45 respondents were selected in which 15 are marble industries worker, 15 are local people, and 15 are farmers through simple random sampling method. The research was conducted in friendly environment with the local people in the study area. The collected data analyzed through SPSS and MS EXCEL in graphical form through frequency bar graph for different findings. After analyzed the data, the researchers found that marble industries have negatively impacts on human's body as well as on fertile land. The researchers recommended that minimizing the negative impacts of marble industries on environment, water treatment plant should be functional and polluted water should be filtered before flow in the drain system and marble dust should be used as a useful element with the soil in bricks design.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study:

Industrial development is associated with both positive and negative impacts on the environment. The negative impacts cannot be allowed to hinder industrial development but they should be properly mitigated in such a way that these impacts on the environment become insignificant. An example of such industrial development is mining and quarrying of mineral resources. The determination of the impacts of mining activities on environment is quite an important issue in sustainable development and management of the available resources. The contradiction between mining activities and protection of the environmental has increased in the recent times, placing more emphasis on the need for improved information on the dynamics of environmental impacts at regional and local scales. (Ako T. A., 2015)

"The production side of business activity is referred as industry. It is a business activity, which is related to the raising, producing, processing or manufacturing of products."

The country Pakistan has immense reserves of various minerals and natural resources. Important minerals found in Pakistan are gypsum, limestone, iron ore, rock salt, silver, gold, precious stones, gems, marble, copper, coal, graphite, fire clay, silica.

Pakistan's marble resources are spread largely across three provinces: KP, Baluchistan, and Punjab. Some quarries also exist in Sindh and parts of Gilgit-Baltistan. A report published around 2010 by the Trade Development Authority of Pakistan (TDAP) estimates marble and onyx reserves to be more than 300 billion tons while granite reserves are estimated to be 1,000 billion tons. Along the rapid growth of human needs in many sectors, a significant decrease in the availability and viability of the natural resources was always faced. Neither the less, the high volume production is always associated by considerable amount of waste materials, which may adversely impacts the surrounding environment. Efforts on bypassing such dilemma were recently intensified in many countries and international establishments looking for new regulations and legislations to minimize and reuse the generated waste (UMTC, 1995; OECD, 1997). One of the major waste generating industries is the marble quarry and production industry by which around 70% of this precious mineral resource is wasted in the mining, processing, and polishing procedures. Around 40% of marble waste is generated world widely during quarrying operations in the form of rock fragments and being dumped either in nearby empty pits, roads, riverbeds, pasturelands, agricultural fields, or landfills leading to wide spreading environmental pollution.

1.2 Problem Statement:

Assessment of the impacts of marble industry on local environment, however there are major role of the stone industry in the country's economy but it also have negative impacts on the whole environment generally and the surrounding environment specifically such as Air pollution, water pollution, climate change, vibrations, and noise.

The surrounding population from the marble industries faced different types of diseases as well as its environment.

1.3 Purpose of the Study:

The purposes of the study is traced out how marble industries impacts environmentally (soil/land, water. air) in the study area or local area surrounding the marble industries in the village of Darmangi, district Peshawar.

1.4 Objectives:

The primary objective of the study include:

- Assessment of the impacts of marble industries on water bodies.
- Understanding about the problems facing by the surrounding people.
- Suggestion for remedies or solution for improvement.
- Identification of health problems.
- Identification of its impacts on agricultural land.

1.5 Universe of the Study:

Peshawar is the capital of the province of Khyber Pakhtunkhwa situated in the broad Valley of Peshawar near the eastern end of the historic Khyber Pass, close to the border with Afghanistan, Peshawar's recorded history dates back to at least 539 BCE, making it the oldest city in Pakistan and one of the oldest cities in the world. Peshawar was the capital of the ancient kushan empire, and was home to what may have been the tallest building in the ancient world, the Kanishka stupa. Peshawar was

then sacked by the White Huns, before the arrival of Muslim empires. The city was an important trading centre during the Mughal era before serving as the winter capital of the Afghan Durrani Empire from 1757 until the city was captured by the Sikhs in 1818, who were then followed by the British in 1849.

The city of Peshawar has a population of 1,970,042 according to the 2017 census, making it the largest city in Khyber Pakhtunkhwa and the sixth-largest in Pakistan, while Peshawar District has a population of 4,269,079.

1.6 Organization of the Research Report:

The study or research report is composed of five chapters, each chapter identifies different components of the research study.

1) The first chapter describes the major topics of the research study. In this chapter we also study all the problems, objectives, importance and purpose etc. this chapter shows the introduction to the study area and also background of the study.
2) The second chapter is comprises on the work which is done by different type of scholar on the impacts of marble industries on environment.

   In this chapter mainly the researchers mention the work of other done on the related topic.
3) The third chapter is about all those methods which are used for data collection. The most common and usable that is Questionnaire data collection method is used for data collection in the study area. The field observation is also mention in the chapter for data collection.
4) The fourth chapter that comes after data collection is data analysis, tools which are used for analysis are SPSS and EXCEL. The finding of all the data showed in the form of graph and table made through SPSS and EXCEL.
5) The fifth chapter is about findings, conclusion, and recommendations give after the analysis of data. Outcomes of the study is described in detail in this chapter.

CHAPTER 2

LITERATURE REVIEW AND TECHNICAL BACKGROUND

2.1 Rationale of the Chapter:

Purpose of this chapter is to review the prior researches related to this topic. This gives researcher more understanding of the topic and help in identifying gaps to be filled by the research. Review of relevant literature is provided here.

2.2 Background:

Marble is a metamorphic rock formed when limestone is exposed to high temperatures and pressures. Marble forms under such conditions because the calcite forming the limestone recrystallizes forming a denser rock consisting of roughly equigranular calcite crystals. The variety of colors exhibited by marble are a consequence of minor amounts of impurities being incorporated with the calcite during metamorphism. While marble can appear superficially similar to quartzite, a piece of marble will be able to be scratched by a metal blade, and marble will fizz on contact with dilute hydrochloric acid.

Marble is a metamorphic rock composed of recrystallized carbonate minerals, most commonly calcite or dolomite. Marble is typically not foliated, although there are exceptions. In geology, the term "marble" refers to metamorphosed limestone, but its use in stonemasonry more broadly encompasses unmetamorphosed limestone.

2.3 Etymology:

The word "marble" derives from the Greek word 'marmaros', meaning "shining stone." This stem is also the basis for the English adjective "marmoreal," which refers to something that is like marble, or someone who is aloof like a marble statue. In addition, the word marble is colloquially used to refer to many other stones that are capable of taking a high polish.

2.4 Kinds of Marble:

Some historically important kinds of marble, named after the locations of their quarries, include:

- Paros and Penteli from Greece
- Carrara from Italy
- Proconnesus from Turkey
- Macael from Spain
- Makrana from India
- Danby from Vermont, United States
- Yule from Colorado, United States

White marbles, like Carrara, have been prized for sculpture since classical times. This preference has to do with its softness, homogeneity, and a relative resistance to shattering. Also, based on the low index of refraction of calcite, light can penetrate several millimeters into the stone before being scattered out, resulting in the characteristic waxy look that gives "life" to marble sculptures of the human body.

Places named after the stone include Marble Hill in Manhattan, New York; the Sea of Marmara; India's Marble Rocks; the towns of Marble in Minnesota and Colorado; and Marble Arch in London. The Elgin Marbles are marble sculptures from the Parthenon (ancient Greek temple) that are on display in the British Museum.

2.5 Impacts of Marble Industry:

Industries play an important role in improving the living standard but at the same time causes several environmental problems. As marble industry is one of the major waste generating industries in all industrial estate, by which is the marble quarry and production industry around 70% of this precious mineral resource is wasted in the mining, processing, and polishing procedures. Around 40% of marble waste is generated world widely during quarrying operations in the form of rock fragments and being dumped either in nearby empty pits, roads, riverbeds, pasturelands, agricultural fields, or landfills leading to wide spreading environmental pollution.

Some of the problems are:

- Environment/air pollution
- Impacts on agricultural land
- Impacts on health

- Impacts on water bodies

2.6 Literature Review:

Industries play an important role in improving the living standard but at the same time cause several environmental problems. In the present study, the researcher study the impact of marble industry effluents on water and sediment quality of Barandu River in Buner District, Pakistan. Water and sediment samples were collected at three different sampling sites (upstream, industrial, and downstream sites) from Barandu River and their physicochemical properties were inter-compared. In addition, they further added different marble stones and mix water (wastewater) from marble industry which were analyzed. The measured physicochemical parameters of river water including pH, electrical conductivity (EC), alkalinity, total hardness, Ca and Mg hardness, total dissolved solid (TDS), total suspended solids (TSS), sulfates (SO4 2−), sodium (Na+), potassium (K+), nitrites (NO2 −), nitrate (NO3 −), chloride (Cl−), calcium (Ca2+), and magnesium (Mg2+) were found to be significantly altered by effluent discharges of marble industries. Similarly, they found that heavy metal concentrations in both water and sediments of the river were significantly increased by marble industry wastewater. It is concluded that large quantities of different pollutants are added to Barandu River due to direct disposal of marble industry effluents which degrades its quality. Therefore, they recommended that direct disposal of marble industry wastewater should be banned and all effluents must be properly treated before discharging in the river water.

Gaza Strip is Facing many environmental problems, air and noise pollution are among the most dangerous types of pollution not only in the Gaza Strip but worldwide, this study focused on air and noise pollution emitted from marble and granite factories in Gaza Strip. In this research, the researchers represents the first attempt to know the real dimensions of this pollution and its negative effects on the environment throughout massive amounts of particulate matter and noise level high outputs from different processes within the factory, the study aims to study air and noise pollution levels emitted from factories marble and check negative effects on the environment. The researcher used the following method for the achievement of stated goals by different methodologies as: field work to measure the levels of pollution levels in five factories and modeling of the readings generated, then see how matching results by local standards and international, sampling, implementation of environmental public awareness program, and finally through a personal interview were selected list of negative impacts resulting from pollution to the environment.

Marble industry is one of the most environmentally unfriendly industries, cutting the stones produces heat, slurry, rock fragments and dust. Although marble waste, in generally, includes non- radioactive by- products and thus it does not induce climate changes .It destroys plant life. The dust particles usually contains CaCO3 resulting in visual pollution Therefore very harmful to the road users. In this way it is very necessary to understand the behavior of marble slurry and dust and to use in this way that it becomes a useful thing for environment and highway users. Therefore, the researchers concluded that by addition of 25% 30% marble dust can reduce swelling percentage of the clay contents of the soil. While the addition of marble dust reduces the clay contents and increase in the percentage of coarser particles, reduces the LL, raises the SL and decrease of PI of soil and thus swelling potential. Activity of the soil reduces by the addition of marble dust. It is also revealed that industrial waste like marble dust has a potential to modify the characteristics of expansive clay.

Marble industry is one of the most labor intensive industry. In Pakistan even material handling in marble industries is done by labors. Pakistan is blessed with large reserves of high quality marbles which can have a significant impact on its Gross Domestic Product. Unsafe working environment affects the worker's morale and reduces the productivity and quality to an alarming level. Protection of labor increases their physical integrity and ultimately reduces the social costs associated with safety. The researchers recommended that a systematic approach needs to be evolved to identify potential hazards with in a working environment. Solid waste with a significance value of 0.08065 is the most significant hazard. As marble industry in Pakistan mostly uses blasting for extraction, the raw material is usually potato shape blocks. The waste is produced not only at the quarry but also at the processing area, which leads to Tuberculosis and cancer among the labors and managers. The next most significant hazard is water pollution. Its significance value is same to first significant hazard. The water is polluted by the unskilled labour, as the slurry involved is drained out of the marble processing zone. It drastically affects the eco-system of humans and animals. It's been reported that because of this slurry the plants are even affected. The third significant factor is skin burn. It is associated with the polishing material. Usually the skilled labour is affected by the skin burn. No use of personal protective equipment leads to this hazard. Its AHP value is 0.08065. Fourth significant hazard with an AHP value of 0.08065 is dust pollution. It affects not only the labours but all the inhabitants around the marble zone. The fifth most significant hazard is the sludge. Its significance value is also 0.08065. It is related to the solid waste. It really disturbs the overall environment within and outside the marble processing zone.

The quality of water is being deteriorating due to rapid increase in industrialization in recent times. The marble industry is the leading waste generating industry causing pollution of both surface and groundwater sources. The study was conducted to analyze the effects of the marble industry effluents on the groundwater parameters in District Swat, Pakistan. The

groundwater samples were analyzed using different tools for various physico-chemical parameters such as taste, color, odor, temperature, turbidity, hydrogen ion concentration, total suspended solids, total dissolved solids, electrical conductivity, total hardness, total chlorine, chloride, nitrate, nitrite, salinity and alkalinity. Most of the groundwater parameters exceeded the standards set by World Health Organization (WHO). The researchers has been investigated from the study that marble industry effluents have a negative impact on the quality of groundwater in District Swat. Proper treatment would be needed before using such contaminated water for different useful purposes.

Marble workers are occupationally exposed to intense environmental marble dust in their workplace. The main objective of this study is to evaluate health risk assessment that might generate from marble manufactures in Damietta City. We also aimed to investigate the effect of marble dust exposure on lungs of rats. The rats exposed to inhalation of dust induced pathological changes in their lungs which involved the different tissue constituents. The degree of these pathological changes was proportional to the duration of exposure. This study shows positive relationships between respiratory lesions and marble dust. The mean concentrations of inhalable dust in marble workshops (A,B,C) were 30.44, 60.41, 68.73 mg/m3 respectively, whereas The mean concentrations of personal respirable dust in marble workshops (A ,B and C) were 6.10, 6.92, 7.15 mg/m3 respectively. Most of these measurements were exceeded the permissible exposure limit. The researchers demonstrated that long period of chronic exposure to dust induced progressive atrophic changes in the alveoli of rats. Therefore, they recommended that there are some potential risk of such industry lying on the environmental, which requires attention, mitigations, and management to protect the existing human and animal health.

The researchers explain that the industrial wastes cause the environmental problem in the world. If we look at the issue in terms of sustainability, the reuse of these wastes is necessary. Especially, for many years large amounts of stone wastes are generated in the quarry processing plants. The environment, humans and economy are impacted significant because of these wastes. Especially, consumption increases with the increase of population in the world and with consumption our natural resources is rapidly declining. However, rapid economic growth, urbanization, rising population and increasing welfare leads to increasing amount of production waste. That large amounts of waste materials are required particularly in the construction industry, road construction, the construction of waste storage areas, and concrete manufacture makes recycling. Today, with the rapid growth of the industry is in excess of industrial wastes increased the performance of work on the evaluation of waste. Utilizing industrial waste provides both prevention of environmental pollution caused by waste and contribution to the national economy by using industrial waste in the construction industry. Such industrial wastes as marble waste pieces and dust.

Chapter 3

RESEARCH DESIGN

3.1 Nature and Procedure of the Study:

This chapter explain the methodological framework, sampling procedure, sampling size, tools of data collection and data analysis procedure. In the initial stage of this research a topic was formulated and a research proposal was drafted and submitted to department. After approval of proposal relevant literature was thoroughly reviewed. Through literature review various indicators were identified and tools of data collection were drafted. Data was collected from quarter concerned and then was analyzed through various software's. After analysis of data it was summarized in tabular and paragraph form. At the end a complete report was compiled from both primary and secondary data.

3.4 District Peshawar, Warsak Road:

Figure 3. : Location of the study area

3.5 Climate of Peshawar:

The Peshawar is situated near the eastern end of the Khyber Pass and sits mainly on the Iranian plateau along with the rest of the Khyber-Pakhtunkhwa. Peshawar is literally a frontier city of South-Central Asia and was historically part of the Silk Road. Winter in Peshawar starts from mid-November to the end of March. Summer months are May to September. The mean maximum temperature in summer is over 40 °C (104 °F) and the mean minimum temperature is 25 °C (77 °F). The mean minimum temperature during winter is 4 °C (39 °F) and maximum is 18.35 °C (65.03 °F).

3.6 Limitation of the Study:

Although this research was carefully prepared but still there are some limitations and short comings. First of all the research conducted in short time which has lasted for two or three months. This is not enough time for a researcher to observe the environmental impacts of Marble Industries on environment in the study area. It would be better if it was done in a longer time and researcher would go to target goals.

3.7 Nature and Methodology of Data Collection:

This methodology is based on data collection. Different tools and techniques are used for data collection. Data collection tools were questionnaires and field observation during data collection for this research. The targeted population was the

most affected by pollution released by marble industries in the study area.

3.8 Sampling Method and Sample Size:

3.8.1 Sampling Method:

Simple random sampling method was used in this research work, where all elements of the population have equal chance of selection, or where the probability of selection can be accurately determined.

3.8.2 Sampling Size:

Sample size determination is the act of choosing the number of observations or replicates to include in a statistical sample. The sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample. Total sampling size for this study were about 45 respondents.

3.9 Tools for Data Collection:

To achieve the objectives of the study, both primary and secondary data were used for data collection from concerned sources.

3.9.1 Primary Data:

Primary source is based on scheduled questionnaire and general observation. Primary source was considered as the most appropriate tools for data collection for the study.

3.9.2 Secondary Data:

To collect secondary data, researchers used different sources like internet, newspapers, books, reports, and articles etc. this data is collected before the field observation to look out about the impacts of marble industries on environment in the study in advance.

3.10 Statistical Data Analysis:

For statistical analysis of data, researchers used MS Excel and SPSS. The SPSS is used for the data analysis after collection. The tables and graphs constructed through SPSS and MS Excel. There are frequency table, percentage table, different types of graph that are constructed by using SPSS and MS Excel.

3.11 Ethical Consideration:

Following the research ethics, proper dress code was followed and permission was obtained from concerned authorities to ensure the confidentiality of the respondents and objectives were properly explained. In case of any difficulty the questions were explained to the respondents. Respondents were also briefed in order to ensure that all the information they provided will be kept confidential. Keeping in mind the busy schedule of the respondents on required, relevant and important questions were asked that were already mentioned in the questionnaire.

Chapter 4

DATA ANALYSIS

4.1 Introduction:

The collected data is always in raw form and to make it meaningful, this data is required to edit and analyzed by applying different tool computer application tools. But the recent and most commonly used software SPSS statistical packages for social science was preferred for the data analysis. For clear understanding of the data to the reader, it is essential to present the data in graphical, tabulation, and descriptive form.

4.2 Tools for Data Collection:

The collected data was analyzed by statistical packages for social sciences (SPSS). Questions of open-ended and closed-ended both were put into SPSS, to find the frequency and percentage of the data by using the numerical and nominal scale of SPSS. SPSS measuring variable like numerical for the close-ended question and string for the open-ended question was used to find the precision of the data analysis.

Respondent's age:

During the field survey, the researchers selected different aged people. The frequency distribution of these respondents is as the age of 15 to 20 year are 2, 21 to 30 year are 19, 31 to 40 year are 9, 41 to 50 year are 3, 51 to 60 year are 6, and 61 to 70 year are 6 as shown in the Table and Graph 4.1.

Table 4. : Respondents age

Respondent age	Frequency
15-20	2
21-30	19
31-40	9
41-50	3
51-60	6
61-70	6
Total	45

Figure 4.1 : Graphical representation of respondent's age

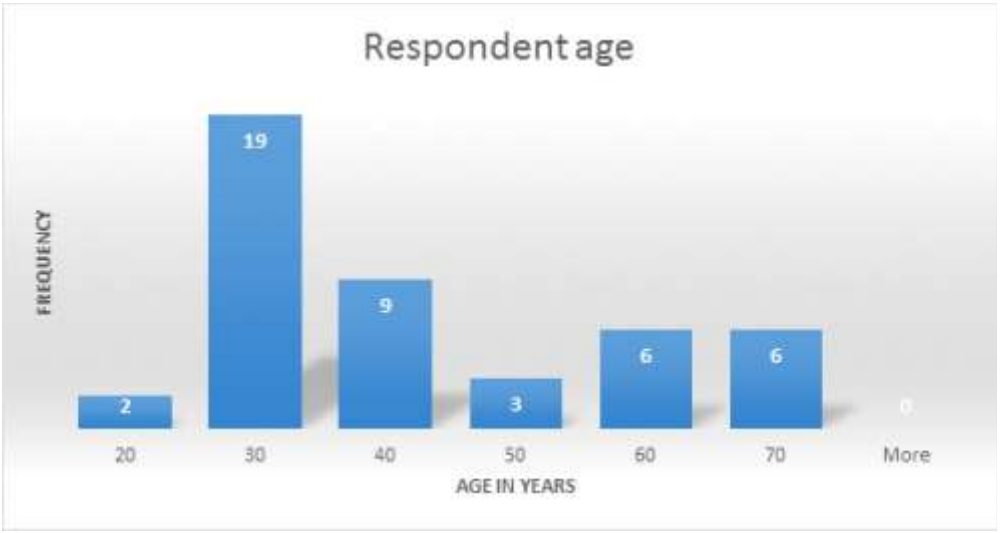

Figure 4.1 : Graphical representation of respondent's age

Education level of respondents:

To find the level of education of the respondents is a compulsory activity because on the basis of their knowledge and experience the researchers collect relevant data. Four categories of education level are selected (Middle, Secondary, Higher, Master, and illiterate) the ratio of middle level education are 8.9%, Secondary level education are 26.7%, Higher level of education are 17.8%, Master level of education are 8.9%, while the ratio of illiterate are 37.8%. The ratio of the education level of the respondents is shown in the Table 4.2 and Graph 4.2.

Education level of Respondents		Frequency	Percent
	Middle	4	8.9
	Secondary	12	26.7
	Higher	8	17.8
	Master	4	8.9
	Illiterate	17	37.8
	Total	45	100.0

Table 4.2 : Education level of respondents

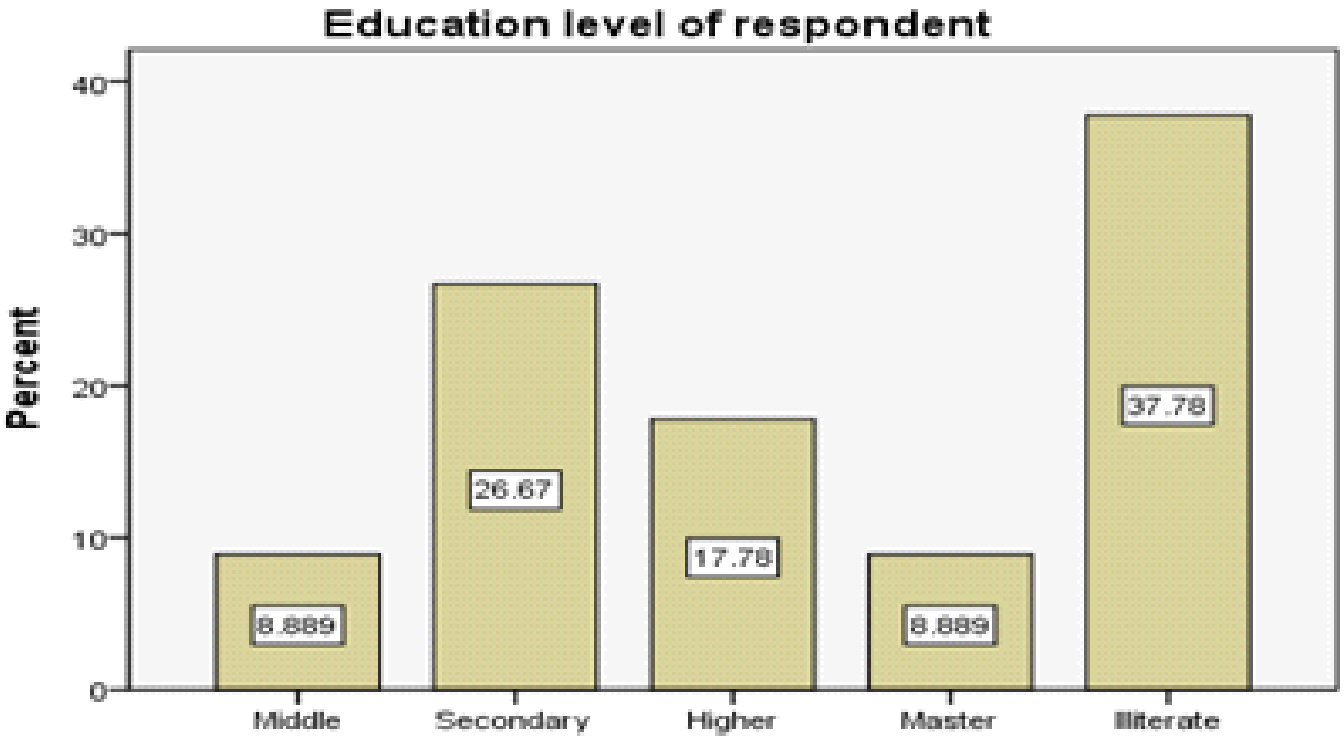

Table 4.2 : Education level of respondents

Impact of Marble Industries:

During the field observation and interviews, the researchers examines that marble industries have directly impacts on the environment. The researchers found that the ratio of the air pollution and water pollution is high in the surrounding environment. The ratio of the impacts of marble industries is shown in Table 4.3 and Graph 4.3.

Different impacts	Frequency	Percent
air pollution	14	31.1
water pollution	13	28.9
noise pollution	5	11.1
traffic blocking	4	8.9
I don't know	9	20.0
Total	45	100.0

Table 4.3 : Impacts of Marble Industries on environment

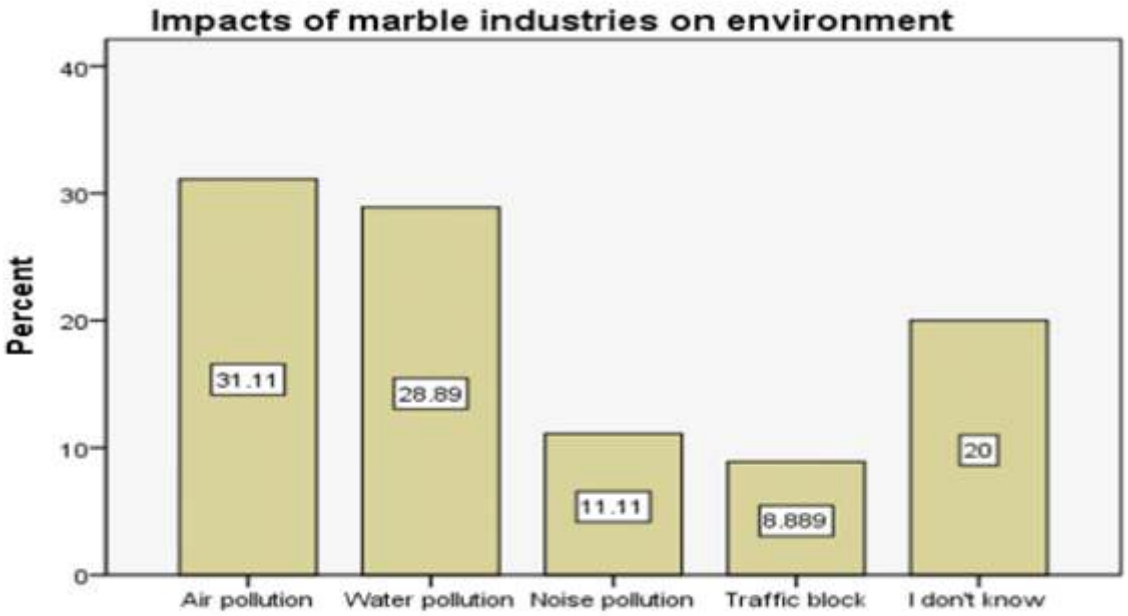

Table 4.3 : Impacts of Marble Industries on environment

Effects Caused By Marble Waste or Pollution:

During the field observation and interviews, the researchers examines that the rate of the effects of marble waste pollution on humans body is high because marble waste consist CaCO3 and other elements which effect on the humans body. The ratio of the disease as irritation of skin and deafness are occupied in workers specially while in the residential people are generally suffered. The effects of marble waste pollution as shown in Table 4.4 and Graph 4.4.

Effects of marble waste pollution		Frequency	Percent
	Irritation of skin	12	26.7
	Irritation of Eyes	5	11.1
	Tuberculosis	8	17.8
	Deafness	11	24.4
	Hypertension	4	8.9
	Typhoid	3	6.7
	Hepatitis	2	4.4
	Total	45	100.0

Table 4.4 : Effects of Marble Industries waste

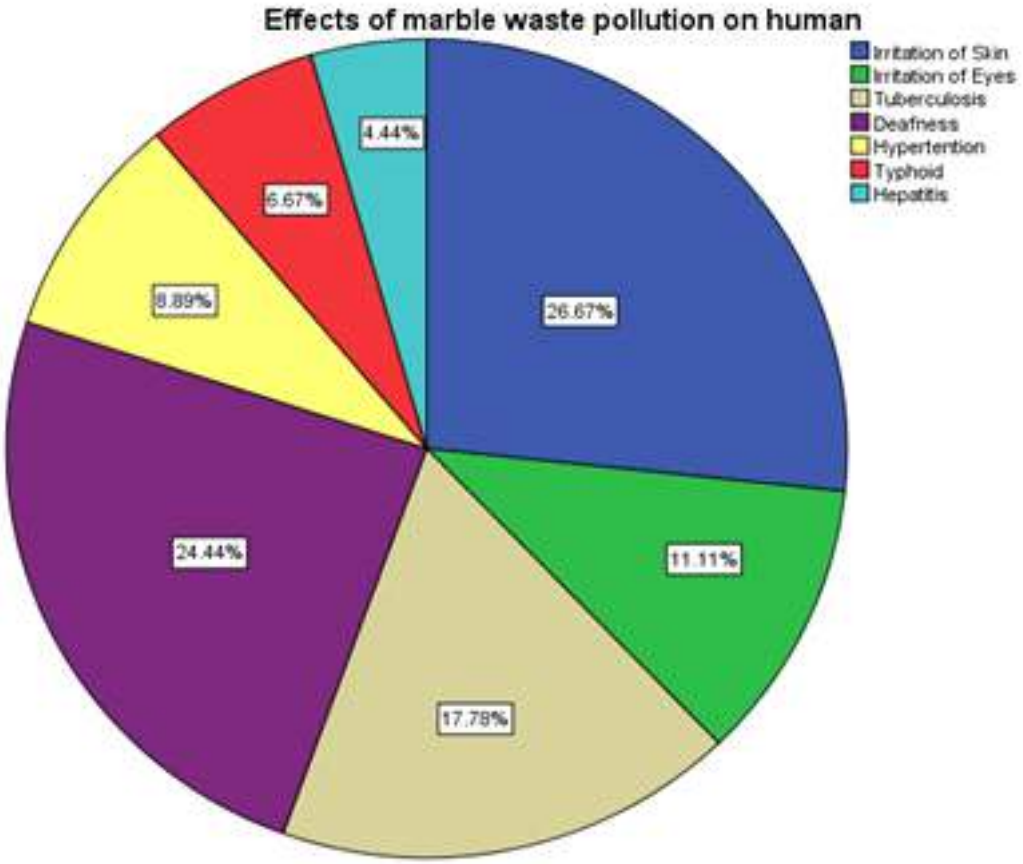

Figure 4.4 : Effects of Marble Industries waste on human

Status of Crop Land Product before Marble Industries Development:

During the field observation and interview, the researchers found that the ratio of the irrigated land was able to yielded more products than expectation of the landlords. As the status of the crop land product before the establishment of the marble industries shows in the Table 4.5 and Graph 4.5 in the study area.

Status of crop land product		Frequency	Percent
	Increase	12	40.0
	Decrease	8	26.7
	Constant	7	23.3
	_	3	10.0
	Total	30	100.0

Table 4.5 : Status of crop land product before establishment of Marble Industries

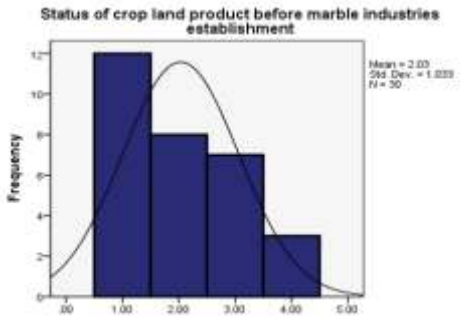

Figure 4. : Status of crop land product before establishment of Marble Industries

Status of Crop Land after Marble Industries Development:

During the field observation and interview, the researchers examines that the product of irrigated land is lower than past because the wastewater of the marble factories is directly flow in the residential drain and then flow in the crop land which caused the crop land rigid. As the status of crop land product shows in the Table 4.6 and Graph 4.6.

Status of crop land product		Frequency	Percent
	Increase	6	20.0
	Decrease	9	30.0
	Constant	11	36.7
	I don't know	4	13.3
	Total	30	100.0

Figure 4.5 : Status of crop land product after establishment of Marble Industries

CHAPTER 5

FINDINGS, CONCLUSION, AND RECOMMENDATION

5.1 Introduction:

After the analysis of collected data, findings, conclusion, and recommendations is also an important aspect of the thesis that lays the foundation for the sound recommendation which are consider the final door of the research. This is the corner stone in whole research.

5.2 Findings:

The main purposes of this research was to conduct study about to assess the impacts of marble industries on the environment in Darmangi Warsak Road, District Peshawar. To achieve the objectives district Peshawar was selected as universe of the study. 45 respondents were selected in the study area, and simple random sampling method was opted to collect the data from concerned respondents.

Findings of the study reveals that all of the respondents were male and were in the maximum age grade 21-30 years. 26.7% were having master qualified while 8.9% are only secondary educated. They were partially aware about the impacts of marble industries and consider air pollution and water pollution as main impacts of the industries with the ratio of 31.1% and 28.9% respectively. 26.7% of respondents says that the most affected impact is the irritation of skin and tuberculosis.

5.3 Conclusion:

This study is conducted to know about the impacts of marble industries on environment, perception and attitude of the people about these impacts and to compare the pre and post impacts before and after the establishment of the marble industries in study area.

Conclusion of the study reveals that all of the respondents were male and were in the maximum age grade 21-30 years. 26.7% were having master qualified while 8.9% are only secondary educated. They were partially aware about the impacts of marble industries and consider air pollution and water pollution as main impacts of the industries with the ratio of 31.1% and 28.9% respectively. 26.7% of respondents says that the most affected impact is the irritation of skin and tuberculosis.

5.4 Recommendations:

After compiling this research report on the impacts of marble industries on environment in Darmangi Warsak Road, District Peshawar, some useful suggestions were found that can be helpful in minimizing and reducing the impacts of marble industries on environment in Peshawar.

5.5 Recommendations for Government:

Government is the first respondent who help the people in every conditions from every disaster, the government take many steps before and after a disaster situation and provide facility to public, here are some recommendations to the government through which they can make the affected public resilient in affected area.

The recommendations are:

- The government should ensure the implementation of the plans related to the industries and environment in order to ensure the safety measures for industrial workers and to the local people.
- The government should look forward towards the agricultural system in the area to make the local farmer able to harvest their crops in the area.
- There must be flexibility from the government for NGO's to enter in the affected area and work for the professional trainings to the local people to restore the environment from the industrial pollution.
- The government should conduct survey properly in a week or in a month in order to find out environment related issues in the area.
- The government should design separate drain system for the industries polluted water.

MULTI HAZARDS VULNERABILITY ASSESMENT:

CASE STUDY VILLAGE COUNCIL BANG, UNION COUNCIL YARKHUNE,
TEHSIL MASTUJ, DISTRIC CHITRAL, PAKISTAN

Submited By
Sidra Alam
&
Shazia Bibi

Abstract

The present study is conducted to identify multi hazards vulnerability in village council Bang, union council Yarkhoon, tehsil Mastuj, and district Chitral, Pakistan. Various method was adopted and data was collected through interview, focus group discussion, transect walk and field observation. We select the whole area of Bang but randomly selected 40 houses and discuss with the notable people, women, child, old age and disable for transect walk, field observation, FGD, s and interview. Through study we identify multi hazards that are earthquake, mass wasting, flood, desertification, and complex disaster there vulnerabilities, impact, damages, element at risk in the area and also physical, social, economic and attitudinal vulnerabilities of local people in study Bang, Chitral, Pakistan. We proposed some useful recommendation for concern stakeholder. The study propose that local, provincial and national government and for the civil societies that the relative local departments of the area were required advanced early warning system and mans of law down plan and policies and their implementation, warning dissemination, hazards mapping, identification of risk, hazards, vulnerabilities and capacities ensure coordination/cooperation/ communication / media and public participation, plantation, as well as education, training, exercise and drills and awareness campaigns etc.

CHAPTER-1

INTRODUCTION

1.1Back ground of the study

Pakistan is the 6th most populous country in the world with a population of 212,742,631 people and total area of 796,096 square km. Pakistan is situated within hazard - prone region and is exposed to a variety of natural disaster such a as floods, earthquake, mass wasting (landslide, avalanche, slump, creep, mud/debris flow, and rock fall), desertification (water erosion and waterlogging), cyclone and droughts, tsunami, GLOFs, fire, terrorism, accident, industrial failure, epidemics and pollution. Rapid population growth, un controlled development and un managed expansion of in fractures are the most common factors that result in the people being vulnerable to natural hazards(Cardona et al. 2003). As a result of these various disaster 6037 people deaths in the period from 1993-2002, with a further 8.7 million people are affected (World Disaster Report).

Chitral is also known as Qashqar. Chitral district's elevation range from, 3,600 feet above the sea level in the southern Aranthu valley to 12,121 feet above the sea level in the north most area of Baroghil valley. The number of tehsil in chitral is 6. Total area of Chitral is 14,850 km (19.93%).The unique topography of Chitral making it highly vulnerable to natural and man - made disasters. Chitral is highly vulnerable to multi hazards that are flood, GLOFs, earthquake, mass wasting (landslide, rock fall, mud / debris flow, slump, creep, and avalanche), desertification (erosion, water logging and salinity), and complex hazards (pollution, road accident and epidemics) etc. The frequency of Natural disaster has increase during the last 10 years. The number of local resident at high risk of natural hazards is 227,321 that is 20 UC of the district; no UC has been free disaster risk (NDMA report).

Various natural and man- made disaster was recorded in Chitral, Such as flash flood in 1973, 1984, 1997, 1998, 2004, 2005, 2010 and 2015. Which cause the loss of 100 of lives and affecting houses, agriculture production, infrastructure and livestock etc about 90% of Chitral district is at risk to flash flooding. The villages which are severely affected by flood are Garam Chasma, Ayun, Reshune,Boni Gol, Washich, Muzhgol, Sonoghur and Brep villages. A large number of population was affected directly or indirectly in 2007, 2010 and 2o15 flood. In 2007 Sonoghor, Reshune Breb villages etc were severely affected by flood and GLOF. In 2010 and 2015 due to heavy rainfall in Chitral the half of Chitral villages was severely affected by flash flood which cause public and private properties, communication network, agriculture sectors etc in Boni, Breb, Chunj, Bang, Dizg, Chapalee Kuragh, Reshun, Ayun, Danin, Jughoor and Mulkhow, Lodkoh etc. the destructive flash flood of 30th June to 19th July 1978, occurred in Chinar valley north of north of Mastuj upper Chitral and destroyed many houses and almost the whole village (Brekes, 1999).

The flash flood of 14th June 2005 in Brep village washed away 103 houses (Khan 2009). Similarly, flash flood of July 14th 2006 occurred in Gurin village, Gurin gole, Shishikho valley lower Chitral causes a lot of damages to houses and also causes damage to crop (Jan, 2006). A very disastrous heavy flood of 25th of June 2010 occurred in Uchosht village, Chitral killing of 12 people and injured 10 people (Pamir time, 2010).

The flood in Chitral of 4th August 2013 was very destructive and hit many areas of Chitral such as Rehune, Kalash, Turkhow, Drosh, Jghoorgol, resulting in many in many death and causes damages to public and private properties, crops and livestock losses (Kasif, 2014).

Chitral district was also severely affected by earthquake in 2005 and 2015 and 2017 as a result adobe houses and semi adobe houses in slope and plain areas are partially or completely destroyed by earthquake. The houses which are located in slope areas are severely affected by earthquake as compared to plain areas. Chitral district was also affected by mass wasting (landslide, mudflow, rock fall, slump, creep and avalanche).The areas which are affected by landslide are Booni, Rashun, Danin, Chevodok, Drosh and Bang etc while the areas which are affected by rock fall are Lower Chitral, Booni, and upper Chitral. some villages in lower Chitral and in upper Chitral(brep parwak, mastuj, chapali, dizg, bang, Patrangaz and uochoghon) etc are effected by mud/ debris flow and the areas which are affected by avalanche are lawari, Asorat, Shershal, Rech, Wachich, Tarich, Shandor, Bang and Boroghol. Avalanche occurs on Saturday afternoon near the village of Susom some 40 km north of the town of Chitral in KPK province. People have been found buried under snow for nearly 20 hours. Avalanche occurs on the north portal of Lawari tunnel trapping 14 person of SAMBU Company. In this area pak army, chitral scout, police and local administration were carry out join search and rescue operation, rescuing 7 out of 14 while other 7 loss(3 from Drosh ,4 from Punjab) their lives (PDMA report).

In Chitral at least 14 people were killed, including a scout, as avalanche hit different villages of the Chitral Distric on

Sunday. The death includes 6 women, 6 children, and 2 men. At least 14 people were killed an avalanche Chitral, SherShal area on Sunday. In 17 to 18 February 2017 avalanche took place in Rach valley near Boni on the night. As a result one death and 3 injured (PDMA report). In 10 April 2009 landslide destroyed 6 houses in Newazantk village of Boni on Thursday. In 4 March 2015 landslide occur in Reshun valley and blocked the river. Chitral district is also affected by desertification like water erosion and water logging. The areas which are affected by water erosion are Green lasht, Danin, Jutilasht, Junalikoch, Chunj, Chenar, Chapale, Cargin and Bang. The Juti Lasht village the river has already swept a way of football ground in several houses. Jinalikoch village know for highest yield of rice, where one- third area was washed away by river and many people were homeless. In Sarghuz village more than 60 families had migrated to safer place whenever thousand Acers land was washed away by river erosion (Dawn newspaper).

The water level in Chitral is continuously rising threating a number of villages on its bank. In Chitral river has cutting main road to Mastuj, Booni, disrtic jail, the professional development center of Aga Khan University, Denin officer colony, houses and hundred Acers of land (Dawn newspaper).

Water logging affects the villages Mastuj, chinar, ghoroo, brep, patrangaz and study area Bang. In Chitral the Parsan village is beautiful valley of Tehsil Water logging present in rizan dah Bang Payeen and Ghorgholang in Bang Bala. It affects agriculture land, irrigation system, plants communication system, livestock etc. Complex hazards like water pollution, road accident and epidemics affect Chitral district. In Chitral on Thursday 2 people were killed and one injured after a double cabin pick-up slipped into deep ravine while taking a short turn near Suri Bala, Terich. On Friday in Chitral 2 person were killed and as many inured in a road accident. According to police, a van carrying a group of ullema to attend a Tableeghi ijtima met an accident in Astaro in upper Chitral as a result Maulana Zakir Ullah a resident of Bakrabad, and Maulana Sohaib Ahmad of Torkoh on the spot (Published in Dawn, July 8, 2017).

Epidemics like malaria, typhoid, etc also affects the people in district Chitral. In Chitral a fast spreading disease has resulted in the dead of dozen of cattle in Chamar khan, Mastuj village. Cattle in the 12 villages of Chamar khan will be afflicted by the disease, at least 50 sheep and goats have been killed and 250 goats and sheep were shifted to Veterinary hospitals for treatment. Epidemics like malaria, typhoid, diarrhea etc are exists in Bang area and people mostly effected by typhoid.

1.2 study area

In this section the brief introduction of study area has been given with spatial reference to its location, in this physiography, population, climate, drainage, vegetation and soil.

1.2.1 Location of study area

The district Chitral is situated in the north of KP, covering an area of 14,850 km (19.93%). Chitral is located at the base of the towering Tirich Mir. The study area Bang is a small village of district Chitral which is situated approximately 150 km away from Chitral city.

a. Geographic location

The geographic location of study area is 36o3256 N latitude, 72o4356 E Longitudes and 36o2945 N Latitude and 72o4819 E Longitudes.

1.2.2 Physiography of study area.

Chitral district is the north most district of Pakistan. It shares a border with Gilgit Baltistan to the east, with kunar, Badakhshan and Nuristan province of Afghanistan to the north and west, and with Kpk district of swat and Dir to the south. A narrow strip of wakhan corridor separates chitral from Tajikistan in the north .The area of chitral consist of plain and mostly mountain areas and there is only one river in chitral that is called chitral river. The chitral river, from it source to the place where it enters to Afghanistan has various names; first of all during journey through the cast and long valley of Yarkhun, is called Yarkune river. At Mastuj it is joined by Laspur River and some other streams joined it on both banks and also Torkhow River on the right bank. The river continuous to be such till it reached a place called Gankorini. On its way, the Chitral River is joined by many steams and side valleys such as Jughoor gole, Ayune gole and Ashurat.

1.2.3 Topography of study area

The chitral Mastuj valley which is appropriately 320 km long is surrounded by three of highest mountains range in the world. These precipitous mountains penning out here and there leave little room for dwelling and cultivable lands. To the west bordering Afghanistan in the Hindu Kush rang, to the east Hindu Raj and in between the Sakardu Karakorum rang the district contains numerous peaks over 20,000 feet. The district contain many valleys most important and the largest of which is Chitral – Mastuj valley. Other valleys are Laspur, Mulkhow, Terich, Owir, Shishi, and Ashuret.

1.2.4 Population of study area

The population of district Chitral is 32,000 and population of study area Bang is1490 i.e 87 bang payeen and 1003 bang balla (1998 census).

1.2.5 Climate of study area

The climate of Pakistan is distinctly continental. It is hot in summer, ranging from very hot in low lands to warm in the up lands and cool in the higher elevation. Spring weather is unpredictable with frequent rainfall and snowfall. Autum has mild and pleasant temperature. The extreme maximum temperature is recorded in Drosh is 36.80oc for the month of July while in chitral it is 30oc in the same month. The summer in high altitude such as Broghil, Solaspur, Owir, Rech etc are cold and windy with extremely cold nights. In winter most of the valleys are in the grip of northerly wind and blizzards. The winter is less severs in low lands as compared to up lands. The extreme minimum temperature recorded at Drosh and chitral station -38oc for the month of January and February respectively from Chitral city. The study area Bang lies in such area in which there will 4 to 5 feet snowfall in winter. The weather of this very cold in winter season and warm in summer season, after 20 November snow fall start in this area and will cut off from other areas for 2 to 3 months due to heavy snow fall.

1.2.6 Vegetation of study area

The major crops of the study area are wheat, maize, pulses and vegetables. Some of the popular plant species found in study area are mulberry, cherry, almond, peach, persimmon, pears, walnut, fig, apricot, apple and grapes. Vegetables like lady finger, turnip, cabbage, cauliflower, potato, spinach, tomato, onion, pumpkin, and bringal etc.

1.2.7 Fauna of study area

Fauna like snow leopard, brown bear, Himalayan ibex, and brown bear are found in chitral. The domestic animals like cow, sheep, goat, hen, and wild animals like cat, dog are exist in the study area Bang.

1.2.8 Soil of study area

The land use of the land is either farming or forestry. The soil is soft, easily erodible and suitable for cultivate

1.3 Disaster in Chitral

Chitral is also known as Qashqar. Chitral district is the north most district of Pakistan. It shares a border with Gilgit Baltistan to the east, with kunar, Badakhshan and Nuristan province of Afghanistan to the north and west, and with Kpk district of swat and Dir to the south. A narrow strip of wakhan corridor separates chitral from Tajikistan in the north. Chitral district's elevation range from, 3,600 feet above the sea level in the southern Aranthu valley to 12,121 feet above the sea level in the north most area of Baroghil valley. The number of tehsil in chitral is 6. Total area of Chitral is 14,850 km (19.93%).The unique topography of Chitral making it highly vulnerable to natural and man - made disasters. Chitral is highly vulnerable to multi hazards that are flood, GLOFs, earthquake, mass wasting (landslide, rock fall, mud / debris flow, slump, creep, and avalanche), desertification (erosion, water logging and salinity) and complex hazards (pollution, road accident and epidemics) etc. The frequency of Natural disaster has increase during the last 10 years. The number of local resident at high risk of natural hazards is 227,321 that are 20 UC of the district, no UC has been free disaster risk (NDMA report).

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Figure 1.1 Village Sonoghur before flood

Figure 1.2 Village Sonoghur after flood

S. No	Areas	Affected Population
1	Kalash Valley	25,000
2	Garam chashma	80,000
3	Upper Chitral (Boni, Mastuj, Mulkhow, Torkhoow & Yarkhun.	2,00,000
4	Oweer Valley	2500
	Total affected population	3,07,500

Source: PDMA- PARRSA assessment report

Chitral district was also severely affected by earthquake in 2005 and 2015 and 2017 as a result adobe houses and semi adobe houses in slope and plain areas are partially or completely destroyed by earthquake. The houses which are located in slope areas are severely affected by earthquake as compared to plain areas. Earthquake damaged human population, houses, buildings, infrastructure, utilities and services etc. The whole Chitral is prone to earthquake but some villages are severely affected by earthquake due to their location and poor design building such as Charun Oweer, chevo dogkh, Asorat Booni, upper Chitral etc.

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Figure 1.3 Avalanche in Chitral

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In 10 April 2009 landslide destroyed 6 houses in Newazantk village of Boni on Thursday. In 4 March 2015 landslide occur in Reshun valley and blocked the river. Chitral district is also affected by desertification like water erosion and water logging. The areas which are affected by water erosion are Green lasht, Danin, Jutilasht, Junalikoch, Chunj, Chenar, Chapale, Cargin and Bang. The Juti Lasht village the river has already swept a way of football ground in several houses. Jinalikoch village know for highest yield of rice, where one- third area was washed away by river and many people were homeless. In Sarghuz village more than 60 families had migrated to safer place whenever thousand acres land was washed away by river erosion (Dawn newspaper).

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Figure 1.5 Water Erosion in Green Lasht, Chitral

Figure 1.6 Water Erosion in Lower Chitral

Figure 1.7 Water erosion in Junalikoch

Figure 1.8 Landslide in Reshune

Waterlogging effect the villages Mastuj, chinar, ghoroo, brep, patrangaz and study area Bang. In Chitral the Parsan village is beautiful valley of Tehsil Water logging present in rizan dah Bang Payeen and Ghorgholang in Bang Bala. It affects agriculture land, irrigation system, plants communication system, livestock etc.

Figure 1.9 Water logging in Bang

Complex hazards like water pollution, road accident and epidemics affect Chitral district. In Chitral on Thursday 2 people were killed and one injured after a double cabin pick-up slipped into deep ravine while taking a short turn near Suri Bala, Terich. On Friday in Chitral 2 person were killed and as many inured in a road accident. According to police, a van carrying a group of ullema to attend a Tableeghi ijtima met an accident in Astaro in upper Chitral as a result Maulana Zakir Ullah a resident of Bakrabad, and Maulana Sohaib Ahmad of Torkoh on the spot (Published in DAWN, July 8, 2017). Epidemics like malaria, typhoid, etc also affects the people in distric Chitral. In Chitral a fast spreading disease has resulted in the dead of dozen of cattle in Chamar khan, Mastuj village. Cattle in the 12 villages of Chamar khan will be afflicted by the disease, at least 50 sheep and goats have been killed and 250 goats and sheep were shifted to Veterinary hospitals for treatment. Epidemics like malaria, typhoid, diarrhea etc are exists in Bang area and people mostly effected by typhoid.

1.4 Research problem

The total population of study area Bang is 1490(487 Bang payeen and 1003 Bang bala).The topography of Bang consist of slope and plain areas which are vulnerable them to multi hazards that are flood, earthquake, mass wasting (landslide, rock fall, mudflow, slump, creep, and avalanche), desertification (water erosion, water logging) and complex disaster (accident). The slope areas are more vulnerable to earthquake, landslide, and rock fall, water erosion while plains areas are more vulnerable to flood, water erosion, waterlogging and salinity and under cutting. Adobe houses are more vulnerable to earthquake then pakaa houses.in the study area Bang four types of vulnerability that are physical, economic, social and attitudinal vulnerability are also exist but physical and economic are high as compared to other. Due to social and economic vulnerability i.e lack of awareness, exercise, drills, training, weak coordination/ relationship/ kinship, insurance, saving, less diversify economy etc. They physical vulnerability increase to multi hazard in study area Bang, Chitral, Pakistan.

1.5 Objectives of the study

1. To study the hazards profile in the study area.
2. To make inventory of the elements at risk in the study area.
3. To assess the physical, economic, social, and attitudinal vulnerability of study area.
4. To analyzed the multi hazards vulnerability in the study area.

1.6 Limitations of the study

For the purpose of study it is important to have a resources and financial matters related to study. But due to lack of all these things following limitation have been encountered by the study.

i. Lack of vehicle to surveyed Bang area the main road is for away and cannot reach in some areas therefore researcher face problem during transect walk and approximately take more one hour to reach the area.

ii. People were reluctant to share the status of social economic condition.

iii. Most of the study limitation was accessibility to secondary data.

iv. The photography of some hazard like earthquake, flood, avalanche etc is not possible by researcher because in case of earthquake and flood people reconstructed their houses and in case of avalanche the snow was melted.

I.7 Organization of the study

The frame work of the study consist five chapters. Chapter 1 comprises background of the study, study area their relative location, physiography, topography, climate, vegetation and soil, disaster in chitral, research problem, objectives, frame work and limitation of the study.

Chapter 2 is literature review which deal with relative multi hazards studies already published on global, national, provincial, district and local level from various sources and also discuss vulnerability to hazards and type of vulnerability.

Chapter 3 deals with the various tools, method and technique used for the data collection and then what are the tools of the study which would help in collecting the information. This chapter deal about justification of the study, purpose, data collection, data analyze and universe of the study.

Chapter 4 data analysis discuss about interpretation of data collected through field observation, FGD's and interview. The collected data were in the form of text, table, pictures and maps. The chapter includes the following topics that are introduction, hazard profile, element at risk, physical, social, economic and attitudinal vulnerability and multi hazard vulnerabilities.

Chapter 5 is conclusion, findings, suggestion that attempted to take out findings of the study beside that researcher present the conclusion and also the recommendation for by the future improvement of disaster management.

CHAPTER-2

LITERATURE REVIEW

Introduction

Literature review plays an important role in finding remedy and solution of the particular problem. This is ta body of text that's, aim to review the critical point of current knowledge including substantive finding as well as theoretical and methodological contribution to a particular topic. Literature review are secondary source and do not report any new or original experimental work. Also a literature review can be intercepted as a review of an abstract accomplishment most after associated with academic - oriented literature review and usually precedes a research proposal and result section. Its main goal is to situate the current study with in the body of literature and to provide context of the particular reader, from (Wikipedia, the free encyclopedia)

This chapter has been divided into six parts that define the definition, types of hazards and also their occurrence in global level, national level, province, district, local level and also vulnerability to hazards and the types of vulnerability.

2.1 Flood

i. "Food may be relatively highly water discharge above a selected flood level" (Paul 1984)

ii. "Flood is high flow of water, which inundates the natural channel, provided by natural flow of water" (Foster1983)

iii. "Flood is any high stream flow which over trooped the natural or artificial bank of river" (Hassan 1995)

iv. "Flood is the overflow of water" (Ward 1978)

v. "Flood is a body of water which rises to overflow the land which is not normally submerged" (White1945 and Alexander 1993).

vi. Flood is extreme event or action of nature, in which the flow of water cannot be contained within the bank of rivers or retention areas. As a result it over flows into the human settlements, infrastructure facilities and economic activities.

2.1.1 Types of Flood

There are three types of flood that are river flood, flash flood, and coastal flood.

2.1.2 River Floods

River floods are usually caused by heavy rainfall over large catchment areas or by melting of the winter's accumulation of snow. River flood associated with river and experienced by flood plains.

2.1.3 Flash Flood

Flash flood is the event with little time occurring between the start of the flood and peak of discharge. These floods normally occur with six hours of the beginning of heavy rainfall and are usually associated with intensive localized shower and severe thunderstorms. These are the extreme; though short- lived, form of inundation.

2.1.4 Coastal Flood

Coastal floods occur in the coastal region and are caused by hurricanes and other severe storms of tsunami.

Worldwide several floods are experience in different countries of world. In 1929 archaeologists found signs of huge flood around the Euphrates River in Iraq dating about 3,200 B.C Historians believe that the story of Noah's Ark was first told in Iraq. The Yellow river in China has flooded more than 1,500 times in the past 3,500 years. In 1887 one million people were drowned. The river is often called China, s sorrow (Lockyer, 1996). Destructive floods that occurred in India were 1916, 1938, 1948, 1956, 1978 and 1982.Among all the flood of 1978 not only crossed all previous records, but caused enormous damage to life and property (Pathak, 1991).

Floods are very important hazard in Pakistan. These flood cause damage to the crops, houses infrastructure, livestock, communication system, irrigation networks and human lives are lost. Serious flood in Pakistan occurred in 1955, 1973, 1974, 1976, 1977, 1978, 1992, 1996, 2010 and 2014(Hassan and Shah, Khan, 1991). In 1955, according to some sources floods inundates 2420 villages leveling 1321 of them.400 people and 70,000 cattle lost their lives. The estimate of crop destroyed was 101911 hectares. The Total estimated damage cause by the flood amounted to R.s 83 million. In 1973 flood inundated approximately 3.6 million hectares of crops and destroyed about 10,000, villages. They flood killed 1600 persons and demolish 3 million dwelling unit. In 1973 to 1978 fives serious floods occurs .These floods have victimized approximately 12.7

million persons and killed 1516 person. Total damage cost about $15 million. In 1992 from the month of August Pakistan was affected by natural disasters. 1500 people died as a result of 1992 flood. About 8.5 million people were victims of flood and 1.2 million houses were destroyed and 24 million hectares of agricultural land was devastated. In 2010 a catastrophic flood occur in Pakistan 2010 flood was effecting the entire length of Pakistan with maximum damage in provinces of KP, Punjab, and Sindh as a result of 2010 flood 1984 persons were deaths, and2946 people were injured. Total districts affected by flood are 780/141 and 1744471 houses and 12693 schools were affected by 2010 floods. In 2014 severe floods occurs in Pakistan. The flood killed 367 people and effects more than 2.5 million people, and 129,880 houses were damaged. Over 1 million acre of crop land, 250,000 farmers was affected.

In KP flood are experienced in year 1992, 2010, and 2014 which causes serious damages and loss lives. District of chitral is badly affected by a number flood during, 2006, 2007 and 2010 half of the village of sonoghur in sub tehsil mastuj. Beside these Oyun, Loatkoh, Drosh, Madak lasht, Bonii, Rashune, Koragh, Sonoghur, Torkhov,Mux gol Mulkhow, Mastuj, Chenar, Chunj Breb, Dizg, Chapalee, Ochoghon, Paweer, Patrangaz. Flood 2010 in Booni gool area was inundating about 13 villages. In Booni the areas near to Booni gool are seriously affected from flesh flood in 2007, 2010 and 2015.

The study area bang affected in 2006, 2007 and 2010 flood. Flood in Bang Gool occurs due to melting of many small glaciers. The flood like flesh flood affected the areas of Bang which are located near Bang Gool. The flooding mostly occurs from June to August. Flood occurs every year in Bang Gool but flesh flood experienced in 2010 and 2015. The areas which are located near Bang Gol and Bang River are seriously effect by flooding. Due to water flooding in Bang Gool, effect private and public sector building, property, livestock, agriculture areas, communication, irrigation channel and water also polluted in case study area Bang, Chitral.

Sources: Field data, 2018 Figure 2.1 Coastal flood

2.2 Earthquake

i. "An earthquake is a vibration or oscillation of the surface of the earth caused by a transient disturbance of the elastic or gravitational equilibrium of rock at or beneath the surface" (J.c. Macelwane)

ii. "A shaking or trembling of the earth that is tectonic or volcanic in origin" (Merriam Webster)

iii. A shaking or trembling of the crust of earth, caused by underground volcanic forces or by breaking and shifting of rock beneath the surface.

iv. Earthquake is a sudden motion or vibration in the earth, caused by the abrupt release of energy built up within the earth over long period of time as a result of tectonic forces (Wall, 2006)

v. An earthquake is a vibration of earth produced by rapid release of energy (UNISDR).

An earthquake is sudden, sometime violent movement of the earth surface from the release of energy in the earth curst. Earthquake cause damage property, loss lives, destruct environment all over the world.

Some of the world deadliest earthquakes are the following. In Shensi, China, on January 23, 1556, 8 magnitude of earthquake was recorded. The total dead tolls were 830,000.In Tangshan, China, on July 27, 1976, 7.5 magnitude of earthquake was recorded. The official deaths were 225,000 and estimated deaths were high as 655,000. In Sumatra, Indonesia, on December 26, 2004, 9.1 magnitude of earthquake was recorded. The total deaths were 2, 27,898. In Haiti, on Jan 12, 2010, 7.5 magnitude of earthquake was recorded and the total death toll according to official estimate was 222,570. In Damghan, Iran, 22 December, 856 earthquake was recorded and about 200,000 people were deaths. In Haiyuan, Ningxia, China, on Dec.16, 1920, 7.8 magnitudes was recorded and the death toll was 200,000.

Earthquake activities are very active in Pakistan because it is geologically located on Eurasian and Indian plate. KP and Baluchistan are geologically located on Eurasian plate and Sindh and Punjab are located in the northern and western corner of Indian plate. AJK and northern areas are located in the edges of Indian plate and Iranian plate. Due to collision of the two plates violent earthquakes occur in these areas, so northern and AJK are highly prone to earthquake as compared to other areas of the country. The following are the major earthquake occurs in Pakistan. In Debal city in 893earthquake was recorded, which was completely destroyed the Debal city. In Quetta in 1935, 7.2 magnitude of earthquake was occur, which was completely destroyed Quetta city and the death toll were more than 30,000. In 1945 earthquake was recorded in Makran, Balochistan, which causes wide spread damages in Makran, Balochistan. 1973 earthquake occurs in Besham and 5000 people loss their life. Its magnitude was 5. 6 on rector scale. In 1991 earthquake occur in the northern parts of NWFP with 6.8 magnitudes. In 2005 earthquakes occur in Pakistan and more effected KP, and AJK. Total death toll as a result of earthquake was 73,000. The total houses losses in KP are 36% and in AJK are 84% and the total damages are $5.2 billion. In 29 October, 2008, 6.4 magnitude of earthquake was recorded in Baluchistan. As results of earthquake 300 people were death and 108, 00 were affected and 3000 were destroyed. In September 24, 2013, 7.7 magnitude of earthquake was occurs. The total toll was 386 and injured were 816. The houses which are completely damaged are 32638 and fully damaged are 14118.

In Oct 2015 earthquake was recorded in KP and Fata as a result of earthquake dead toll is low as compared to 2005 but damages are very high. In KP earthquake occur in1991, 2005, 2014 and 2015. In Chitral major earthquake was recorded in 1991, 2005, 2014, and 2015, and severs effect half villages / areas like Charun Oveer, Booni, Mastuj, and lower chitral area. In October 26 earthquake a village Charun Owir was razed to the ground. Out of 135 houses in the village, 120 have been flattened by earthquake. In village Warijun some of 30 houses of the 170 in Warijun Bala have been destroyed and 11 of the 110 houses in Wariijun Payen leveled and also effect case study area bang, chitral. Earthquake affected the kaacha houses of study area as compared to pakaa houses. The houses which are located in slope area are completely damage as compared to plain area which is partially damage by earthquake. The study area Bang is more effected in earthquake 2005 and2015.

Sources: field data, 2018 Figure 2.2 Earthquake

2.3 Mass wasting

"Mass movement is the detachment and down slope transport soil and rock material under the influence of gravity. The sliding or flowing of this material is due to their position and gravitational forces, but mass wasting is accelerated by the presence of water, ice and air. The definition of mass movement permits consideration of the movement of earth materials at all scales and all rates" (R.j.Charley,et al,1985)

2.3.1 LANDSLIDES

i. "Landslide is usually rapid downward movement of a mass of rocks, earth, or artificial fill on a slope" (Merriam Webster).

ii. A large mass of rocks and earth that suddenly and quickly moves down the side of a mountain or hill. Landslide is the mass wasting events where large amounts of weathered rock slope hill slope or mountain side primarily by gravity related erosion. Landslides occur very quickly and move with incredible speed and destruction often removing or covering everything in their path.

Worldwide various landslides occurs that cause destruction of property, loss of lives, negative impact on environment and damage infrastructure etc. Several landslide occur worldwide and formed many dammed lakes in last 50 years. For instance, the event of Aini (Tajakistan, 1964, Mayunmarca (Peru, 1974), Valpol (Italy, 1987), Tsatichu (Bhutan, 2003), Hattain Bala (Pakistan, 2005), Tangjiashan (China, 2008) and Attabad(Pakistan, 2010).

The most slide-affected areas in Pakistan lie in the Himalayas regions. The historical landslides events in Pakistan are experience in 1841, 1858, 1962, 1974, 2005 and 2010. In January 1841 an earthquake triggered giant landslide dammed the Indus River and form a lake with a maximum depth of about 150m and a length of approximately 30km. Dam failure by overtopping occurred in June 1841. A Sikh army that had camped upstream of attack was hit but the wave with at least 500 dead. In 1858, another massive slope failure (Ghammessar landslide, 125 million meter cube).The landslide blocks Hunza River and impounded a lake. In October 1962 a mass movement was release from the scarp of the Ghammessar landslide, killing 6 mans of public workers. On October, 8, 2005, a magnitude 7.6 earthquake struck Pakistan as a result several mass movement were triggered. As a result of earthquake Haitian Bale landslide was occurring, consisting of sand, silt, and mudstones of the Muree formation, it destroyed a small village and several farms. On January 4, 2010 a 45 million meter cub rock slide occurred on the right sides of the Hunza gorge at the village of Attabad. As a consequence of the Atta bad event, a huge debris deposit in the valley blocked the Hunza River. As a result 25,000 people living upstream of the dam suffered from lack of economic activity and items of daily sustenance.

In district Chitral landslide occur in the areas of Rashun, Greenlasht, Parwak, Booni and study area Bang etc. In 4 March 2015 landslide occur in Reshun valley and blocked the river.

Landslide is also experience in Bang, Chitral. In Bang landslide is present in slope areas and the area near the bank of river. Landslide occurs in winter season at the beginning of summer season and in rainy season. Due to glacier melting in winter at the beginning of summer and rainfall in rainy season the soil particles become loss, due to which the soil become unstable. In this year in 2018 the people of Bang experience landslides in mountain of Ishpaar. Landslides effected trees, people, agriculture land, houses, livestock, communication, irrigation system, water channel etc and the number of houses which are effect by landslides are more than 20 in Bang.

Sources: field data, 2018 Figure 2.3 Landslide

2.3.2 Mud/Debris Flow

Mud and Debris flows are mass wasting events that form when heavy rain fall produce large amount of runoff that transport eroded soil, sediments, plant debris down slope where the flows eventually spreads out across valley bottom. The debris and mudflow consist of thick, muddy sludge carrying rocks, twigs, branches, trees, and other available debris Mud flows are most likely to occur in a place where soil is not protected by vegetation cover. For this reason mudflow are likely to occur in arid region.

Mud flow is likely to occur in arid region. The largest volcanic mud flow was the Osceola mud flow, which 5000 years ago. The result of volcanic eruption, it consisted of debris flow of around 3km cube that hurtled down the mountain at around a KP.

- In 1999 Vargas Tragdy: In December, 1999, in the highland of Veneznela, excessive rainfall resulted in deadly mudslide which ravaged the country up to 30,000 people are estimated to have lost their lives and 10% of state people.
- 2013India monsoon: In 2013 terrible flood in northern Indian state of Uttavakand caused mudslides and dead 6,000 people.
- 1985Armero Tragedy: The mudslide was brought on by the eruption of Nevado Del Riz stratrolcano in tolima, Colombia, 20,000 of the town of Armories 29,000 inhabitants are estimated to have killed in the slides.

Mud/debris flow also present in Pakistan and also effect Chitral distric in Kp. The areas which are prone to mud/debris flow in Chitral are lotkuh, mulkhow, chapalee, torkhow and study area bang etc. The people of Bang experience mud/debris flow in rainy season. There is a mud flow in area of Ishpaar, Dronelee gool, Nawahch gool, Zeeyarat gool, and Berzoz goal. When heavy rainfall occur they soil particles loss in mountain and carries soil Particles, rocks, plant branches, twigs etc with them. And effect the plant, animals, houses, bridges, water channel, Soil, communication etc.

2.3.3 Rock Fall

Rock fall is defined as when a rock of bed rocks breaks off and falls freely or bounces down a cliff. Rock fall is common in mountain areas. Rock fall is also called rolling stone in which the rock detached from a bed rocks and move downwards under the influence of gravity.

In world level rock fall occurred in various countries. Rock fall was recorded in Mason City. The Yosemite rock fall at 6:52 pm PDT Wednesday, July, 10, 1996 a large block of granite, with an estimated volume of 78,000 cubic yards, detached from the cliff between was burn points and grades point, in Yosemite Valley. Yosemite National park, California, 1857, 15 people death and at least 85 people injured. Since in the park first documented rock fall in 1857 damaged road, trails and other facilities.

The Chitral District in KP is affected by rock fall, the road, river, streams, irrigation channel etc are block by the rock fall of mountain, which block water bodies and cause flood, erosion and undercutting etc. People of Bang experience rain fall in rainy season and snow fall, about more than 50 household are affected in Bang Bala and approximately more than 20 house hold are effected in Bang Payeen.it also effect plants, animals, irrigation channel, communication system, agriculture land and other infrastructure.

Sources: Field data, 2018 Figure 2.4 Rock Fall

2.3.4 Slump

Slump is very common form of mass wasting. Where the rock or soil collapses, breaks off from the hill slope, rotate slightly and slump down hills.

"According to Wikipedia slump is a type of mass wasting event that occur when loosely consolidated materials or rock layers move a short distance down a slope" (Wikipedia)

In Bang slump is experience in river bank and slope areas .The settlement near the bank of river and slope are affected by slump. It effect road, building, bridges, infrastructure, irrigation, agriculture land, communication system and people lives etc.

Source: Google images, 2018

Source: Google images, 2018

Figure 2.5 Slump in Chitral

2.3.5 Creep

Creep is slowest mass wasting process and involve a very gradual down hills movement of soil, bed rock and weathered rock fragment, usually the entire slope slowly creeping down hills as a complete unit. In creep shear stress is greater than shear strength. Two factors that contribute significantly to creep are water in the soil and daily cycle of freezing and thawing. Creep is evident by bend or extended tree trunks that are adjusting to the slow movement of soil, regolith and weathered material they are rooted into.

Creep is experience in Bang especially in those areas where soil is weak, sandy and unstable. It affected plants, soil, and communication system etc.

Source: Google images, 2018

Source: Google images, 2018

Figure 2.6 Slump in Chitral

2.3.6 Avalanche

Avalanche is defined as the rapid down slope movements of snow. It occurs when a buildup of a snow is related down a slope, and one of the major dangers faced in the mountains. A large avalanche can run for many miles at speed of up to 250 miles per hour and causes a great damage to forest, buildings and anything else in its path. Following are the two types of avalanche.

- Debris avalanche
- Snow avalanche

Debris Avalanche

A flow involving a wide variety of material, such as soil, and rocks, and trees, all flowing together down slope is called debris avalanche.

Snow Avalanche

Snow avalanche is the down slope movement or flowing of snow under the influence of gravity. Avalanche occurs worldwide a cause serious destruction. The worst natural disaster in the history of Peru occurred on 31 May, 1970 and is know is the Ancash earthquake. The earthquake triggered an avalanche that alone claimed the lives of almost 20,000 people and record deadliest avalanche in history. Tryrolean Alps, 13 Dec 1916 an avalanche was occurred and caused 10,000 deaths. Plurs, Switzer land, 4 Sep, 1618 an avalanche caused 2,427 causalities. The entire town of Plurs Switzer land was wiped off the face of the earth when massive avalanche known as Rodi avalanche, buried the town. Lahual valley, India, early March 1979 occurred and caused 200 causalities. A series of snow storms over a five day periods result in avalanche.

In Pakistan serious avalanches are also recorded which caused serious causalities that are following. On 7 April, 2012 an avalanche hit a Pakistani military base in Gayari sector, near Siachen Glacier region, trapping 140 soldiers and civilian contractor under deep snow. An early 9 April, a deadly avalanche engulfed Pakistan army head quarter near Siachen glacier. Some 130 people have been buried due to the incident. In 2010 an avalanche killed some 24pakistani troops in 2010 while just few months back, an avalanche 13 Indian troops. They 2010 kohistan avalanche occurred in the Kohistan, District, KP, Pakistan on Feb 17, 2010 striking the village of Bagaro Serii and killing up to 102 people and up to 45 are missing.

In chitral also serious avalanche was recorded. Avalanche occurs on the north portal of Lawari tunnel trapping 14 person of SAMBU Company. In this area pak army, chitral scout , police and local administration were carry out join search and rescue operation, rescuing 7 out of 14 while other 7 loss(3 from Drosh ,4 from Punjab) their lives (PDMA report) In Chitral at least 14 people were killed, including a scout, as avalanche hit different villages of the Chitral district on Sunday. The death includes 6 women, 6 children, and 2 men. At least 14 people were killed an avalanche Chitral, SherShal area on Sunday. In 17 and 18 February 2017 avalanche took place in Rach valley near Booni on the night. As a result one death and 3 injured (PDMA report).

Avalanche occurs in Bang Gool and Ishpaeer and sometime it is snow avalanche and other it is debris avalanche. It affects plants, agriculture land, irrigation channel, communication system and animals etc.

Source: Google images, 2018 Figure 2.7Avalanche in chitral

2.4 Desertification

2.4.1 Erosion

Erosion is the physical removal and transportation of weathered material by water, wind, ice, or gravity.

They process of eroding or being eroded by wind, water or other natural agents. (Oxford Dictionary)

The following are the types of erosion.

i. Water erosion (fluvial): Water erodes rocks and shapes the land scape by removing and transported weathered materials on their source to another location where they are deposited and either stored or transported to location. Fluvial erosion is classified into three distinct categories that are rain splash erosion, Sheet erosion and rill/ gully erosion.

ii. Wind erosion (Aeolian): Wind erodes weathered rocks by picking them up and temporarily transported from there source to another location where they are deposited and either store or remobilized and transported to another location.

iii. Ice erosion (per glacial and glacial): Ice erosion occurs in combination with peri glacial and glacial erosion.

iv. Gravity erosion: Gravity facilitates the down slopes transportation of loss weathered materials and enable them to move with the aid of water, wind or ice.

The case study area Bang, Chitral is affected by water erosion. Erosion like water erosion occurs in Bang and affected those areas which are located near water bodies like river, stream and irrigation channels etc.

Sources: Field data, 2018 Figure 2.8 Erosion

2.4.2 Water Logging and Salinity

The rising of water table on earth surface is called water logging. The word salinity is derived from saline/salt. The excess of salt present on earth surface is called salinity.

Water logging is a serious problem in the world wide. In Bangladesh each year when monsoon set in, water logging in many areas of Sylhet city and its suburbs was a common scenario for dwellers that caused immense sufferings to them. Busy city roads used to go under water even after light to moderate rain fall due to the lack of proper drainage system. Heavy rain fall some time caused the kitchen markets inundate. Life in Sylhet city was unbearable due to water logging problem.

Source: Google images, 2018 Figure 2.9 Water logging in Chitral

In Kp, Chitral, district is effected by water logging and water logged areas are mastuj, chinar, ghoroo, brep, patrangaz and study area Bang. In Chitral mastuj, chinar, bang and patrangaz are vulnerable to water logging.

In Bang Payeen water logging is present in rizan dah and Ghorgholang in Bang Bala. It affects agriculture land, irrigation system, plants, Communication system, livestock etc.

Source: Field Data, 2018 Figure 2.10 Water logging in Bang

2.5 Complex Hazards

2.5.1 Accidents

i. An unforeseen and unplanned event or circumstance there meeting was an accident.

ii. "An unfortunate event resulting specially from carelessness or ignorance" (Merriam Webster).

iii. "An accident also known as unintentional injury, is an undesirable, incidental an un planned event that could have been prevented had circumstance leading up to the accident being recognized, an acted upon, prior to its occurrence" (Wikipedia).

iv. A road accident is refer to an accident involving at least one road vehicle, occurring on a road open to public circulation and in which at least one person kill or injured.

Road Accident

Source: Google images, 2018 Figure 2.11 Road accident in Chitral

Road accident is defined as an accident between two or more vehicle and object. In KP (upper Dir) at least 14 passengers were killed and 7 injured as a coach they were in fell in deep ravine Lawari top. In Chitral June 24, 2013 one person was killed and 10 others sustained injuries in a road accident near Lawari tunnel. The source said a passenger van skidded of the road and fell into a stream near Ziarat village. In Chitral on Thursday 2 people were killed and one injured after a double cabin pick-up slipped into deep ravine while taking a short turn near Suri Bala, Terich. On Friday in Chitral 2 person were killed and as many inured in a road accident. According to police, a van carrying a group of ullema to attend a Tableeghi ijtima met an accident in Astaro in upper Chitral as a result Maulana Zakir Ullah a resident of Bakrabad, and Maulana Sohaib Ahmad of Torkoh on the spot (published in DAWN, July 8, 2017).

Road accident is very common in case study area Bang, Chitral because the road condition in the study area is not good. Accident like road accident occurs in Bang specially the roads which pass through Rizan Dah Bang Payeen. In road accident still no people are dead but injured.

2.5.2 Pollution

Pollution is the introduction of contaminates into natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light.

The presence of matter(gas, liquid and solid) or energy (heat, noise, radiation) whose nature, location or quantity directly or indirectly alters characteristics or processes of any part of environment , and can damage to the condition, health, safety, or welfare of animals, human, plants or property(Business Dictionary).

Water Pollution

Water pollution is a type of pollution. They contamination of fresh water by pollutants that is human and animal wastes,

agriculture pesticides and fertilizer, industrial toxic wastes etc each present particular to the environmental, ecosystem and human (Oxford Dictionary).

The whole world is affected by water, air, land, noise pollution. Pakistan is also victim of air, water, land, and noise pollution. Water pollution is one of the major threats to public health in Pakistan. Drinking water is poorly managed and monitor and drinking water sources, both surface and ground water are contaminated with California, toxic metals and pesticides throughout the country. Air pollution: Throughout the world 2 million people die pre maturely from the effect of polluted air every year. Air pollution is the serious problem is serious problem for all. Noise pollution the mega cities of Pakistan, such as, Karachi, Rawalpindi, Lahore, Peshawar etc face the issue of noise pollution.

Plastic Pollution: it not causes land pollution and destroyed animal and plant but also cause water, air pollution. The major portion of garbage contains plastic, when this garbage is burn it polluted land and air. In case study area Bang, pollution like water pollution exist up to some extent study area Bang, up to some extent water erosion is present and cause epidemic during flooding.

2.5.3 Epidemic

Epidemics is the rapid spread of infections, diseases to a large number of people in a given population within a short period of time usually two week or less. In one community, one time, and one disease spread from one person to another at particular place, particular time spread one disease in whole community. Epidemics when interact with vulnerable community it cause disaster. The deathliest epidemics throughout history are following.

- The third Cholera Pandemic (1852-1860) cholera is the bacterial infection that mainly contracted through food and water. A recent Cholera outbreak known in Haiti made headlines last year, but the largest Cholera outbreak known to mankind is the third Cholera outbreak and killing 23,000 people in Britain only.
- Asian flu Pandemic: The Asian Flu pandemic was outbreak of avian influenza that originates in China and spread worldwide. The estimated death rate was one to two million.
- Typhus Fever in world war: This disease is spread by lice. In the war conditions, there was poor sanitation that probably led to density of lice, which meant that the Typhus was more prevalent. During WW1 3 million deaths in Russia alone HIV/AIDs (1960 Present). The first cases of acquired HIV/Aids were reported in 1918 as a result 65 million infections and 25 million deaths.

In Pakistan various disease outbreak such as, malaria, dengue, etc Chikungunya, another arboviral disease, is spreading in Karachi, Pakistan. The causel agent of the disease, Chikungunya virus, is transmitted through the bites of infected Aedes mosquitoes. Chikungunya virus was found circulating in rodents Pakistan as early 1983. Dengue fever is an important infectious disease in Pakistan with increasing frequent epidemics. In Pakistan, in summer of 2011, more than 300 people died of Dengue fever. The prevalence of the disease was over 14,000. The outbreak mostly occurred in Lahore area Punjab Pakistan. In 2017 Dengue outbreak was also recorded in Peshawar.

The Chitral, district in KP, was also affected by epidemics and case study area Bang is also victim of epidemics like malaria, diarrhea and typhoid. In Chitral a fast spreading disease has resulted in the dead of dozen of cattle in Chamar khan, Mastuj village. Cattle in the 12 villages of Chamar khan will be afflicted by the disease, at least 50 sheep and goats have been killed and 250 goats and sheep were shifted to Veterinary hospitals for treatment. Epidemics like malaria, typhoid, diarrhea etc are exists in Bang area and people mostly effected by typhoid.

Hazards

A hazard is a process phenomenon or human activity that may cause loss of life, injury other health impact, property damage, social and economic disruption or environmental degradation. Hazard may be natural, anthropogenic or socio natural in origin (UNISDR, 2016).

Risk

The probability of something happening negative in future is called risk.

Risk=Probability × Loss

Disasters

i. A serious disruption of the functioning of community or society involving widespread human, material, economic or environmental losses and impacts, which exceed the ability of the effected community or society to cope uses its own resources (UNISDR).

ii. Disaster is a catastrophic situation in which day to day patterns of life are suddenly disrupted and a result people need protection, food, clothing, shelter, medical and social care and other necessities of life (IFRC).

iii. For a disaster to be entered into the EM-DAT database, at least one of the following criteria must be met (CRED).

- 10 or more people are reported killed.
- 100 people are reported affected.
- A state of emergency is declared.
- A call for international assistance is issued.

iv. A disaster is an event which fulfills one of the following conditions (NHRG).

- At least 100 persons dead.
- At least 100 persons are injured.
- At least $ 10, 00, 000 damages.

2.6 Vulnerability to Hazards

i. The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or system to the impacts of hazards (UNISDR).

ii. The characteristics and circumstance of a community, system or a set that make it susceptible to the damaging effects of hazards is called vulnerability.

iii. A factor or constraints of physical, social, economic or geographic nature which reduce the ability of a community to prepare for and cope with the impact of hazards.

iv. The inability of a community to deal/cope with disaster structure is called vulnerability.

v. The degree of susceptibility of a community against potential events is called vulnerability.

vi. Vulnerability in this context can be define as the diminished capacity of individual or group to anticipate, cope with, resist and recover from the impact of a natural or man- made hazards. Vulnerability is most often with poverty, but it can also arise when people are isolated, insecure and defenseless in the phase of risk, shock or stress. Vulnerability may also vary in its form poverty, i.e. may mean that housing is unable to with stand to an earthquake or a hurricane, or lack of preparedness may result in a slower response to a disaster, leading to greater loss of life or prolonged suffering. The reverse side of the coin is capacity, which can be describe as the resources available to individual, households and communities it cope with a threat or to resist the impact of hazard. Such resources can be physical or material, but they can also be found in the way a community organized or in the skills or a tributes individuals and/or organization in the community (IFRC, 2016).

Example of vulnerability

i. Poor design and construction of building.

ii. Inadequate protection of assets.

iii. Lack of public information and awareness.

iv. Limited official's recognition of risks and preparedness measures.

v. Disregard for wise environmental management.

2.6.1 Physical Vulnerability

The physical vulnerability of an area also depend on it a geographic proximity to the sources and origin of disaster i.e if an area lies near the coastal lines, fault lines, river bank, unstable hills etc and it make the area more vulnerable to disaster such as tsunami, earthquake, flood and mass wasting. Physical vulnerability includes the difficulty in access to water resources, means of communication, hospitals, police stations, roads, bridges and exits of a building or/ an area, in case of disasters. Furthermore, the lack of proper planning and implementation in construction of residential and commercial buildings results in buildings that is weaker and vulnerable in earthquake, floods, landslides, and other hazards.

2.6.2 Economic Vulnerability

Economic vulnerability of a community can be assessed by determining how varied its sources of income are, the ease of access and control over means of production (farmland, livestock, irrigation, capital etc), adequacy of economic fall back mechanisms and the availability natural resource in the area.

26.3 Social Vulnerability

A Social vulnerable community has weak family structures, lack of leadership for decision making and conflict resolution, unequal participation in decision making, weak or no community organization, and the one in which people are discriminated on racial, ethnic, linguistic or religious basis, other social factors such as culture, tradition, religion, local norms and values, economic standard an a political accountability also play a vital role in determining the social vulnerability. Social vulnerability to natural phenomena is greatest among the poorest people in developing countries owing to lack of

information and resources with which to take the appropriate measures. To reduce social vulnerability, all of above factors must be addressed but this requires knowledge and understanding of local conditions, which can-in most cases- only be provided by local actors.

2.6.3 Attitudinal Vulnerability

Communities which has negative attitude towards change and lacks initiative in life resultantly become more and more dependent on external support. They cannot act independently. Their source of livelihood does not have variety, lacks entrepreneurship and do not possess the concept of collectivism. This brings about dis unity and individualism in the society. Thus, the become victims of conflicts, hopelessness and pessimism which reduce their coping capacity of coping disaster.

CHAPTER-3

RESEARCH METHODOLOGY

3.1 Introduction

The chapter research methodology describes justification of study, purpose of study, data collection that are primary and secondary data collection, data analysis, and also universe of the study. The purpose of the study is to identify multi hazards, types of vulnerability of multi hazards and people, element at risk, data(primary and secondary data) are collected through field observation, FDG's, interview and transect walk, research report, books, internet, Google earth and relevant organization.

3.2 Justification of Study

There was no study has been conducted on multi hazard vulnerability assessment in the study area Bang, Chitral. The study focus to identify multi hazards vulnerabilities, impacts, damages, element at risk and also the physical, social, economic and attitudinal vulnerability of the local people. The study will be significance endeavor in promoting awareness regarding hazards and vulnerability that is through this study the local people, organizations know the hazards and vulnerabilities that are present in the area. The study may also serve as a useful reference, tool for future research/ studies. Over all it helps to boost up the growth of disaster management researches.

3.3 Purpose of the Study

The purpose of the study is to identify multi hazards that are earthquake, mass wasting, flood, desertification, and complex disaster there vulnerabilities, impact, damages, element at risk in the area and also physical, social, economic and attitudinal vulnerabilities of local people and also to reduce risk, hazard, and disaster in study area Bang, Chitral.

3.4 Data Collection

To achieve the objectives of the study, primary and secondary data would be used.

1. Primary data

Primary data was collected from the study area by field observation, transect walk, FGD's and interview.

a. Field observation

Through field observation we find out, multi hazards that are earthquake, mass wasting, flood, desertification, and complex disaster, there vulnerabilities, impact, damages, element at risk in the area and also physical, social, economic and attitudinal vulnerabilities of local people in study area Bang. During field observation we observe the status of streams, mountains, irrigation channels, drainage system, agriculture areas, environmental resources (air, water, plants and soil) and vegetation in the study area Bang.

b. Transect walk

Through transect walk we identify multi hazards that are earthquake, mass wasting, flood, desertification, and complex disaster, there vulnerabilities, impact, damages, element at risk in the area and also physical, social, economic and attitudinal vulnerabilities of local people in study. Through transect walk we also identify natural resource, topography, indigenous technology, soil, vegetation, farming practices, problems and opportunities and also taking picture of the area for making research more meaning full. During transect walk, we walk with notable people in the community who give us accurate information about the area.

c. FGD's

During focus group discussion we discuss the member of community about multi hazards vulnerability, impacts, damages, element at risk in the area and also physical, social, economic and attitudinal vulnerability of people. We visit 40 houses for FGD's which consist of 8-10 members in each household. We discuss with this member about their multi hazards vulnerability, impact and damages etc. The people share their knowledge and information with us. FGD's consists of child, women, old age, disable and other within the community.

d. interview

We take interview with the head of family and notable people in the community. We asked predetermine question to the people. The people give us answer of the question which we asked. During interview we asked the following questions with interviewee for instance the hazards profile of study area, multi hazards their causes, impact, damages, element at risk, and multi hazards vulnerabilities, physical, social, economic and attitudinal vulnerabilities of people. We take interview from the

head of family, women, disable and notable person in a community.

2. Secondary data

The secondary data has been collected from following sources.

- Internet
- Research report
- Books
- Library books
- Google
- Google earth
- Relevant organization i.e Focus humanitarian assistance, AKRSP, UC office, Religious council, police station, hospitals etc.

Tools for data collection

We used different tools for data collection during for data collection during field observation, transect walk, FGD's, and interview. The tools which are use are pen, pencil, charts, notebook, clipboard, and camera etc.

3.5 Data Analysis

The data is collected to primary and secondary sources about hazards profile, element at risk, different vulnerabilities of people, and physical, social, economic and attitudinal vulnerability of each hazard.

Hazard profile

The hazard profile describe multi hazards that are flood, earthquake, mass wasting, desertification, and complex hazards their occurrence, location damages and impacts in the area.

Element at risk

The element at risk describe the elements that are human population, houses, irrigation channels, utilities and services, commercial manufacturing natural resources which are vulnerable to multi hazards.

Physical vulnerability

The physical vulnerability describe the element that are human population, houses, irrigation channels, utilities and services, commercial manufacturing natural resources are physically vulnerable to multi hazards in the study area Bang.

Social vulnerability

Social vulnerability describes the elements that are human population, houses, irrigation channels, utilities and services, commercial manufacturing natural resources which are socially vulnerable to multi hazards.

Economic vulnerability

Economic vulnerability describes the elements that are human population, houses, irrigation channels, utilities and services, commercial manufacturing natural resources which are economically vulnerable to multi hazards.

Attitudinal vulnerability

Attitudinal vulnerability describes the elements that are human population, houses, irrigation channels, utilities and services, commercial manufacturing natural resources which are attitudinally vulnerable to multi hazards.

Tables

The data is collected through field observation, transect walk, FGD's and interview. Data analyzed through cross tab represented in the form of table and images.

Multi hazard vulnerability

Vulnerability to multi hazards describe the physical, social, economic and attitudinal vulnerability of multi hazards that are flood, earthquake, mass wasting, desertification and complex hazards.

3.6 Universe of Study

This research study will help the people of the village, country and those people who are living in multi hazard prone areas to identify the causes, impacts and strategy for multi hazard safety. It can also provide a data for student who is willing to write a research report on multi hazards. It also provides the strategy to identify the safe areas and make houses in the safe area where multi hazards don't occur.

Through field observations, FGD's and interview study the area but randomly visited to 40 houses which are vulnerable to

multi hazards that are flood, earthquake, mass wasting, desertification and complex hazards. During field observation we observed that there is an area which is nearer and front of stream and river and prone to flood, water erosion and under cutting by river. Also study the historical of study area Bang which was severely affected by flood, water erosion and under cutting in past. Some houses, school, commercial and manufacturing, gabion wall, protection wall, road, bridges, agriculture area and forest are severely affected by flooding in 2010 and 2014. We observed that most houses in study area are adobe and semi adobe houses which are vulnerable to earthquake and also study historical profile of study area Bang. Through observation we observed that some adobe and semi adobe houses are partially or completely damage by earthquake.

We observed during field observation that slope areas are highly vulnerable for mass wasting like landslides, rock fall, mud/debris flow, slump, creep and avalanche. We observed some condition in study area which represent mass wasting such as area at the base of steep slope with a lot of ditched but buried boulders, steep slope areas with thick soil mass free of vegetation, crake on wall, relatively flat areas with thick soil mass and frequent seepage and areas adjacent to a base or top of cut or fill slope for landslides.

For creep we observed that there is bent or extended trees, tilted posts, fences and gravestone, bent and broken wall etc. We observed that there are some areas where rock or soil collapse, break off from hill slope which represent slump in study area Bang. We study historical profile of study area and find that people of Bang experience avalanche in past and also find that mud/debris flow is also hazard in study area Bang.

Desertification like water erosion and water logging is also observed by field observation. We find an area where water table is high which represent water logging in an area. The areas which are nearer to water bodies are affected by water erosion. And along the bank of river and stream water erode soil and plants.

Through field observation we observed complex hazards like epidemics, pollution and accident. The yarkhoon road which passes through study area Bang is highly vulnerable to road accident, specially the road nearer to school and Bang gool. Through visit of health center Bang we find that some people are affected by epidemics like malaria typhoid and diarrhea etc every year Bang people experience flood which cause epidemics. We also observed that posturers contaminate water bodies by dispose animal remains, wastes and other materials into Bang gool.

CHAPTER-4

DATA ANALYSIS

4.1 Introduction

This chapter describes hazard profile of study area, Multi hazards, element at risk, multi hazard vulnerabilities, tables, graph, and map. The hazard profile define multi hazard that are flood, earthquake, Mass wasting(landslide, rock fall, slump, creep), desertification(water erosion, water logging and salinity), complex hazards(road accident, pollution, and epidemics), its location, time of occurrence, and impacts in study area bang, chitral. The multi hazard discuss about multi hazards in detail the definition with references, history from top to bottom (international to local level) and there impacts. The element at risk describe the elements which are at risk to multi hazards that are flood, earthquake, landslide, rock fall, mud slide, slump, creep, avalanche, water erosion, water logging and salinity, accident, pollution and epidemics in study area Bang, Chitral .Multi hazard vulnerabilities define different types of vulnerability (physical, social, economic and attitudinal) vulnerability of study area, Bang and also discuss the elements which are Vulnerable to multi hazards. Define some elements in table from while other in theoretical form. The topic table show the element which at risk to multi hazard on the basis of their vulnerabilities and categorize into low, medium, and high then show map of study area.

4.2 Hazards Profile

Multi hazards like flood, earthquake, mass wasting (landslide, rock fall, mud flow slump, creep, avalanche), desertification (water erosion, water logging and salinity) and complex hazards (water pollution, accident, and epidemics) are frequently occurs in the study area Bang, Chitral, Pakistan.

Sources: Google earth image, 2018 Figure 4.1: Hazards view in the study area Bang

This is the picture of Bang which show multi hazard in study area Bang, Chitral, Pakistan.

4.2.1 FLOOD

In provincial level flood are experienced in year 1992, 2006, 2007, 2010, and 2014 which causes serious damages and loss lives. The district of chitral is badly affected by a number flood during, 2006, 2007 and 2010 half of the village of sonoghur in sub tehsil mastuj. Beside these Oyun, Loatkoh , Drosh, Madak lasht, Bonii, Rashune, Kourgh,Sonoghur, Torkhov,Mux gol Mulkhow, Mastuj, chunj, chenar, Breb, Dizg, Chapalee,Ochoghon, Pawer, Patrangaz. Flood in 2010 in Booni gol area was inundate about 13 villages. In Boni the areas near to Boni gol are seriously affected and also case study area Bang is affected in 2006, 2007 and 2010 flood. There is flooding in Bang Gool due to melting of many small glaciers. The flood like flash flood

affected the areas of Bang which are located near Bang Gool. The flooding mostly occurs from June to August. Flood occurs every year in Bang Gool but flesh flood experienced in 2010 and 2015. The areas which are located near Bang Gol and Bang River are seriously effect by flooding. Due to flooding in Bang Gool, effect private and public sector buildings, property, livestock, agriculture areas, communication, irrigation channel and water also pollute.

Sources: field data, 2018 Figure 4.2 Flood

4.2.2 Earthquake

In 1991 earthquake occur in the northern parts of NWFP with 6.8 magnitudes. In 2005 earthquakes occur in Pakistan and more effected KP, and AJK. Total death toll as a result of earthquake was 73,000. The total houses losses in KP are 36% and in AJK are 84% and the total damages are $5.2 billion. In Oct 2015 earthquake was recorded in KP and Fata. As a result of earthquake dead toll is low as compared to 2005 but damages are very high. In KPK earthquake occur in1991, 2005, 2014 and 2015. In Chitral majors earthquake was recorded in 1991, 2005, 2014, and 2015 and sever effect half villages/ areas like Charun Owir, Bonii, Mastuj, and lower chitral area. In October 26 earthquake a village Charun Owir was razed to the ground. Out of 135 houses in the village, 120 have been flattened by earthquake. In village Warijun some of 30 houses of the 170 in Warijun Bala have been destroyed and 11 of the 110 houses in Wariijun Payen leveled and also effect case study area bang, chitral. Earthquake affected the kaacha houses of study area as compared to pakaa houses. The houses which are located in slope area are completely damage as compared to plain area which is partially damage by earthquake. The study area Bang is more effected in earthquake 2005 and2015.

Figure 4.3 Earthquakes

4.2.3 Mass Wasting

Landslides: In district Chitral landslide occur in the areas of Rashun, Greenlasht, Parwak, and Booni. In 4 March 2015 landslide occur in Reshun valley and blocked the river. Landslide is also experience in Bang, Chitral. In Bang landslide is present in slope areas and the area near the bank of river. Landslide occurs in winter season, at the beginning of summer season, and in rainy season. Due to the glaciers melting in winter at the beginning of summer and rainfall in rainy season the soil become loss as a result the slope become unstable. In this year in 2018 the people of Bang experience landslides in mountain of Ishpaar. Landslides effected trees, people, agriculture land, houses, livestock, communication, irrigation system, water channel etc. and the number of houses which are effect by landslides are more than 20 in Bang.

Mud/debris flow: Mud/debris flow also present in Pakistan and also effect Chitral distric in KP. The areas which are prone to mud/debris flow in Chitral are lodkouh, mulkhow, chapalee, torkhow and study area bang etc. The people of Bang experience mud/debris flow in rainy season. There is a mud flow in area of Ishpaar, Dronelee gool, Nawahch gool, Zeerat gool and Berzoz goal. When heavy rain fall occurs they soil particles loss in mountain and carry soil particles, rocks, plant branches, twigs etc with them and effect the plant, animals, houses, bridges, water channel, Soil, communication etc.

Rock fall: The Chitral District in KP is affected by rock fall, the road, river, streams, irrigation channel etc are block by the rock fall of mountain which block water bodies and case flood, erosion and undercutting etc. People of Bang experience rain fall in rainy season and snow fall, about more than 50 household are affected in Bang Bala and approximately more than 20 house hold are affected in Bang Payeen and effect plants, animals, irrigation channel, communication system, agriculture land and other infrastructure.

Sources: field data, 2018 Figure 4.4 Mass Wasting

Slump: In Bang slump is experience in river bank and slope areas. The settlement near the bank of river and slope are affected by slump. It effect road, building, bridges, infrastructure, irrigation, agriculture land, communication system and people lives etc.

Creep: Creep is experience in Bang especially in those areas where soil is weak, sandy and unstable. It affected plants, soil and communication system etc.

Avalanche: In chitral also serious avalanche was recorded. Avalanche occurs on the north portal of Lawari tunnel trapping 14 person of SAMBU Company. In this area pak army, chitral scout , police and local administration were carry out join search and rescue operation, rescuing 7 out of 14 while other 7 loss(3 from Drosh ,4 frome Punjab) their lives (PDMA report). In Chitral at least 14 people were killed, including a scout, as avalanche hit different villages of the Chitral District on Sunday. The death includes 6 women, 6 children, and 2 men. At least 14 people were killed an avalanche Chitral's SherShal area on Sunday. In 17 to 18 February 2017 avalanche took place in Rach valley near Boni on the night. As a result one death and 3 injured (PDMA report). Avalanche occurs in Bang Gool and Ishpaeer and sometime it is snow avalanche and other it is debris avalanche. It affects plants, agriculture land, irrigation channel, communication system and animals etc.

4.2.4 Desertification

Erosion: The case study area Bang, Chitral is affected by water erosion. Erosion like water erosion occurs in Bang and affected those areas which are located near water bodies like river, stream and irrigation channels etc.

Sources: field data, 2018 Figure 4.5 Desertification

Water logging and salanity: In Chitral the Parsan village is beautiful valley of Tehsil Garam Chasm. Population of 350 households is 45 kiss away from chitral districts. It has been withering away due to water logging from many years. Now climate change has increase melting of glacier in this region. Water logging is present in rizan dah Bang Payeen and Ghorgholang in Bang Bala. It affects agriculture land, irrigation system, plants Communication system, livestock etc.

Source: field data, 2018

4.2.5 Complex Hazards

Accident: In KP (upper Dir) at least 14 passenger were killed and 7 injured as a coach they were in fell in deep ravine Lawari top In Chitral June 24, 2013 one person was killed and 10 others sustained injuries in a road accident near Lawari tunnel. The source said a passenger van skidded of the road and fell into a stream near Ziarat village. In Chitral on Thursday 2 people were killed and one injured after a double cabin pick-up slipped into deep river while taking a short turn near Suri Bala, Terich. On Friday in Chitral 2 person were killed and as many inured in a road accident. According to police, a van carrying a group of ullema to attend a Tableeghi ijtima met an accident in Astaro in upper Chitral as a result Maulana Zakir Ullah a resident of Bakrabad, and Maulana Sohaib Ahmad of Torkoh on the spot. Road accident is very common in case study area Bang, Chitral because the road condition in the study area is not good. Accident like road accident occurs in Bang specially the road which

passes through Rizan Dah Bang Payeen. In road accident still no people are dead but injured.

Pollution: In case study area Bang, pollution like water pollution exists up to some extent.

Epidemics: In KP 2017 Dengue outbreak was recorded in Peshawar. In Chitral a fast spreading disease has resulted in the dead of dozen of cattle in Chamar khan, Mastuj village. Cattle in the 12 villages of Chamar khan will be afflicted by the disease, at least 50 sheep and goats have been killed and 250 goats and sheep were shifted to Veterinary hospitals for treatment. Epidemics like malaria, typhoid, diarrhea etc are exists in Bang area and people mostly effected by typhoid.

4.3 Element at risk for multi hazard in case study area Bang, Chitral

4.3.1 Human Population

People are at risk due to different hazard in area of Bang, Chitral E.g they are injured, displace, disease, malnutrition, sleep disorder, emotion distress and behavior problem, depress, physiological trauma, and PTSD but not dead. They are affected due to flood, earthquake, landslides, mud/debris flows, slump, creep, avalanche, erosion, water logging, accident, pollution, and epidemics but more affected by flood, mud/ debris flows, landslides, rock fall and erosion.

4.3.2 Houses

The total numbers of houses in the study area Bang are 185, 121 in Bang Bala and 64 in Bang Payeen (census report 1998) and approximately 70% houses are vulnerable to multi hazards. The houses which are located near the bank of river and Bang Gol are physically vulnerable to floods, water erosion, landslide, slump, epidemics and creep, approximately more than 20 houses are vulnerable to flood, 30 houses are vulnerable to mud flow, the erosion also exist near water channel and also more than houses are vulnerable to waterlogging. The houses which are located in slope are physically vulnerable to earthquake, rock fall, avalanche, slump, and landslides. The mud houses or poorly constructed houses are partially or completely vulnerable to earthquake. More than 50 houses are vulnerable to rock falls.

4.3.3 Agriculture

Agriculture areas are at risk and affected by flood, mud flows, water logging and salinity and erosion etc but due to flood and mud flow these are more affected as a result there will be shortage of food and fodder for animals and people. Livestock are also affected by flood.

4.3.4 Irrigation Channels

In case study area Bang, irrigation system is used for drinking water and agriculture activities. In irrigation system (channelization, drainage, and water shade etc) are poorly constructed with local materials by local community. Irrigation systems are at risk to flood, mud flow, rock fall, slump, landslides and avalanche etc. The irrigation system is more affected by mud flow, rock fall and flood in the study area Bang.

4.3.5 Utilities and Services

Utilities are at risk due to flood, earthquake, landslides, mud/debris flows, slump, creep and avalanche Utilities are more affected by flood, mud flow, and slump. E.g electricity line, communication networks, water supply, road and bridges etc.

Those structure / essential elements which are used during emergency / situation and after emergency/ordinary situation are called critical facilities. The critical facilities of study area Bang, Chiral are schools, college, health center, religious center, utilities, communication, transportation and government building. There are 8 schools (1 ECD school, 5 primary, 2 meddle and 1high school for girls and boys) and 1 college for co-education. One primary school is prone to mud flow, one primary school is prone to rock fall,3 primary schools one meddle school, one high school and college are prone to flesh flood. There is one health and one medical in Bang area, the medical center is prone to mud flow and health center is prone to rock fall. There are 3 bridges in study area Bang, Chitral, 2 bridge are prone to flood and rock fall and one bridge is prone to flesh flood, water erosion and under cutting.

4.3.7 Commercial and Manufacturing

In the case study area Bang, Chitral the commercial sector like business (wood, livestock, fruit, i.e dry fruit, and shops are at risk to flood, mud flow, landslides, and slump and water erosion.

4.3.8 Environmental Resources

Environmental resources like air, soil, water, flora and fauna are at risk to flood, landslides, mud flow, rock fall and avalanche etc in case study area Bang, Chitral.

4.4 Physical vulnerability

Vulnerability: A factor or constraints of physical, social, economic or geographic nature which reduce the ability of a community to prepare for and cope with the impact of hazards.

In case study area Bang houses, farm land, infrastructure and basic services etc are at risk to earthquake, flood, landslides,

slump, creep, avalanche etc. The houses and buildings are weak design and constructed with local material in local method so this type of houses and building are weak/poor for flood, earthquake, mud flow, landslides, slum, creep and rock fall. The people are physically vulnerable due to lack of basic services such as education, health, safe drinking water, sanitation, roads, electricity and communication in time of flooding, earthquake, landslides and mud flow etc. Due to lack of vehicle is a physical vulnerability of study area bang because people face difficulty during evacuation in time of flood, mud flow and epidemics. Lack of tools and equipment are physical vulnerabilities of Bang, people to cope with disaster and lack of skill, expertise and technologies are also physical vulnerabilities of Bang people.

4.4.1 Human Population

According to 1998 census report the total population of study area are 1,490, 487 in Bang, Payeen and 1003, in Bang Bala. The people of Bang are physically vulnerable to multi hazards. They are injured, displace, disease, malnutrition, sleep disorder, emotion distress, behavior problem, depress, physiological trauma and PTSD but not dead.

Table No.1

S. No	Hazards	Low	Medium	High	Total
1	Flood	2	3	35	40
2	Earthquake	8	11	21	40
3	Landslides	2	2	36	40
4	Desertification	4	17	19	40
5	Complex Hazards	12	11	17	40

Sources: field data, 2018

They are affected due to flood, earthquake, landslides, mud/debris flows, slump, creep, avalanche, erosion, water logging, accident, pollution and epidemics but more affected by flood, mud/ debris flows, landslides, rock fall and erosion.

4.4.2 Houses

They total numbers of houses in the study area Bang are 185, 121 in Bang, Bala and 64 in Bang, Payeen (census report 1998) and approximately 70% houses are vulnerable to multi hazards. The houses which are located near the bank of river and Bang Gol are physically vulnerable to floods, water erosion, landslide, slump, epidemics and creep, approximately more than 20 houses are vulnerable to flood, 30 houses are vulnerable to mud flow, the erosion also exist near water channel and also more than houses are vulnerable to water logging. The houses which are located in slope are physically vulnerable to earthquake, rock fall, avalanche, slump and landslides. The mud houses or poorly constructed houses are partially or completely vulnerable to earthquake. More than 50 houses are vulnerable to rock fall in study area Bang, Chitral.

This map shows houses which are highly vulnerable to multi hazard. For example house no1,2,3,4,5,6,7,8,9,10,11,12,13,14 and 40 are vulnerable to water erosion, water logging, under cutting and flood, house no 37,38 are vulnerable to mud flow, houses no 31, 32,33,34,35,36,30,25,26,29,20 are vulnerable to rock fall and landslides, house no 39,24,21,22,23,27,28,18,19,17,16 and 15 are highly vulnerable to earthquake because these are adobe houses.

Sources: Google image, 2018
Figure 4.6; Houses view that are vulnerable to multi hazards.

4.4.3. Flood

They total number of houses in the study area Bang are185 (1998 census report). Out of 185 houses through field observation and FGD's, interview 40 houses are visited and found that 16 houses(1, 2, 3, 4, 5, 7, 39, 22, 23, 24, 25, 26, 10, 11, 12, 16) are highly vulnerable to flood which are located near the Bang Gol and river, 13 houses (6, 38, 8, 9, 10, 11, 27, 28, 17, 18, 19, 20, 21) are medium and 11 houses (13, 14, 33, 34, 35, 36, 29, 30, 31, 32, 40) are low vulnerable to flood.

Table No. 2

S. No	Houses	Low	Medium	High
1	Adobe	4	6	7
2	Semi Adobe	3	3	5
3	Pakaa	2	1	2
4	Semi pakaa	2	3	2
5	Total	11	13	16

Sources: field data, 2018

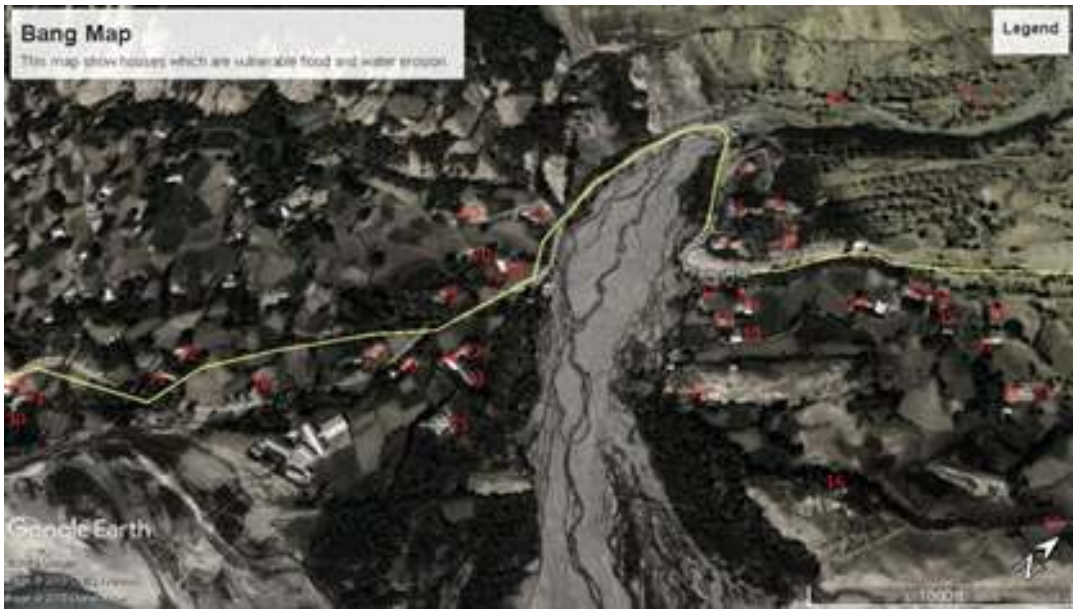

Figure: flood and water erosion view in study area. Sources: Google image, 2018

4.4.4 Earthquake

Out of 185 houses 40 houses are visited through field observation, FGD's and interview and found that15 houses are highly vulnerable to earthquake which are locate in slope area and side of under cutting, 13 are medium and 11are low vulnerable to earthquake in study area Bang.

Earthquake

S. No	Houses	Low	Medium	High
1	Adobe	4	5	6
2	Semi Adobe	3	4	4
3	Pakaa	2	2	2
4	Semi paka	3	2	3
5	Total	12	13	15

Source: Field data, 2018

Source: field data, 2018

Source: Field data, 2018

4.4.6 Desertification

There are 185 houses in study area Bang (census report 1998) but visited 40 houses through field observation, FGD's, interview and found that 12 houses are highly vulnerable which are near water logged area (Ghorgholong), 15 are medium and 13 are low vulnerable to desertification.

Desertification

Table No. 5

S. No	Houses	Low	Medium	High
1	Adobe	5	6	7
2	Semi Adobe	3	4	2
3	Pakaa	2	2	1
4	Semi Pakaa	3	3	2
5	Total	13	15	12

Source: Field data, 2018

Source: Field data, 2018

4.4.7 Complex Hazards

Out of 185 in study area Bang, 40 houses are visited through field observation, interview, FGD's and found that 11 houses are highly vulnerable to complex hazard like pollution (water pollution), and Epidemics, 7 are medium, 22 houses are low vulnerable to complex hazards.

Complex Hazard

Table No. 6

S. No	Houses	Low	Medium	High
1	Adobe	12	3	4
2	Semi Adobe	7	2	3
3	Pakaa	1	1	2
4	Semi Pakaa	2	1	2
5	Total	22	7	11

Source: Field data, 2018

4.4.8 Agriculture

Agriculture areas are at risk and affected by flood, mud flows, water logging and salinity and erosion etc but due to flood and mud flow these are more affected as a result there will be shortage of food and fodder for animals and people. Livestock are also affected by flood.

4.4.9 Irrigation Channel

In case study area Bang, irrigation system is used for drinking water and agriculture activities. In irrigation system (channelization, drainage, and water shade etc) are poorly constructed with local materials by local community. Irrigation systems are at risk to flood, mud flow, rock fall, slump, landslides and avalanche etc. The irrigation system is more affected by mud flow, rock fall and flood in the study area Bang.

Source: field data, 2018 4.4.10 Utilities and Services

4.4.10 Utilities and Services

Utilities are at risk due to flood, earthquake, landslides, mud/debris flows, slump, creep and avalanche Utilities are more affected by flood, mud flow, and slump. E.g electricity line, communication networks, water supply, road and bridges etc. Those structure/essential elements which are used during emergency/situation and after emergency/ordinary situation are called critical facilities. The critical facilities of study area Bang, Chiral are schools, college, health center, religious center, utilities, communication, transportation and government building. There are 9 schools (1 ECD school, 5 primary, 2 meddle and 1high school for girls and boys) and 1 college for Coe-education. One primary school is prone to mud flow, one primary school is prone to rock fall, 3 primary schools one meddle school, one high school and college are prone to flesh flood. There is one health and one medical in Bang area, the medical center is prone to mud flow and health center is prone to rock fall. There are 3 bridges in study area Bang, Chitral, 2 bridge are prone to flood and rock fall and one bridge is prone to flash flood, water erosion and under cutting.

Table No.7

S. No	Hazards	Schools and college	Health and religious center	Bridge
1	Flood		1, R –center	3, bridge
2	Earthquake	-	-	-
3	Landslides	-	-	-
4	Mud/Debris flow	1, school	1, medical center	-
5	Rock fall	1, school	2, R-center	-
6	Slump	-	-	-
7	Creep	-	-	-
8	Avalanche	-	-	-
9	Erosion	-	-	1, bridge
10	Water logging	-	-	-
11	Accident	-	-	-
12	Pollution	-	-	-
13	Epidemics	-	-	-

Figure: 4. Rainfall in Peshawar (April) 2015

Source: Field data, 2018

4.4.11 Commercial Manufacturing

In the case study area Bang, Chitral the commercial sector like business (wood, livestock, fruit, i.e dry fruit, and shops) are physically vulnerable to flood, mud flow, landslides, slump and water erosion.

4.4.12 Environmental Resources

Environmental resources like air, soil, water, flora and fauna are at risk due to flood, landslides, mud flow, rock fall and avalanche.

4.5 Social Vulnerability

In case study area Bang lack of training and awareness among people make them socially vulnerable because the people don't know how they respond in times of flood, earthquake, landslides, rock fall, avalanche and epidemics. Due to lack of participation of people make them socially vulnerable because the people don't take interests to participate in any disaster related activities and there is no or neglected relationship with government, administrative structures so the people of Bang are socially vulnerable to different disaster. Lack of coordination/ relationship / kinship among people within the family and community are social vulnerability of Bang area and lacks of preparedness before any disasters are social vulnerability of Bang area. There are many CBOs in Bang area but they are not active so the people of Bang are socially vulnerable to multi hazards. The concept of class, and caste are exist in Bang villages therefore people are socially vulnerable to various disasters because the notable people in area are try to work in their own area or relative area and also NGO's/ Donator agencies prefer to work with notable people.

4.5.1 Social Organization

According to1998 census report the total population of study area Bang is 1490(487 in Bang Payeen and 1003 in Bang Bala).Through field observation, FGD's and interview observe that there are CBOs, Gramm's and NGO's are actively working in study area Bang, Chitral. Approximately 12 gram, 7 CBOs (women organization, youth organization etc) are present and 7 NGO's (AKRSP, Focus humanitarian assistance, WASEP, BASEP and SRSP) etc is working in study area. They are working in disaster prevention, mitigation, preparedness, response, recovery and development in disaster affected area Bang and provide fund and opportunities to empower local people in order to reduce their vulnerabilities and enhance capacities in study area Bang, Chitral, Pakistan.

4.5.2 Houses

Due to the lack of awareness, training and education the people are unaware that how to make their houses hazard resistances/ resilient NGO's like AKRSP, FHA (Focus Humanitarians Assistance), AKPB are working with coordination of CBOs and Gramm's for creating productive infrastructure, provide shelter in disaster effected areas and give training on building design.

4.5.3 Agriculture

Due to the lack of awareness, training, and education the people of Bang are unable to produced wide variety of crops and not used modern technologies in agriculture sector such as hybrid seeds, fertilizer, and unaware about crop rotation. NGO's like AKRSP, LSO/BLSO are working with coordination of CBOs and Gramm's developing agriculture sector with coordination of CBOs. The introducing new agriculture technology, such as new high yielding varieties of food, crops, fruits and provide hybrid seeds and plants.

4.5.4 Irrigation

Due to lack of education, awareness, relationship, etc. the people are construct Irrigation channels in hazard prone location like mountain which leads to landslide, flood, Mud flows and slump. In irrigation sector AKRSP, WASEP etc are working with coordination of CBOs and Gramm's for improvement of water channels.

4.5.5 Natural Resources

Due to the lack of awareness session, seminars, education regarding Proper use of environmental resources like soil, waters, plants, so the people miss used the Natural resources e.g water pollution as a result different diseases break out and affect the people of the study area. NGO's like AKRSP, BLSO/LSO, AKAM, WASEP are working with coordination of CBOs and Gramm's in study area Bang for developing natural resources such as land, water, and forestry. The provide plants, hybrid seeds and improve access to pure drinking water and sanitation.

4.6 Economic Vulnerability

Lack of insurance and saving is the economic vulnerability of local people of Bang. Less diversify economy is the economic vulnerability of Bang area because the people of Bang are usually depend on wood, fruit and dry fruit etc for their income, when these sources are affected by any disaster than the people are socially vulnerable and Indebtedness leads to economic vulnerabilities.

4.6.1 Human Population

According to 1998 census report the total population of study area Bang are1490, (1003 Bang Bala and 487 Bang Payeen).Through surveyed it is observed that different categories (poor, average, and rich) of people are living in study area Bang.

Human Population

Table no. 8

S. No	People	Income
1	Poor	Less than 10,000
2	Average	Up to 20,000
3	Rich	More than 40,000

Source: Field data, 2018

4.6.2 Houses

Due to lack of money people not constructed houses with modern technology and make houses with local materials therefore houses are vulnerable to flood, earthquake, mud flow landslide and water logging. The total houses of study area bang are 185 and out of 185, 40 houses are surveyed thorough field observation, FGD's, interview and observed that houses/ services are damage in low, medium and high.

Houses

Table No.9

S. No	Houses	Low	Medium	High
1	Adobe	3,000	6,000	12,000
2	Semi adobe	15,000	17,000	20,000
3	Pakaa	25,000	35,000	45,000
4	Semi pakaa	22,000	26,000	30,000

Source: Field data, 2018

4.6.3 Agriculture

In agriculture sector due to lack of money the people are unable to purchase fertilizer.

4.6.4 Irrigation

Due to lack of money the people bang are properly constructed irrigation channel. So due to poor construction of irrigation channel it cause seepage of water and leads to flood, landslides, water erosion and slump etc.

4.6.5 Commercial Manufacturing

In case study area Bang people are economically vulnerable to Flood, mud flow and rock fall etc because due to lack of money people start business in hazards area.

4.7 Attitudnal Vulnerability

Lacks of confidence, hopelessness, fatalism, negative thinking toward change, dependency and lacks of initiatives etc. These all are attitudinal vulnerability of Bang area.

4.7.1 Human Population

According to 1998 census report they total population of study area are 1490(1003 Bang Balla and 487 Bang Payeen). Through surveyed it is found that approximately 90% population of study area are literate and 10% are illiterate, 70% population are aware, 30% are un aware, 20% are train or expert and 80% are untrained or un expert out of 1490 population. There is coordination or relation among 60% population out of total of study area Bang, Chitral.

Human Population

Table NO.10

S. No	People	
1	Literate	90%
2	Illiterate	10%
3	Aware	70%
4	Unaware	30%
5	Train/ skilled/expert	20%
6	Untrained /unskilled/ inexpert	80%
7	Coordination/ relationship among people	60%

Source: Field data, 2018

4.8 Multi hazard vulnerabilities in study area

I. Vulnerability: A factor or constraints of physical, social, economic or geographic nature which reduce the ability of a community to prepare for and cope with the impact of hazards.

ii. There are four types of vulnerabilities in study area Bang, Chitral, they are the followings.

iii. The inability of a community to deal/cope with disaster structure is called vulnerability.

iv. The degree of susceptibility of a community against potential events is called vulnerability. There are four types of vulnerabilities exist in study area Bang that are physical, social economic and attitudinal vulnerability. The physical vulnerability in study area is hazards prone location, weak infrastructure, lacks of vehicle, tools/ equipment, technologies, skills and expertise, lacks of basic services such as education, health, communication, electricity, road, pure water and sanitation etc. The social vulnerability in study area is lacks of training/education/awareness, weak coordination, relationship and CBOs. The economic vulnerability in study area Bang is lack of insurance and saving, indebtedness and less diversify economy. The laziness, dependency, fatalism, negative thinking and resistance towards change etc are attitudinal vulnerability of study area Bang, Chitral, Pakistan.

Flood

Physical vulnerability: The houses, utilities and services, agriculture areas, natural resources, human population, commercial and manufacturing and irrigation channels etc are highly vulnerable to flood hazard in study area Bang, Chitral, Pakistan. Those elements which are located near the stream (Bang Gool) such as houses, irrigation channels, agriculture areas and commercial and manufacturing etc. are highly vulnerable to flood hazards.

Social vulnerability: The lack of awareness, training, exercise, drills, leadership, coordination/relationship/kinship, leadership, preparedness and weak CBOs, gram, NGOs are social vulnerability of Bang. The NGO's gram and CBOs are working in study area Bang but not working effectively related to flood management.

Economic vulnerability: The lack of money, saving, insurance and less diversify economy etc are economic vulnerability of flood in study area Bang, Chitral, Pakistan. The economic sector in study area Bang like commercial and manufacturing, plants and agriculture are economically high vulnerable to flood hazard.

Attitudinal vulnerability: The laziness, dependency, fatalism, negative thinking etc are attitudinal vulnerability of flood hazard in study area Bang. Due to all these the people of Bang not start any flood management activities in study area Bang, Chitral, Pakistan.

Earthquake

Physical vulnerability: The houses, utilities and services, agriculture areas, natural resources, human population, commercial and manufacturing and irrigation channels etc are highly vulnerable to earthquake hazard in study area Bang, Chitral, Pakistan. The houses which are located in slope area are highly vulnerable to earthquake in the study area Bang.

Social vulnerability: The lack of awareness, training, exercise, drills, leadership, coordination/relationship/kinship, leadership, preparedness and weak CBOs, gram, NGO's are social vulnerability of Bang. Due to lack training, awareness session, seminars, education exercise , drills, coordination, weak relationship, inactive CBO's, Gramm, NGO's the people study area don't make earth quake resilient houses and also construct houses in earth quake prone areas and don't incorporate application of building code, modern technology etc.

Economic vulnerability: The lack of money, saving, insurance and less diversify economy etc are economic vulnerability of flood in study area Bang, Chitral, Pakistan. Due to the lack of money, saving, insurance etc. the people makes houses in earthquake prone location and also don't incorporate building code and modern technologies.

Attitudinal vulnerability: The laziness, dependency, fatalism, negative thinking etc are attitudinal vulnerability of flood hazard in study area Bang. Due to negative thinking, fatalism, laziness the people don't participate in earthquake related training, awareness session, seminars, drills, exercise etc, therefore the people of study area are attitudinal vulnerable to earthquake.

Mass wasting

Physical vulnerability: The houses, utilities and services, agriculture areas, natural resources, human population, commercial and manufacturing and irrigation channels etc. are highly vulnerable to mass wasting hazard in study area Bang, Chitral, Pakistan. The houses, utilities and services, agriculture areas, natural resources, human population, commercial and manufacturing and irrigation channels etc which are located in slope area are highly vulnerable to landslide, rock fall, slump, creep and avalanche in the study area.

Social vulnerability: The lack of awareness, training, exercise, drills, leadership, coordination/relationship/kinship, leadership, preparedness and weak CBOs, gram, NGOs are social vulnerability of Bang. Due to lack of awareness, training,

exercise,drills,leadership,coordination/relationship/kinship,leadership,preparednes and weak CBOs, gram, NGO's, the people constructed there houses in mass wasting (landslide, rock fall, slump, creep, and avalanche) prone location and also the people are un aware about afforestation for landslide, rock fall, slump, and creep in the study area.

Economic vulnerability: The lack of money, saving, insurance and less diversify economy etc are economic vulnerability of flood in study area Bang, Chitral, Pakistan. Due to lack of money, saving, insurance the people are not properly constructed irrigation channels, So due to poor construction of irrigation channel it cause seepage of water and leads to landslides, creep and slump.

Attitudinal vulnerability: The laziness, dependency, fatalism, negative thinking etc. are attitudinal vulnerability of flood hazard in study area Bang. Due to laziness, dependency, fatalism and negative thinking the local people don't support/ coordinate external stake holder to initiate mass wasting relate activities in mass wasting prone areas and local people depend on external stake holder to initiate mass wasting relate activities, local people don't make protection wall, gabion wall, check dam etc to prevent mass wasting in study area Bang, Chitral, Pakistan.

Desertification

Physical vulnerability: The houses, utilities and services, agriculture areas, natural resource, commercial and manufacturing and irrigation channels etc. are highly vulnerable to desertification hazard in study area Bang, Chitral, Pakistan. The houses which are located near the bank of river are highly vulnerable to water erosion and the houses which are located near water bodies are highly vulnerable to water logging and salinity in the study area Bang. The irrigation channels, commercial and manufacturing, utilities and services are also affected by water erosion.

Social vulnerability: The lack of awareness, training, exercise, drills, leadership, coordination/relationship/kinship, leadership, preparedness and weak CBOs, gram, NGO's are social vulnerability of Bang. Due to lack of awareness, training, exercise, drills, leadership, coordination/relationship/kinship and leadership people cut forest instead of afforestation or reforestation which leads to water erosion and water logging. Due to lack of awareness, coordination CBO's and NGO's don't make protection wall.

Economic vulnerability: The lack of money, saving, insurance and less diversify economy etc are economic vulnerability of flood in study area Bang, Chitral, Pakistan. Due lack of money, saving, insurance the people cut forest fuel, construction which leads to water erosion and business and don't make any protection wall in water erosion prone areas.

Attitudinal vulnerability: The laziness, dependency, fatalism, negative thinking etc are attitudinal vulnerability of flood hazard in study area Bang. Due to laziness, fatalism and negative thinking the local people don't support/ coordinate external stake holder to initiate desertification related activities desertification prone areas and local people depend on external stake holder to initiate desertification relate activities, local people don't make protection wall, gabion wall, check dam etc to prevent desertification in study area Bang, Chitral, Pakistan.

Complex hazards

Physical vulnerability: The houses, agriculture areas, natural resources, human population, are highly vulnerable to complex hazard i.e. is accident, pollution, accident in study area Bang, Chitral, Pakistan. Flood cause water pollution and epidemics as a result human population and agriculture physically vulnerable to complex hazards.

Social vulnerability: The lack of awareness, training, exercise, drills, leadership, coordination/relationship/kinship, leadership, preparedness and weak CBOs, gram, NGO's, are social vulnerability of Bang. Due lack of awareness, training, exercise, drills, coordination/relationship/kinship, leadership, preparedness people are un aware about vaccination of epidemics and cause water pollution which are the social vulnerability of complex hazards.

Economic vulnerability: The lack of money, saving, insurance and less diversify economy etc are economic vulnerability of flood in study area Bang, Chitral, Pakistan. Due to lack of money, saving, and insurance the people are unable to treatment/ vaccination against epidemics.

Attitudinal vulnerability: The laziness, dependency, fatalism, negative thinking etc are attitudinal vulnerability of flood hazard in study area Bang. Due to negative thinking and fatalism they people against vaccination which leads to different disease.

Flood **Table No. 11**

S.no	Physical vulnerability	Economic vulnerability	Social+attitudinal vulnerability	Environmental vulnerability
1	Human population	Lack of money	Lack of awareness, training, education	Water
2	Commercial and manufacturing Houses	Lack of insurance	Lack of coordination, relationship, kinship	Marine habitats
3	Utilities and services	Lack of saving	Lack of exercise, drills	Plants
4	Irrigation channels	Less diversify economy	Weak CBOs, grams and NGOs	Soil
5	Houses	-	Lack of leadership	-
6	Agriculture areas	-	Laziness	-
7	-	-	Fatalism	-
8	-	-	Dependency	-
9	-	-	Negative thinking	-

Source: field data, 2018

Earthquake **Table No. 12**

S. No	Physical vulnerability	Economic vulnerability	Social+attitudinal vulnerability	Environmental vulnerability
1	Human population	Lack of money	Lack of awareness, training, education	Water
2	Commercial and manufacturing Houses	Lack of insurance	Lack of coordination, relationship, kinship	Marine habitats
3	Utilities and services	Lack of saving	Lack of exercise, drills	Plants
4	Irrigation channels	Less diversify economy	Weak CBOs, grams and NGOs	Soil
5	Houses	-	Lack of leadership	-
6	Agriculture areas	-	Laziness	-
7	-	-	Fatalism	-
8	-	-	Dependency	-
9	-	-	Negative thinking	-

Source: Field data, 2018

Mass wasting **Table No.13**

S. No	Physical vulnerability	Economic vulnerability	Social+attitudinal vulnerability	Environmental vulnerability
1	Human population	Lack of money	Lack of awareness, training, education	Water
2	Commercial and manufacturing	Lack of insurance	Lack of coordination, relationship, kinship	Marine habitats
3	Utilities and services	Lack of saving	Lack of exercise, drills	Plants
4	Irrigation channels	Less diversify economy	Weak CBOs, grams and NGOs	Soil
5	Houses	-	Lack of leadership	Animals
6	Agriculture areas	-	Laziness	-
7	-	-	Fatalism	-
8	-	-	Dependency	-
9	-	-	Negative thinking	-

Source: field data, 2018

Desertification **Table No.14**

S. No	Physical vulnerability	Economic vulnerability	Social+attitudinal vulnerability	Environmental vulnerability
1	Human population	Lack of money	Lack of awareness, training, education	Water
2	Commercial and manufacturing	Lack of insurance	Lack of coordination, relationship, kinship	Marine habitats
3	Utilities and services	Lack of saving	Lack of exercise, drills	Plants
4	Irrigation channels	Less diversify economy	Weak CBOs, grams and NGOs	Soil
5	Houses	-	Lack of leadership	-
6	Agriculture areas	-	Laziness	-
7	-	-	Fatalism	-
8	-	-	Dependency	-
9	-	-	Negative thinking	-

Source: field data, 2018

Complex hazards

Table No.15

S. No	Physical vulnerability	Economic vulnerability	Social+attitudinal vulnerability	Environmental vulnerability
1	Human population	Lack of money	Lack of awareness, training, education	Water
2	-	Lack of insurance	Lack of coordination, relationship, kinship	Marine habitats
3	-	Lack of saving	Lack of exercise, drills	Plants
4	-	Less diversify economy	Weak CBOs, grams and NGOs	Air
5	-	-	Lack of leadership	Animals
6	-	-	Laziness	-
7	-	-	Fatalism	-
8	-	-	Dependency	-
9	-	-	Negative thinking	-

Source: field data, 2018

Conclusion

Bang area is located in district Chitral, tehsil Mastuj and union council Yarkhun. The topography of Bang makes it highly vulnerable to multi hazards. In past Bang people experience various disasters like flood in 2007, 2010 and 2014, earthquake 2005 and 2015, still no research has been conducted about Bang area, but after our research it is find that Bang area is vulnerable to multi hazards but highly vulnerable to mass wasting and flood and medium vulnerable to earthquake, desertification and complex hazards. The physical, social, economic and attitudinal vulnerability also exist in Bang area but physical and economic vulnerability are high among Bang people due to social vulnerability e.g lack of training, awareness, education etc.

CHAPTER-5

FINDINGS CONCLUSION AND RECOMMENDATIONS

Introduction

Bang is an area of Chitral disric, tehsil Mastuj and UC Yarkhun which is prone to multi hazards i.e flood, earthquake, mass wasting, desertification, and complex hazards. The total population of Bang is 1490 (487 Bang payeen and 1003 Bang Balla). More than half of the population is vulnerable to multi hazards. The total houses in Bang are 185. Most of houses in Bang area are adobe therefore they are vulnerable to earthquake. The physical, social, economic and attitudinal vulnerability also exist in Bang area but physical and economic vulnerability are high among Bang people. The local people have little knowledge about prevention, mitigation and preparedness measures towards hazards and its vulnerabilities. In Bang area government and NGO's launch different prevention and mitigation projects in order to reduce hazards and its vulnerabilities but its work are not effective. There is no emergency management plan for any disaster.

5.1 Findings

In this part of the chapter we will highlight the key findings that were obtained after analyzing the data obtained through field observation, transect walk, FGD's and interview.

1. The study area Bang is prone to multi hazards like flood, earthquake, mass wasting, desertification and complex hazards, but highly vulnerable to rock fall and flood.
2. Multi hazards like flood, earthquake, mass wasting, desertification and complex hazards effects and damage human population, agriculture sector, irrigation channels, commercial and manufacturing, natural resources, utilities and services.
3. The physical, social, economic and attitudinal vulnerabilities also exist but physical and economic vulnerabilities are high in Bang area.
4. Human population, agriculture sector, irrigation channels, commercial and manufacturing, natural resources, utilities and services are at risk to multi hazards in study area Bang.
5. The local people have little knowledge about prevention, mitigation and preparedness measures towards hazards and its vulnerabilities.
6. In study area Bang government and NGO's launch different prevention and mitigation projects in order to reduce hazards and its vulnerabilities but its work are not effective.
7. In case study area Bang houses, irrigation channels, commercial and manufacturing, farm land, infrastructure and utilities and services etc are physical vulnerable to earthquake, flood, landslides, slump, creep, avalanche etc. The houses and buildings are were weak design and constructed with local material in local method so this type of houses and building are weak/poor for flood, earthquake, landslides, slump, creep and avalanche.
8. In case study area Bang lack of training and awareness among people make them socially vulnerable because the people don't know how they respond in times of flood, earthquake, landslides, rock fall, avalanche, and epidemics.
9. Lack of coordination/relationship/kinship among people within the family and community are social vulnerability of Bang area and lacks of preparedness before any disasters are social vulnerability of Bang area. There are many CBO's in Bang area but they are not active so the people of Bang are socially vulnerable to multi hazards.
10. Lack of insurance and saving is the economic vulnerability of local people of Bang. Less diversify economy is the economic vulnerability of Bang area because the people of Bang are usually depend on wood, fruit and dry fruit etc for their income, when these sources are affected by any disaster than the people are socially vulnerable and Indebtedness leads to economic vulnerabilities.
11. Lack of confidence, hopelessness, fatalism, negative thinking toward change, dependency and lack of initiatives etc. These all are attitudinal vulnerability of Bang area.

5.2 Conclusion

Bang area is located in district Chitral, tehsil Mastuj and union council Bang. The topography of Bang makes it highly vulnerable to multi hazards. In past Bang people experience various disasters like flood in 2007, 2010 and 2014, earthquake 2005 and 2015(mass wasting i.e mud/debris flow, slump, creep, rock fall and avalanche and desertification i.e water erosion

and water logging and complex hazards like road accident, pollution and epidemics also affect Bang area. For rock fall more than 50 houses in Bang Bala and about 20 houses in Bang Payeen are vulnerable and effect road, bridges, agriculture land, irrigation channel, other land, forests, houses, commercial and manufacturing etc still no research has been conducted about Bang area, but after our research it is find that Bang area is vulnerable to multi hazards but highly vulnerable to mass wasting and flood and medium vulnerable to earthquake, desertification and complex hazards.

5.3 Recommendation

After completion our research report on multi hazards vulnerability assessment some useful suggestion were found that can be help in minimizing and reducing multi hazard vulnerability(physical, social, economic and attitudinal vulnerability) in study area Bang..

1. There should be land use planning, site selection, soil testing, and afforestation/reforestation, construction of gabion, retaining, protection wall, channelization, embankment, levee and dame etc for flood.
2. There should be site selection, soil testing, engineering measure i.e building code etc for earthquake.
3. There should be plantation, site selection, soil testing, land use planning, sowing, cheek dames, vegetated crib wall, vegetated gabion wall, and protection wall etc for mass wasting.
4. There should be site selection soil testing, plantation and protection wall etc for desertification.
5. There should be proper management and dumping or recycling of solid waste for pollution and epidemics, and site selection, soil testing, avoid under cutting along road site for road accident.
6. There should be training, education, awareness, exercise, drills etc in provincial, district and especially in local level to identify multi hazards vulnerabilities.

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