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ADDIS ABABA UNIVERSITY



ADDIS ABABA UNIVERSITY
COLLEGE OF DEVELOPMENT STUDIES
CENTER FOR FOOD SECURITY STUDIES

ASSESSMENT OF FLASH FLOOD INDUCED DISASTER RISK AND COPING STRATEGIES ON RURAL HOUSE HOLD LIVELIHOOD OF PEOPLE: IN THE CASE OF SHASHOGO WOREDA, HADIYA ZONE, ETHIOPIA

MSc THESIS SUBMITTED TO DEPARTMENT OF FOOD SECURITY STUDIES OF ADDIS ABABA UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN FOOD SECURITY AND DEVELOPMENT STUDY

BY:

YISHAK ALEMU

August 2021

Addis Ababa, Ethiopia

ADDIS ABABA UNIVERSITY
COLLEGE OF DEVELOPMENT STUDIES
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
A THESIS SUBMITTED TO CENTER FOR FOOD SECURITY STUDIES IN PARTIAL
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STUDIES

BY:

YISHAK ALEMU

ADVISOR: TEMESGEN TILAHUN (PHD)

APPROVAL SHEET

As Research advisors, we hereby certify that we have read and evaluated this Thesis prepared, under our guidance, by Yishak Alemu entitled “*Assessment of Flash Flood Induced Disaster Risk and Coping Strategies on Rural HouseHold Livelihoodsof People: In the Case of Shashogo Woreda, Hadiya Zone,Ethiopia :In the Case of Shashogo Woreda, Hadiya Zone,Ethiopia*”,we recommend that it be submitted as fulfilling the research requirement
Major Advisor: TemesgenTilahun Signature :  Date: 16/10/ 2021

As members of the Board of Examiners of the MSc. Thesis Open Defense Examination, we certify that we have read, evaluated the research prepared by Yishak Alemu and examined the candidate. We recommend that the research be accepted as fulfilling the research requirement for theDegree of Master of Science in Food Security and Development Studies.

Yishak Alemu

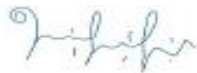
16/10/2021

Candidate

Signature

Date

Desalegn Yayeh



15-10-2021

Internal Examiner

Signature

Date

Bogale Teferi (PhD)



14/10/2021

External Examiner

Signature

Date

Head, CFSS

Signature

Date

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DEDICATION

I dedicate this thesis manuscript to my beloved wife , Sintayehu Mulu , for her invaluable support by giving priority to me even during the hard and unharmonious times she faced that contributed a lot to the success of my fruitful effort; and to all my family members who provided me moral support.

Declared By: Yishak Alemu

Signature:

Date: September , 2021

Place: Addis Ababa University College of Development Studies, Center for Food Security Studies

This is to certify that the above declaration made by the candidate is correct to the best of my knowledge as an advisor.

Advisor: Temesgen Tilahun (PhD) Ass.Professor

Signature:

STATEMENT OF THE AUTHOR

I, Yishak Alemu , do hereby declare to Addis Ababa University School of Graduate Studies that this thesis is a product of my original research work, and it has not been submitted to any other university for any academic degree. Materials and information other than my own are duly acknowledged.

Name: Yishak Alemu

Signature: _____

Date of Submission: September , 2021

Center for Food Security Studies,

Addis Ababa University

BIOGRAPHY

The author was born on May 14, 1987 in Hadiya Zone, SNNP region. He attended his primary and secondary education at former Shokbira and Senior Secondary Schools, at Wachamo and Ethiopia Tikidem Number One Addis Ababa respectively. He joined YIC Addis Ababa in September 2010 and graduated with Bachelor of Science in Disaster Risk Management and Sustainable Development on August 27, 2013. Also he joined Hossana College of Teacher Education from 2005-2007 in Natural Science after graduation, the author worked in GO and NGO. He joined Addis Ababa University in 2019 as a Government sponsored student.

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ACRONYMS

CSA:	Central Statistical Agency
DFID:	Department for International Development
DPPA:	Disaster Preparedness and Prevention Agency
ETB :	Ethiopian Birr
FGD:	Focus Group Discussion
FAO:	Food and Agriculture Organization
HH:	Household
KII:	Key Informant Interview
NGO:	Non-Governmental Organization
NMA:	National Meteorological Agency
SAP:	Structural Adjustment Program
UN/ISDR:	United Nations International Strategy for Disaster Reduction
UNDP:	United Nations Development Program
UNCCC:	United Nations Framework Convention on Climate Change
WMO/GWP:	World Metrological Organization/Global Water Partnership
SLA:	Sustainable Livelihood Approach
SLLF:	Sustainable Livelihood Framework
SWAO:	Shashogo Woreda Administrative Organization
SNNPR:	Southern Nations Nationalities and Peoples Region

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ABSTRACT

The purpose of this study was to assess the flash flood induced disaster risk and coping strategies on rural household livelihoods of people in Shashogo woreda, Hadiya zone, SNNPR, Ethiopia. the study desired to examine the impact of flood induced disaster risk on rural household livelihoods, identify the factor, and determine the flood impact and to assess the coping strategies used by rural households due to flood induced disaster risk. For this study, data from 255 sample households were collected from three rural kebeles namely: Golicho Boyo, Suta and Urbech Antata. The data were analyzed by using SPSS software version 25 In addition, three FGD each composed of 6-12 individuals from different socio-economic status and age groups were selected and used as primary sources of information. Key informant interview was conducted with experts from SWARDO and DAs. The finding of the study reveals that some elements of flood effects) show inter seasonal flood variability with slightly increasing trend. And the main source of income in the study area is rain fed agriculture (92%) which is being adversely affected by unpredictable flood induced disaster risk , and high food shortages etc. This study also identified women, children and elderly; were most vulnerable to flood induced disaster risk. Therefore, depending on the finding of the study, the following policy recommendations are forwarded are: increasing farmers' awareness on how to use agricultural technologies, Structural mitigation, restoring the degraded environment, facilitating access to credit services, diversifying source of income, building the capacity of farmers and encouraging CBA strategies as the main poverty reduction approach.

Keywords: *Flash Flood induced disaster risk, livelihoods, coping mechanisms, adaptation strategies*

1. INTRODUCTION

1.1.BACKGROUND OF THE STUDY

Flood is the most common type of disaster causing serious economic losses in various part of the world (G.Ramakrishna et al. 2014; Toubes et al. 2017). The immediate effect of natural disasters and other climatic change variability on smallholder farmers include loss of lives, destruction of crops and farmlands, loss of livestock, damage to properties and infrastructure and food security problem among the affected communities(Alametal.2010;Islam&Wong2017;Okeleyetal.2016).

The Third World Water Forum: Poverty and Floods held in March,2003 indicated that in recent years, floods had become more frequent and of increasing severity resulting into loss of life, injury, homelessness, damage to infrastructure and environment as well as impacting on other critical sectors such as education and agriculture. Floods are the most costly and wide reaching of all natural hazards. They are responsible for upto50,000 deaths and adversely affect some75million people on average world wide ever year. Ethiopia has a lot of rugged and mountainous topography with altitudes that range 4650 meter above sea level to125meters below sea level (Environmental Protection Authority, 2003). The wide variation in elevation means that various climatic conditions exist in Ethiopia. The rainfall also varies from place to place it reaches at average 2400mm/year in the south west and not greater than 150mm/year in the northern part(Environmental Protection Authority,2003).While other parts of the While other parts of the country have suffered from limited rainfall, other parts of the country have suffered from heavy floods due to the high rain in high land parts of the country. Flooding is common in Ethiopia during rain season between June and September and the major type of flooding which Ethiopia is experiencing are; Flash flood and river floods (FDPPA, 2006).Flash floods are mainly linked with isolated and localized intense rain fall. It is a short duration event caused by high peak discharge (Few, 2006). The basic and aggravating cause for flash floods are intensity, duration and distribution of rainfall, steep slopes, sedimentation of rivers channels, absence of vegetation, poor soil infiltration capacity, failure of hydrologic (dam, reservoir, etc) structures, sudden release of water from dams, and landslides (Bekele, 1997). This type of flood could pose a big damage to human life and property because they occur suddenly with very high speed (Greenough et al,2001).

There were flash floods in many parts of Ethiopia at different times. An illustrative example of flash floods is the flood that occurred in Dire Dawa in 2006 which displaced 9,956 people and killed 256 (FDPPA, 2007). River flood is the overflow of rivers from their banks and extend to low lying areas as a result of intense rainfall or a reduction of the capacity of the river (Douben, 2006).

It usually occurs in low land parts of Ethiopia as a result of heavy rains in high land parts of the country. These types of floods buildup slowly and the magnitude depends on many factors such as size of the catchments, the intensity of rainfall and amount of precipitation that fall into the water shed and tributaries, topography, the presence and absence of vegetation, anthropogenic activity in the catchments area, drainage basin (Bonacci et al, 2008).

According to FDPPA (2006) flood prone areas in Ethiopia are the following: “areas in Oromia and Afar Regional States that constitute the mid and downstream plains of the Awash River; places in Somali Regional State that fall mainly along downstream of the Wabishebele, Genalle and Dawa Rivers; low-lying areas falling along Baro, Gilo and Akobo Rivers in Gambella Regional State; downstream areas of Omo River in the Southern Nations, Nationalities and Peoples Regional State; extensive plain fields surrounding Lake Tana and Gumara and Rib Rivers in Amhara Regional .Major effects arise mainly from inundation and erosion and may include the isolation of communities or areas and involve the need for large scale evacuation. The Third World Water Forum: Poverty and Floods held in March, 2003 indicated that in recent years, floods had become more frequent and of increasing severity resulting into loss of life, injury, homelessness, damage to infrastructure and environment as well as impacting on other critical sectors such as education and agriculture.

Flooding is a natural process and part of the hydrological cycle of rainfall surface and ground water flow and storage. Floods occur whenever the capacity of the natural or manmade drainage system is unable to cope with the volume of water generated by rainfall. Floods vary considerably in size and duration. With prolonged rain falling over wide areas rivers are fed by a network of ditches, streams and tributaries and flows build up to the point where the normal channel is overwhelmed and water floods onto surrounding areas. In Ethiopia context, the rainy season is concentrated in the three months between June and September when about 80% of the rains are received. Torrential down pours are common in most parts of the country (Flood Risk Assessment in Ethiopia 2018).

1.2. Statement of the Problem

Flood is the maximum not unusual place sort of catastrophe inflicting extreme monetary losses in numerous a part of the sector (G.Ramakrishna et al. 2014; Toubes et al. 2017). The on the spot impact of herbal failures and different climatic alternate variability on smallholder farmers consist of lack of lives, destruction of vegetation and farmlands, lack of cattle, harm to homes and infrastructure and meals protection hassle many of the affected groups (Alam et al. 2010; Islam & Wong 2017; Okeleye et al. 2016).

Although agriculture is predicted to play a key function in making sure meals protection and usual monetary improvement, its overall performance is generally confined, among different things, via way of means of degradation, unreliable climate situations and underdeveloped technology. The livelihood of many tens of thousands and thousands of farmers in Ethiopia is significantly challenged via way of means of Flood catastrophe. The country agricultural manufacturing has elevated however in line with capita cereal yield stays stagnant (World Bank 2010). About sixteen most important country wide droughts passed off because the Eighties and currently in 2015 and 2017 approximately 10 and five million humans, respectively, had been significantly challenged via way of means of drought (Alemu and Mengistu2019).

Moreover, erosion has critically degraded 50% of the highlands of Ethiopia and is decreasing annual land productiveness via way of means of approximately 2% (Daniel 2001; Tamene et al. 2006; Kebede and Mesele2014). High degradation, weather alternate/variability, lower in grazing land and growing meals and electricity call for because of ever growing populace strain are taken into consideration as a number of the improvement demanding situations in Ethiopia.

Climate alternate and variability worsened the scenario via way of means of growing moisture strain with inside the developing seasons of maximum cereal vegetation (Kindu et al, 2013).

If agricultural manufacturing with inside the low-profits growing nations of sub-Saharan Africa like Ethiopia is adversely tormented by weather alternate, the livelihoods of massive numbers of the agricultural terrible had been be positioned at danger and their vulnerability to meals lack of confidence increases (Abebe, 2013). The susceptibility of the country is annoyed via way of means of terrible agricultural and cattle practices, a delicate and degraded herbal surroundings, vast poverty, confined delivery and communiqué infrastructure, inefficient markets, variable and converting

climatic situations, excessive populace growth, loss of true governance, opposition over scarce sources and border issues (FDREDRMC,2009).

Due to the fast growth of population in Shashogo Woreda, humans are exploiting herbal plants and lengthening cultivation, that have brought about land degradation and deterioration of the ecosystem. As a end result, the region has turn out to be at risk of erosion and flood occasions. Shashogo Woreda has various topography starting from very flat to dissected plateaus. Such remedy kinds are pretty distributed, whilst the very flat a part of the complete region in Shashogo Woreda takes approximately 85 % of all flat regions with inside the complete catchment. Such a topographic setup is assumed to were producing heavy flooding on the low and flat regions thereby widening the seasonal length of Boyo Lake with inside the coronary heart of the Shashogo Woreda.

Most of the tributaries of Lake Boyo provoke their controllers from especially better elevations and the on the spot catchment regions are poorly protected exposing the flat regions to heavy flood at some point of the wet season. In exercise, flooding happens while the extent of water in a river or flow exceeds the potential of the channel. It additionally takes region alongside the lake while better than regular water tiers inundate low-mendacity regions. The very flat lands of the region, mainly flood plains in Shashogo Woreda are at risk of flooding in each 12 months at some point of the wet season. Flood waters stay stagnant for approximately one to 2 weeks over the flood undeniable of the Woreda. As an end result, humans should evacuate. Further, vegetation in massive quantity of regions are submerged main to human socio-livelihoods sufferings. So, it's far essential to recollect most important elements that contributed greater with inside the beyond flood threat calamities. Most of the groups focused with inside the region are placed alongside the Bilate River which flows into the Boyo Lake. The population together with the river will develop over the years. Flood became stated in 14 kebeles of Shashogo woreda from 28 September to 03 October and affected 14,261 people and displaced 5665(Ethiopia Flooding Flash Update, 20 October 2019).

The flood additionally destroyed four essential faculties and 1,772 hectares of discipline vegetation on this region. Almost 3 quarters of the land is makes use of for crop manufacturing, particularly maize and vegetable gardening. Other vegetation grown consists of sorghum, millet, groundnuts, beans, pepper and candy potatoes. Some cattle farming is likewise gift practiced. Owing to its geographical location, that is, alongside the river banks, the groups have a confined potential to manipulate the hydrological occasions resulting from the river catchment (UN-OCHA, 2019).

The region has suffered floods for 3 (four) consecutive rainfall seasons namely; Jun,july.Augest and September .The season has been defined via way of means of the network because the worst in phrases of the quantity of rainfall acquired and degree of impact. The floods triggered displacement of humans from their ordinary living locations ensuing into various influences on infrastructure, vegetation, fitness, training, surroundings in addition to harm to property (UN-OCHA, 2019). In spite of the lengthy age nearby farmers enterprise to conform to the flood result in catastrophe danger, their attempt to obtain resilient livelihood is confined via way of means of numerous elements. This can be partially because, their variation and coping techniques aren't properly organized, now no longer incorporated with improvement polices, won't be according with network priorities and needs.

Furthermore, it could be assumed that their attempt to adapt to flash flood disaster risk and attain more resilient livelihood lacks, collective action and social capital and does not emphasize local decision making processes. Shashogo woreda is one of the agricultural surplus producer regions of Hadiya zone. Farmers with inside the woreda exercise combined farming in maximum elements of woyine-dega agro- ecological situations and pastoralism and agro-pastoralism in kolla agro- ecologic situations of the woreda.

Nowadays, like in most rural areas of Ethiopia, the have a look at woreda is characterized via way of means of closely fragile herbal useful resource base, scarcity of agricultural land and fast deforestation which ended in excessive land degradation with inside the area. Since current beyond, farmers with inside the woreda are going through detrimental effect of flood result in catastrophe danger on rural family's livelihood Farmers suffered losses in inventory and irrigation land whilst farming implements, plantations and sheds alongside rivers have been broken in addition to houses, bridges roads, rope manufacturing hand dams. As a end result of this, livelihoods additives which include human, bodily and herbal capital have reduced and the woreda has turn out to be substantially prone to the impact of flooding catastrophe. Flood result in catastrophe danger and coping techniques evaluation studies on livelihood humans carried out to this point with inside the have a look at region may be very confined and maximum of it makes a specialty of coverage responses to weather alternate leaving out the efforts made to conform in family and network degree. Soil erosion, land degradation, vegetation loss, over utilization of fuel wood, ground water pollution and sanitation problem, exotic weeds and trees and rainy season flooding are some of the environmental problems in Ethiopia face.

Accordingly, rainy season flooding is one of the major environmental problems of the people living in the total Ethiopia. High flood, which is normally due to the intensive rainfall in the up lands of the watershed, sparse vegetation cover, steep slopes and low infiltration capacity of the ground surface. This flood at times of unusually high rainy days over top the normal flood ways and create a lot of calamity to the residents of Ethiopian people. Some people with low income are forced to sprawl over river bed and around the river bank. This has aggravated the flood hazard disaster in the rainy seasons.

Samson (2008), as cited by Sinafikish (2016), made an assessment of the effects of floods specifically on health in Gambella, Ethiopia in relation to the strength and weakness of coping strategy. The study reported that the main impacts of flooding on human health in Gambella region were deaths, injuries, and diseases such as malaria and diarrhea. Another notable consequence of flooding was crop destruction and subsequent malnutrition. But this study is focus on assessment of flash flood induced disaster risk and coping strategies on rural house hold livelihoods of people at house hold level in study Woreda

Therefore, to fill this gap, this study as the first flash flood induced disaster effect on rural household's livelihood in Shashogo woreda, pay due attention to both household and community in the study areas.

1.3. Objective

1.3.1. General Objective of the Study

The general objective of the study is to *Assessment Of Flash Flood Induced Disaster Risk And Coping Strategies On Rural House Hold Livelihood Of People: In Shashogo Woreda.*

1.3.2. Specific Objective

More specifically this study was strive

- To assess the factors flood induce disaster risk on rural household livelihoods in the shashogo woreda
- To identify the effect of flood induce Disaster Risk on rural house livelihoods of the people in the Study Area.
- To identify coping mechanisms employed by the community during flooding Disaster Risk and strengthen positive coping strategies;

1.4. Research Question

- What are the factors of flood induce disaster risk on livelihoods in the shashogo woreda?
- What are the effects of flood induced disaster on the livelihoods of people in Shashogo Woreda?
- What are the sustainable developmental and coverage alternatives to address the trouble of floods
- What are the coping mechanism employed by the community in shashogo Woreda?

1.5. Significant of the Study

The importance of this study will provide the relevant information on the effect of floods on the community socio-economic livelihoods that endeavors to establish the underlying causes of vulnerability of the people in the study woreda and to design the sustainable mitigation measures to minimize the impact of flood and associated risks. Therefore, the result of this study is thought to be crucial inputs to the current governments and end over to alleviate the prevailing flooding Disaster problem in rural community/households and to bring sustainable development. Particularly, GOs, NGOs, researchers and policy makers with flood Disaster related information about the woreda at woreda and regional levels can make use of this study output as reference/milestone to plan for specific rural developmental and livelihood enhancement/ improvement strategies.

1.6. Scope of the Study

Livelihood is very wide concept including many elements and explanatory variables that are related to each other in a complex way. And the effects of flood induce disaster risk can affect all elements of livelihood resources (natural capital, human capital, social capital, physical capital and financial capital). However, this study will focus only on the impact of flood induce disaster risk and its determinants on agricultural production, crop production, farm land size, livestock, water resources availability, leadership skills, rural saving and credit and market access rural in the study area.

1.7. Limitation of the study

The researcher faced several problems. One of the limitations for this study was that some of the respondents are not willing to stay patient until data enumerator filled the questionnaires. However, the researcher tries to manage the situation that convincing households to fill the questionnaires and tell them the study is only for academic purpose. During data collection key informants and focus

group participants busy on their tasks. However, the researchers used to arrange the key informants and focused groups' session by smooth communication with them. Also the study limited were be by lack of information coming from the varies respondents for fear of information confidentiality not being honored by the researcher .This aided in assuring the respondents that the information obtained from households were purely for academic research purpose and were be treated with utmost confidentiality. The study was tackled with other expected obstacles which is included and not limited to accurate information due to household's attention to surveys. The study could have interest to include more *kebeles*. However, due to financial and time constraints the study relied only on the three selected *kebeles*. Due to COVID-19 global epidemic disease the researcher's challenged to discuss face to face with advisors. But the problem solved by communicated via email and technology.

1.8. Organization of the study

This paper is organized in five chapters. The first chapter deals with the introduction part which includes the background of the study, statement of the problem, research questions, objectives, significance of the study, limitation and organization of the paper. Chapter two is all about review of related literature. The third chapter describes research methodology and description of the study area. Chapter four presents discussion and findings of the study. And the fifth chapter deals with summary, conclusion and recommendations forwarded by the researcher.

2. REVIEW OF RELATED LITERATURE

This chapter tries to present an overview of the theoretical literature, related empirical studies, the literature gap and the conceptual framework of the study. It focuses on the causes and impacts of flooding, and land use dynamics vs. flooding. The chapter then concludes by will providing the analytical framework depicting the conceptual roadmap of the study in the context of Shashogo Woreda in three kebele.

Flooding is a natural process and part of the hydrological cycle of rainfall surface and ground water flow and storage. Floods occur whenever the capacity of the natural or manmade drainage system is unable to cope with the volume of water generated by rainfall. Floods vary considerably in size and duration. With prolonged rain falling over wide areas rivers are fed by a network of ditches, streams and tributaries and flows build up to the point where the normal channel is overwhelmed and water floods onto surrounding areas. In Ethiopia context, the rainy season is concentrated in the three months between June and September when about 80% of the rains are received. Torrential down pours are common in most parts of the country.(Flood Risk Assessment in Ethiopia 2018)

2.1. The concept of flooding

Flooding has many different definitions among which Meyer' (2004) definition is worth mentioning. Meyer (2004) defined flooding as flooding is 'the accumulation of water with in a water body and the overflow of excess water on to adjacent flood plains, or it is an overflow of inland or tidal waters, unusual and rapid accumulation of runoff or surface waters from any source'. Flash flooding occurs when the ground under a storm becomes saturated with water so quickly that it cannot be absorbed. The runoff collects in low-lying areas and flows rapidly downhill. Grabs (2011) and Bariweniet.al (2012), cited in Sinafikish (2013), finalized the concept of flooding in this manner that flood occurs when ponds, lakes, and riverbeds have no a capacity to hold additional water due to sedimentation or other related factors, and also it occurs when soil and vegetation cannot absorb or infiltrate all the water may come from rainfall or other sources.

2.2. Types of Floods

Smith (1999) believes that floods are the most common type of disaster worldwide and he also mentions the three major types being categorized as river floods, flash floods and coastal floods.

According to UNESCO (2004), river floods or seasonal floods are caused by seasonal precipitation over large catchment areas, melting of snow or a combination of these. Flash floods or tropical storm floods are associated with violence and are accompanied by heavy rainfalls which become too much for the streams and rivers to handle, and they overflow and produce floods. They have short duration, and are measured in minutes not hours. Lastly, the coastal floods which include storms, winds and other events cause ocean water to overflow and lead to onshore flooding.

2.3. Causes and Consequences of Flooding

According to Mulugeta (2016) and Sinafikish (2013), floods are caused by many factors such as heavy rainfall, highly accelerated snowmelt, severe winds over water, unusual high tide, tsunamis, or failure of dams, levees, retention ponds, or other structures that retained the water. In other way, flooding can be exacerbated by increased amounts of impervious surface or hard ground cover that not allow the water to pass thorough as well as by other natural hazards such as wildfires, which reduce the supply or the amount of vegetation cover that can absorb rainfall.

Mulugeta (2016) indicated that floods can occur due to meteorological, partly meteorological or other causes, which can exacerbate the occurrence of flooding. Meteorological causes include snowmelt, rain, and combination of rain and ice melt. Coastal storm surges and estuarine interactions between stream flow and tidal conditions entail the partly meteorological causes (Alexander, 2000). The remaining causes of floods can be attributed to other natural hazards such as earthquakes, landslides,

According to Sinafikish (2013), land use is being dynamically shaped under the influence and interaction of two broad sets of forces human needs and environmental features and processes. Land use occurs as a result of natural process such as climatic variation, volcanic eruptions, change in river channels or the sea levels, etc. However, most of the land cover changes of the present and the recent past are due to human actions or intervention to using of the land for production or settlement. This is because of the different socio-economic drivers including demographic, social, economic, technological, market, political and institutional factors and their processes. There are two major aspects that connect land use and flooding. The first one is the location or existence of values and key components of the economy on flood plains provides economic benefits and at the same time creates risks for the society in terms of flood loss potential. Secondly, the development of land through different construction activities has consequences on the flow of water on the one hand, either by

accelerating runoff through reducing the infiltration capacity of soils or obstructing the natural drainage system as well as sediment and pollutants on the other hand. In general, human alterations of the catchment area can significantly contribute to changes to all those processes that are the hydrological processes through large scale land use changes and land use practices. In addition to this, with increasing human alteration and development of the catchment area, the runoff generation process is changed, especially through decreasing the infiltration capacity of the soil and the change of soil cover. This has led to a great concern over human beings which play a great role in increasing flood hazards through the alterations of the catchments (WMO, 2008). outbreaks after floods in tropical countries are also common. It has been estimated that in India and Bangladesh 300 million Different population segments can be exposed to greater relative risks because of their socio-economic conditions of exposure.

Hanson, *et al.* (2007:405) states that reducing poverty is one of the great challenges facing the world.

Over half of the world's poor live in rural areas. Poverty worsens when natural hazards destroy vital rural infrastructure.

Asia is struck by 70% of all floods in the world and the average annual cost of floods over the past decade is approximately 15 billion USD. Economic losses and impacts have remained high and constitute a large developmental burden. They suggest that there is a need for new types of strategies in order to cope with the financial burden from hazardous events. One of the largest deltas in Vietnam is seriously threatened by floods. Lives

and property are threatened by annual flood events which impose a substantial burden on the community.

The area has experienced increased flooding due to its dense and increasing population and its location in a low land.

Borrows and De Bruin (2006:1) indicated that among natural catastrophes, flooding has claimed more lives than any other single natural hazard. In the decade 1986 to 1995, flooding accounted for 31% of the global economic loss from natural catastrophes and 55% of the casualties. The damaging effects of flooding are likely to become more frequent, more prevalent and more serious in the future. Douben (2006) states that since ancient times people have settled in flood prone areas due to favorable geographic conditions which facilitate economic growth, such as accessibility (transportation) and food production (fertile land). This fact forces societies all over the world to protect vulnerable assets against flooding. Nevertheless, flooding is still the most damaging of all natural disasters and more than

half of all victims are flood related. Flood mitigation policies and measures should therefore be implemented in order to enable societies to increase their resilience to flood hazards.

Mirza, et al. (2003) states that flood disaster has different impact on individuals, households and communities. People cope in different ways. Those who have the capacity after being hit by disaster emerge faster while those without such capacity sink deeper into the spiral of impoverishment. Coping strategies include actions such as migration from floods affected areas, flood forecasting, flood insurance of animals and crops, food stockpiling, providing emergency health services and building flood shelters. They have, however, not been woven systematically into the approach to achieve security from flooding. If the approaches build on coping strategies and seek to identify new ones, they could address the social impacts of flood problems affectively at a lower social, economic and environmental cost than approaches that attempt to manage or control the resource base itself (Mirza, et al. 2003:7).

Zahiran,et al. (2008:537) observed that floods are the most lethal kind of hydro-meteorological disasters in the United States. According to data from the Spatial Hazard Events and Losses Database for the United States (SHELDUS), floods claimed the lives of 2,353 people from 1970-2000. Over this period, fewer people were killed by hurricanes, tropical storms and tornados combined. In support of this observation, the Federal Emergency Management Agency (FEMA)estimates that flood events are responsible for the death of more than 10,000 people in the US since 1900.

This study undertaken in Texas established that socially vulnerable populations suffer disproportionately in terms of property damage, injury, and death as a result of physical impacts of disaster. For reasons of economic disadvantage, low human capital, limited access to social and political resources, residential choices, and evacuation dynamics are the social factors that contribute to observed differences in disaster vulnerability and economic class.

Brouwer,et al.(2007:313) states that Bangladesh is a highly flood prone country. Eighty (80)percent of the country consists of floodplains and several other minor rivers. These flood plains sustain a predominantly poor rural population. Once every ten (10) years roughly one third of the country gets severely affected by floods while in catastrophic years such as 1988, 1998 and2004,more than 60% of the country was inundated. Floods caused social disruptions and resulted in scarcity of drinking water as surface water got contaminated. Cases of diarrhea, cholera and other diseases increased remarkably during and after floods. The increased volume of rainfall caused by climate change during the past

decades has intensified the flood problem. The hardest hits by flood disasters are the poor people who also have very little capacity to cope with the loss of property and income (Brouwer, et al.2007:314).

A study carried out in 2005 in Southeast Bangladesh confirms the positive relationship between environmental risk, poverty and vulnerability. Poorer segments of society live closer to the river and therefore face a higher risk of flooding and are thus more vulnerable. Environmental risk exposure also goes hand in hand with income inequality and access to natural resources(Brouwer, et al.2007:324). Families living nearer to the river seem to have fewer opportunities to engage in multiple economic activities which make them more vulnerable to natural disasters and may keep them trapped in a poverty cycle (Brouwer, et al.2007:325).

Dixit (2003:156) stated that in Southern Nepal, flooding leads to large scale disruption of social and economic lives. The rivers bring large sediments whose deposition on agricultural lands harms productivity. The poor mostly live in these floodplains (vulnerable zones) because they have no opportunity to live in less hazardous areas. In Nepal, every year floods cause death, cultivated fields and irrigation, bridges and after rural infrastructure.

He argues that policymakers, donors and relief and development agencies treat flood disaster as isolated events that break the continuity of the normal way of life. Most interventions to mitigate disasters are ad hoc responses made under the assumption that an emergency support in the form of relief will help overcome the situation of hardship. Such support aims at restoring the situation to what it was before the disaster. Even when a flood disaster affects the same community every year, government, donors and Non-governmental organizations respond by providing the same relief and rehabilitation measures each time. This approach does not consider the situation of a society during normal times between the occurrences of two hazard events.

Disasters are considered as a coincidence when a hazard interferes with society. According to Dixit (2003:166), research shows that disasters are the outcome not only of natural hazards but also of socioeconomic structures and political process that make individuals and families vulnerable.

Dixit (2003:167) further points out that vulnerability is the condition of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. Even in normal times people live in vulnerable conditions. Vulnerable conditions and families find it hardest to reconstruct their livelihood following a disaster. Families do not live in conditions that are vulnerable to disasters out of ignorance about the hazard sort their erroneous perceptions of risk. Instead, most have little freedom to

choose how and where they live. Vulnerability therefore is not static but a dynamic process that depends upon the social, economic and political contexts that change overtime, which will consequently affect the probability of loss.

On the other hand, he suggests that strengthening social resilience capacity would reduce vulnerability. These social, political and economic conditions and their interrelationships during normal “times” determine why certain sections of the societies are more vulnerable to disasters than others. The flood afforded an opportunity to study some important questions about the role that coping can play in disasters. First does coping make a difference in terms of outcomes? With the effect of disasters being so devastating and overwhelming, do human coping efforts have an impact on how people ultimately fare in their aftermath? Second, if coping does make a difference, what are the effects of different coping strategies? Third, how is coping related to some of the other factors that may influence disaster outcome? What variables are important to control for when examining the role of coping in disasters? Fourth, how does the influence of coping vary across different kinds of outcomes? For example, does coping affect psychological and physical health in the same way? Each of those questions has evolved out of previous research undertaken. Despite the overwhelming nature of disasters, there is growing evidence to suggest that coping may significantly affect the outcome for those involved (Smith 2008:226).

Rashid (2000:240) described the 1998 floods that hit Bangladesh as the worst in the last century. Almost two-thirds of the country was submerged under water and millions were affected. A total of 33 million people were marooned of whom 18 million needed emergency food and health services in 52 districts. The floods continued for more than 65 days. They destroyed basic infrastructure like roads and bridges as well as houses, crops, animals and cattle. The most damaging aspect of the flood was the destruction of people’s means of livelihood. The response to the floods included distribution of food, medicine and clothing for the poor.

In the severely affected areas, boats became the principal means of communication and many slum dwellers coped by living in shelters and relief camps while others made arrangements in their own homes to deal with the rising flood waters. They refused to move, as they did not want to leave their household belongings behind.

The 1998 floods clearly illustrated the people’s despair and utter helplessness, with no homes, all the property destroyed and no money to buy food. According to Rashid (2000:245), women and children are the most vulnerable during the disasters. During the 1998 floods, the women shared stories about the difficulties they faced in gaining access to basic sanitation as most of the latrines were submerged by the

floodwaters.

They resorted to a number of desperate measures to cope with the predicament. Some of the women admitted walking long distances with female relatives or planned trips together by boat to other less flooded areas to use the latrines. During these particular floods almost all of the wells were covered by the flood waters. Number of women managed to cope by purchasing water from individuals who owned deep wells. Children were mainly affected with diarrhea as many of them swam in the dirty floodwaters to fetch relief items, and some of them played in the dirty water out of boredom, even drinking and bathing in it. Some of affected people developed skin and fungal infection on their legs and feet due to dirty flood waters. Further, widespread incidences of diarrhea, fever, coughs, cold, other skin infections and even cases of jaundice were reported.(Rashid 2000:247).

According to Mustafa (2002:94), despite Pakistan's massive investment in its water sector, it still remains vulnerable to the flood hazard. Pakistan suffered major floods in 1950, 1956, 1973, 1976, 1988 and 1992, each affecting more than 10 thousand lives. The 1992 floods cost the country more than 3 percent of its total GDP. According to the study undertaken in four villages in Central Pakistan, the people attributed their vulnerability to floods to poverty, God's will, socio-economic powerlessness and Government (Mustafa 2002:100).

Ninno, et al. (2003:1221) stated that the 1998 floods in Bangladesh caused severe damage to the rice crop and threatened the food security of tens of millions of households. Government food transfers to the affected people helped limit the impact of the flood on household access to food. The flood led to major crop losses, losses of other assets and lower employment opportunities and thus affected household income as well as market prices (Ninno, et al .2003:1224).

Carey (2005:122), argue that human populations worldwide are vulnerable to natural disasters. Certain conditions such as geographical location or people's income level can affect the degree to which natural disasters impact people's homes and livelihoods. Gao, et al. (2007:27) states that although water shortages often grab the headlines, floods continue to be the most serious natural disaster in China. This is despite enormous efforts to construct structural engineering projects for flood control.

The catastrophic 1998 floods in the Yangtze and Songhua river basins, for example, directly affected nearly one out of five Chinese. The severity of floods was clearly influenced by erosion in the watershed and the heedless reclamation of lakes. Although fewer lives were lost than in the past floods, the populations

living along China's major rivers and lakes remained inordinately vulnerable to flooding events. They indicate that historical records indicate that China has suffered from a recorded flood disaster on an average of about once every 2 years. The nationwide flood disaster in 1931, for example, led to the deaths of almost 400,000 people in eight provinces. According to Mohapatra and Singh (2003:131), among all natural disasters, floods are the most frequent to be faced in India. On an average, floods have affected about 33 million persons between 1953 and 2000. This figure may have risen due to population growth. From the global level outlined above, it is clear that floods have had adverse impact on people's lives and livelihoods. The African continent has not been spared by the floods. According to UNEP (2006), the continent, home to approximately one (1) billion people is more vulnerable than any other continent to climate change. Almost two (2) billion people were affected by disasters in the last decade of the 20th century. Eighty-six percent (86%) of these were floods and droughts.

Heavy rains destroyed homes and crops, leaving whole communities vulnerable. Rising floodwaters across Africa are intensifying health risks for millions of people. Major floods in early 2008 plunged Southern Africa into a growing humanitarian crisis killing dozens and displacing thousands.

Du Plessis(1988:11) stated that in South Africa, the farming sector had been particularly hit by the successive floods of 1983, 1984 and 1985. Various farming products had to be imported to supply the domestic market.

Further, grazing capacity had been reduced that some stock had to be thinned until only the studs remained. The outcome had been that in certain areas, farmers obtained no income and inexorably built up debt. The shrinking income of farmers had meant that they had invested less in farming implements, reduced their sowing and purchased less fertilizer. This in turn had led to the over production of certain farming requisites and chemicals which had necessitated rationalization in those industries.

In 1986/87, floods hit again and had an adverse direct impact on both the farmer and the consumer and had also seriously damaged the infrastructure of riverside towns. Farmers suffered losses in stock and irrigation land while farming implements, plantations and sheds alongside rivers had been damaged as well as houses, bridges roads railways lines, telephone connections and dams. In many places the supply of drinking water had been affected and apart from the special measures that had to be taken in this regard, it was also necessary to introduce preventive health measures (Du Plessis 1988).

Snoussi, et al. (2008:206) said that it has been recognized that climate change and sea level rise will impact seriously upon the natural environment and human society in the coastal zones. In Morocco, for

example, the coastal zone forms one of the main socio-economic areas of the country with more than 60% of the population inhabiting the coastal cities as well as incorporating 90% of the industry, making them more susceptible to flooding. Parker (2000:188) observed that in many African countries, floods create great natural threats to life, health and population. The exposure and vulnerability of human settlements and activities to floods is partly explained by the important role which flood plains play in African Societies and economics, and partly by the condition of societies and the resilience they are able to present in the face of disaster. In addition, there is an important feedback effect between environment degradation caused by African societies and increased vulnerability to flood hazards and tropical storms. Parker (2000) further argues that the damaging effects of flood on African societies are complex. Extreme events affect both the formal and informal economics, making it difficult to assess impacts which include direct and indirect ones.

The most tangible form of damage caused by floods is structural damage to homes, shops and public buildings and their contents and loss of crops and livestock. Depending on how well they are constructed and the severity of the event, buildings may be partially or totally destroyed by flooding. The number of reported homeless persons following floods is particularly high because of the vulnerability of dwelling to rain and flood. Floods frequently cause major infrastructure damage including damage of roads, railway lines, airports, electricity supply systems, water supply and sewage disposal systems. Bridges over rivers are particularly exposed to damage and disruption of transportation systems follows.

The economic effects of flooding are often much greater than the flood itself (Parker 2000). According to Parker (2000), because floods frequently destroy crops and livestock, food shortages are not uncommon in the aftermath. For example in the Sudanese floods of 1988, a food shortage arose immediately. Floods may affect food availability in a number of ways. Food stocks may be damaged if storage areas are flooded. Serious flooding usually disrupts transportation of food and insufficient food supplies are likely in food deficit areas, particularly in towns, which are cut off from supply sources and have inadequate food stocks. The flood that hit Sudan in 1988 is a good example of an extreme flood event. The sudden and unexpected flow of water of the White and Blue Nile due to unprecedented torrential rain caused serious property damage and human sorrow. In Khartoum province alone food production fell by at least 60% and damage included irrigation canals, sewage system, electricity, roads and water system. Severe losses were reported in agriculture, the main economic activity of the population (Disaster Risk Management Study Guide for DIM 605: Module 2).

According to OCHA (2008), the cumulative number of people affected by rains and floods in 2007 in

Southern Africa was more than 194,103 persons. This included 60,995 in Malawi (mostly damage to property and crops), 94,760 people in Mozambique (all were evacuated into resettlement camps); more than 16,680 in Zambia (1,890 persons in temporary accommodation, the rest in host families); and 15,168 in Zimbabwe. An estimated additional 4,000 people had been affected in Lesotho and another 2,500 persons in Swaziland. In 2008, thousands of people were affected after flash floods submerged hundreds of hectares of farmland in the north-eastern region after floods displaced hundreds of families in the region. The farmland which supported some 1,200 farmland had their livelihoods and food security disrupted (IRIN 2008).

Theron (2007) indicated that at least 20 countries in Africa were affected by floods. These countries included Algeria, Berlin, Burkina Faso, Cote d'Ivoire, Ethiopia, Gambia, Ghana, Guinea, Kenya, Liberia, Mali, Mauritania, Nigeria, Rwanda, Senegal, Sierra Leon, Sudan, Togo and Uganda. Reports estimated that approximately 300 people in 20 countries had died in floods during a period of two (2) months, noting that the inaccessibility of the affected areas had made it difficult to accurately access the death toll.

The destruction of roads and other infrastructure delayed ongoing development initiatives and political processes (Theron 2007). He observed the immense damage to farms, crops and livestock caused long term food insecurity. The Ivory Coast flooding occurred very close to harvest time making the loss even greater, since farmers did not have much food stored from the previous harvesting season.

Floods also caused loss of soil fertility which lessened future harvests. In the long-term, affected areas had to deal with the spread of infections and water borne diseases, cholera, dysentery and diarrhea which increased the need for safe drinking water and the provision of water purification tablets. He further observed that the displacement of people and damage to infrastructure disrupts.

African societies in their development effects and impact on the achievement of almost every Millennium Development Goal, for example, damage to schools in Uganda left at least 100,000 children out of school.

A study conducted on poverty, Vulnerability and the Impact of flooding in the Limpopo Province in South Africa argue that while disasters may affect everyone and play an important role in increasing vulnerability, poor people are made more vulnerable from a web of circumstances that make them prone to the effects of disasters (Khandlhela and May 2006:276). In this study, they established that the varying impact of floods on households and the community and large showed that vulnerability to the effects of a flood disaster is indeed an outcome of the interaction between socio, economic and political process.

Adamson (1983:24) states that extreme events such as floods over Southern Africa have resulted in loss of life, massive damage to property, crops and livestock and disrupted communications. The risk of such

events at any point in the subcontinent may be small but their occurrence within the total sub-continental space has been historically quite frequent.

The Laingsburg flood disaster of January, 1981 has been described as South Africa's greatest Natural Catastrophe. The flood waters washed away a considerable part of the town with loss of 100 lives. In addition to loss of lives extensive damage was largely on bridges and irrigation schemes. The heavy rains of January, 1974 had a disastrous effect on the agricultural economy of the central regions of South Africa. From the literature reviewed, it's clear that the increasing population of our planet is leading to the increasing exposure of people and property to hazards of flooding. This assertion is in line with the findings of the research which has confirmed that the population of people living along the river banks in the study area has increased over the years and has made them susceptible to the flooding. With the increased population on our planet, it may be expected that the effects of climate change will further aggravate this. At present, there are not sufficient and effective measures globally to limit the growing chance and consequence of flooding.

The evidence is that flood risk is increasing and continuing vigilance is needed to ensure that existing systems are maintained and improvements introduced. It is imperative that human society adopts a risk management approach if there is to be harmonious coexistence with floods. In practical terms, the chance of flooding can never be eliminated entirely. However, the consequences of flooding can be mitigated by appropriate behaviors and actions. Successful flood risk management independent upon the active support of all on whom the effects of flooding may impact, those directly at risk, the civil authorities and the wider community and its leaders.

The literature suggests that socially vulnerable or disadvantaged households have lower levels of disaster preparedness. Flood risk is expected to increase substantially in coming years as a result of both climate change and continued socioeconomic development. Further, it's clear that most flood studies acknowledge that floods have had negative impact on people. However, the studies have tended to address the subject matter depending on the objective of the study. These literatures reviews suggest that the documentation of longer term flood impacts on communities vary markedly.

2.4. Vulnerability context

Refers to seasonality, trends, and shocks that affect people's livelihood. The key attribute of these factors is that they are not susceptible to control by local people themselves, at least in the short and medium term (DFID, 2000).

2.5. Livelihood Resources (Assets)

Livelihood assets are the resources on which people draw in order to carry out their livelihood strategies (Farrington et al., 2002). The members of a household combine their capabilities, skills and knowledge with the different resources at their disposal to create activities that will enable them to achieve the best possible livelihood for themselves. Everything that goes towards creating that livelihood can be thought of as a livelihood asset (Messer and Townsley, 2003).

The livelihood approach respects the asset status of households as important to understanding the choices open to them, containing diversification into non-farm activities.

The asset location of a household has a significant effect on household participation in non-farm activities.

The major livelihood assets are;

2.5.1. Social capital:

which refers to networks and connectedness, Kollmair and Gamper, (2002) asserts that in the context of the SLA it is the social resources up on which people draw in search of their livelihood outcome such as networks that add to peoples trust and ability to cooperate or participate in a membership of more formalized groups and their arrangements of rules, norms and sanctions.

2.5.2. Financial capital:

like savings, credit, and remittances from family members working outside the home(CARE, 2001; Bezemer and Lerman, 2003); and

2.5.3. Natural capital:

This is the natural resource stock from which resource and service flow, for instance, good air and water quality and foundation for good health and other features of a livelihood (Kollmair&Gamper, 2002).

2.5.4. Human capital:

Like age, education, gender, health status, household size, dependency ratio and leadership potential, etc. (Bezemer and Lerman, 2003; Farrington et al., 2002; Kollmair and Gamper, 2002);

2.5.5. Physical capital:

comprises the basic infrastructure and producer goods needed to support livelihoods, such as reasonable transport, sheltered and housings, sufficient water supply and sanitation, reasonably priced energy and access to information (DFID, 1999);

2.6. Policies and institutions

Policies and institutions which influence rural household's access to livelihood assets are also important aspects of livelihood framework (DFID, 2000). Institutions are the social cement which link stakeholders to access to capital of different kinds to the means of exercising power and so define the gateways through which they pass on the route to positive or negative [livelihood] adaptation (Scoones, 1998).

2.7. Livelihood strategies

According to DFID (1999) the term livelihood strategies are defined as the range and combination of activities and choices that people make in order to achieve their livelihood goals, including productive activities, investment strategies, reproductive choices, etc. Livelihood strategies are composed of activities that generate the means of household survival and are the planned activities that men and women undertake to build their livelihoods (Ellis, 2000).

2.8. Livelihood outcomes

Livelihood outcomes are the achievements of livelihood strategies, such as more income (e.g. cash), increased well-being (e.g. non material goods, like self-esteem, health status, access to services, sense of inclusion), and reduced vulnerability (e.g. better resilience through increase in asset status), improved food security (e.g. increase in financial capital in order to buy food) and a more sustainable use of natural resources (e.g. appropriate property rights) (Scoones,1998).

In the circumstance of this study, activities are taken by the household to produce income, such as engagements in non-farm, waged-employment, self-employment and a mix of farm and non-farm engagements. The decision on the set of activities a household will involve itself in, and the strength of those activities, is trained by the arbitrating processes and the context in which the household operates. Social relations, institutions, and organizations are critical mediating factors for livelihoods.

Movements and shocks constitute the context influencing household decisions through natural and non-natural forces (draught, floods, population growth macro-policy, technological changes, etc.).

The asset location of household is facilitated by social relations, institutions and organizations result in the acceptance of livelihood strategies, which are collected of activities that produce the means of household survival. Livelihood results are the achievements or outputs on livelihood policies. For the purpose of this study they are what the study is seeking to achieve is through diversification into non-farm activities. An attempt is made to build this study around the above ideas of livelihood and diversity. In the same vein, Ellis (2000) has defined livelihood and diversification as indicated in the following quotation.

A livelihood comprises the assets (natural, physical, human, financial and social capital), the activities and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household. Diversity refers to the existence, at a point in time, of many different income sources, thus also typically requiring diverse social relations to underpin them. Diversification, on the other hand, interprets the creation of diversity as an ongoing social and economic process, reflecting factors of both pressure and opportunity that cause families to adopt increasingly intricate and diverse livelihood strategies (Ellis 2000:14)

2.8. Economic, social and environmental impacts of Flood

Infrastructure losses such as transportation, communication network, water supply and sewer system

Government facility losses (including military) Residential losses such as property, Furniture Public facility losses such as schools, hospitals Employing business losses, Sales Losses Displacement of business and farm, Job losses, Income losses. Agricultural losses: an acre of agricultural land and facilities, loss of crops, animal losses, Loss of recreational facilities and Resources. Increase in operational costs such as fuel and lost time due to traffic delays and use of alternative routes and resources. Cost of emergency measures. Increased taxes due to cover costs of replacement, repair and rehabilitation of infrastructure and public facilities.

2.9. Social impacts of Flood (source: Petersen 2001

Human endangerment Loss of life. Human injury (physical, emotional, psychological Displacement of people. Health hazards: polluted water, communicable diseases, shortage of food supply, exposure to cold, rain etc due to lack of shelter. Emotional and psychological trauma associated with loss of

relatives and loved ones, loss of personal property and memorabilia, homes, Loss of social (community) Cohesion Communities, Disruption of educational Programmes Loss of security related to job and income interruptions, Loss of recreation Opportunity. Disruption of cultural programmes (sports events, church programmes etc) Disruption of law enforcement programmes.

2.11. Environmental impacts of Flood (source: Petersen 2001)

Destruction of flora Destruction of fauna, Damage to habitats, food chains, species diversity and stability, Damage to rare to endangered species, Damage to natural recreational resources Damage to scenic resources, Damage to archaeological and historical resources (source: Petersen 2001)

2.12. Flood Risk Assessment in Ethiopia

Flooding is a natural process and part of the hydrological cycle of rainfall surface and ground water flow and storage. Floods occur whenever the capacity of the natural or manmade drainage system is unable to cope with the volume of water generated by rainfall. Floods vary considerably in size and duration. With prolonged rain falling over wide areas rivers are fed by a network of ditches, streams and tributaries and flows build up to the point where the normal channel is overwhelmed and water floods onto surrounding areas. In Ethiopia context, the rainy season is concentrated in the three months between June and September when about 80% of the rains are received. Torrential down pours are common in most parts of the country.

Soil erosion, land degradation, vegetation loss, over utilization of fuel wood, ground water pollution and sanitation problem, exotic weeds and trees and rainy season flooding are some of the environmental problems in Ethiopia face. Accordingly, rainy season flooding is one of the major environmental problems of the people living in the total Ethiopia. High flood, which is normally due to the intensive rainfall in the up lands of the watershed, sparse vegetation cover, steep slopes and low infiltration capacity of the ground surface. This flood at times of unusually high rainy days over top the normal flood ways and create a lot of calamity to the residents of Ethiopian people. Some people with low income are forced to sprawl over river bed and around the river bank. This has aggravated the flood hazard disaster in the rainy seasons.

2.13.1. Empirical Literature Review

2.13.2. Effects of flood induced risk on Rural Livelihoods

Agriculture is a means to feed the ever growing world population and agricultural activities often harm the environment by deteriorating the quality and quantity of locally available natural resources. Nowadays, the problem is a challenge to implement efficient and profitable ways to produce sufficient safe food, while avoiding extraction and degradation of natural resources and having the environment under rapidly changing climatic condition (Fuhrer, 2007). Compared to other sectors of a country economy, agriculture is more vulnerable to climate change. The effect of flash flood induced disaster risk on agriculture and human well-being include three important aspects of biological effects on crop yields, impact on outcomes including prices, production and consumption and effect on per capita calorie consumption and child malnutrition (Nelsson et al, 2009).

According to FAO (2010), the rising of temperature and variation of rainfall patterns have direct effects on crop yields. Price fluctuation is one of the indicators that show the effect of climate change on agriculture. The primary effect of food induced disaster risk on human welfare is the change in calorie availability and an increasing number of malnourished children. Flood induces disaster risk likely to affect either food price or production and nutritional security hence, income disparities and availability of food for the society is very vulnerable to food insecurity (Keulen et al, 1998). According to IFPRI (2007), “global climate change poses great risks to poor people whose livelihoods depend directly on agriculture, forestry and other natural resources”. Hunter (2007), explain that climate change can reduce the availability of local natural resources, limiting the options of rural livelihoods that depend on natural resources and land become less fertile. The population in Africa has greatly exceeded the carrying capacity of the continent. Excessive demands have been made on soil, water, rangelands, forests and wildlife. As a result of the degradation of these resources, the quality of life for many Africans has sharply decreased (Owen et al, 1990).

Many countries in tropical and subtropical parts of Africa are expected to be vulnerable to the impact of flood disaster risk . The problem of sustainable water supply is a major challenge for African countries and climate change exacerbates an already problem of water supply in rural areas (Alemayehu, 2012). In addition, climate change aggravates the impact and as a result countries face semi-arid and arid conditions that make agriculture very challenging (Dinar et al, 2008). A large

number of studies and research constitute an evidence of the variability of climate change and its impact. Besides, the effect of climate change on agricultural production, it also has an impact on various physical, human and capital aspects of the country which indirectly disable the economic, social and political factors of the government, above all the rural people access to the food is threatened (FAO, 2008; FAO, 2010). Predominantly, small holders and subsistence agriculture are more vulnerable to the effect of flood induce disaster risk . The impact of flood induced disaster risk is not only affecting or changing the surrounding environment of a particular area, it is also the cause for food insecurity in different parts of developing world plus widening the gap between poor and rich. In 1983 FAO defined food insecurity, “Food insecurity exists when people do not have adequate physical, social and economic access to food” (FAO, 2006).

Ethiopia has experienced a worsening food insecurity problem for several years. However, the country has been structurally food deficient since at least 1980’s. Drought, war, a fragile natural resource base and weak institutions, inconsistency in governmental policies are structural factors that contribute to food insecurity (Deverux, 2000; Negatu, 2004). Ethiopia has a total land area of about 1,104,300 square kilometers of which 10.01% is arable land, 0.65% is under permanent crop and 2,900 square kilometers is irrigated land (CIA World fact book, 2012). The country has a population about 82 million. Agriculture remains by far the most important sector of the economy because: I. It contributes with 42% the GDP (Gross Domestic Product) II. More than 80% of the country export items are from the agricultural sector III. Almost 80% of the people depend on agriculture in terms of livelihood and employment (US Department States, 2011). Ethiopia is one of the examples of how climate change affects Africa (Haakansson, 2009).

Based on UNDP (2007/2008) human development report, 46% of the population in Ethiopia is malnourished and 77.8% of the population earns less than two US dollars a day. Moreover, The World Bank (2012), states that Ethiopia is one of the countries extremely vulnerable to flood induced disaster risk and natural disasters such as flood, heavy rain, frost and heat waves. This extreme weather, because of the impact of climate change, causes the loss of peoples and livestock live, livelihoods of farmers and their properties disrupts. From the nine regions which make up FDRE (Federal Democratic Republic of Ethiopia), SNNPR (Southern Nations and Nationalities People Region) is one of the most diversified culture, religion and ethnic group which comprise a tribal matrix of 56 different ethno-linguistic groups (PDC, 2009).

Agricultural drought and socio economic drought are perspectives of drought caused by climate change (Dietz et al, 2004). As agriculture is the main livelihood of the Konso woreda, farmers face both an agricultural drought problem and a socio economic problem. The rapidly growing number of population in the woreda increase the demand of food, resources, land and other basic needs for life, especially, during drought time the problem were become very challenging for the community.

2.13.3. Effects of flood induced disaster risk on Agriculture

Flood disaster and agriculture are interrelated. The interrelationship between the two is on the one hand, agriculture and changes in land cover, food system, emit greenhouse gases that contributes to flood and on other hand, flood affects agriculture. Given the over-dependence on rain-fed agriculture by the majority of people living in rural areas, flood induce disaster risk and variability has been one of the major limiting factors in agricultural production, resulting in food insecurity and low-income generation (Tanner and Mitchell, 2008). The studies conducted by Rosenzweig (2002) revealed that changes in rainfall patterns and amounts have led to loss of crops and reduced livestock production. As has been also indicated by Chakraborty, Tiedemann and Teng (2000), climate change affects agriculture in two ways direct and indirect. Changes in climatic factors (for example, temperature, and rainfall) affect agricultural productivity through physiological changes in crops. In addition, flood induce disaster risk also affects other factors of production in agriculture, such as water availability, soil fertility, and pests (Porter et al., 2014).

The overall effect of flood induce disaster risk on agriculture could be positive or negative; the magnitude of impact can also vary from very low to very high, depending on regional or geographical location and status of socioeconomic development (Mendelsohn, Dinar and Wereiams, 2006; Tol, 1995; Tol et al., 2004; Tripathi, 2016). Increasing impacts of climate change and variability on agriculture have been associated with various adaptations and coping mechanisms (Gwambene, 2007). Agricultural adaptation is a vital policy response that were shape the future severity of climate changes impacts on food security. In 1999, Adams and colleagues indicated that adaptation can lessen the yield losses that might result from climate change, or improve yields where climate change is beneficial.

2.13.4. Effects of flood induced disaster risk on the Livestock Production

Similar to crop production, the impact of climate change and variability in the livestock production is generally negative. Heat stress and its impact on seasonal water availability have a variety of detrimental effects on livestock, with significant effects on milk production and reproduction in dairy cows, and swine fertility (Niguse, 2011). Drought and delay in the onset of rain led to poor grass regeneration/forage deficit, water shortage and heat stress on livestock, and consequently increased the mortality of the livestock, vulnerability to diseases and physical deterioration due to long distance travel for water and pastures (Abate, 2009).

Flood induced disaster risk affects livestock both directly and indirectly. The direct effects from air temperature, humidity, wind speed and other climate factors influence animal performance: growth, milk production, wool production and reproduction. Flood induced disaster risk was having far-reaching consequences for dairy and meat production, especially in vulnerable parts of the world where it is vital for nutrition and livelihoods. The impact of flood disaster risk can heighten the vulnerability of livestock systems and exacerbate existing stresses upon them, such as drought (Abebe, 2013). The most vulnerable communities to the impacts of climate change inhabit the dry lands areas. Pastoralists inhabiting dry lands have been able to survive the harsh environments practicing various sustainable livelihood approaches including seasonal movements, keeping livestock, among others (UNDP, 2010).

2.13.5. Impacts on Water Resources Availability

Water is an essential resource for all life and a requirement for good health and sanitation. It is a critical input for industry and essential for sustainable growth and poverty reduction. Flood induced disaster was altering patterns of water availability by intensifying the water cycle. Droughts and floods were become more severe in many areas. There were be more rain at high latitudes, and less rain in the dry subtropics (Pender, J.S. 2001). Observed warming over several decades has been linked to changes in the largescale hydrological cycle such as: increasing atmospheric water vapor content; changing precipitation patterns, intensity and extremes; reduced snow cover and widespread melting of ice; and changes in soil moisture and runoff. Precipitation changes show substantial spatial and inter-decadal variability (Bates et al, 2008).

Climate change is also likely to intensify the current challenges of water scarcity and water competition within and between communities and nations, linked by hydrological flows across watersheds and basins. By the middle of the 21st century, annual average river runoff and water availability are projected to increase as a result of flood induce disaster at high latitudes and in some wet tropical areas, and decrease over some dry regions at mid-latitudes and in the dry tropics.

Poor and vulnerable populations of SSA are likely to face the greatest risk. Moreover, there is recognition that climate change, mainly as a result of human action, is impacting SSA more than other continents because its economies are largely based on weather sensitive crop-livestock and agro pastoral production systems and also due to the low adaptation capacity of SSA countries to climate change and variability (FAO, 2011).

2.13.6. Impact of Flood induced disaster risk on Rural Livelihoods

Climate change is understood as a change in the statistical properties of the climate system when considered over long periods of time, regardless of cause. Accordingly, fluctuations in average temperature, average rainfall and others over periods of more than 20 years may represent climate change while climate variability refers to variations in the mean state and other climate statistics (standard deviations, the occurrence of extremes, etc.) on all temporal and spatial scales beyond those of individual weather events. Variability may result from natural internal processes within the climate system (internal variability) or from variations in natural or anthropogenic external forces (external variability) (Houghton and John, 2001).

The major and almost the exclusive livelihood activities of the rural Ethiopia are crop production, livestock rearing, natural resource extraction, and only less than small percentage engaged in off-farm activities. Hence, given the inherent link of these livelihood activities to natural resources, they are largely at the mercy of uncertainties driven by climate change, including extreme events such as flooding and drought. Over the last decade or so, climate change (in terms of long-term changes in mean temperature or precipitation, as well as an increased frequency of extreme climate effects) has gradually been recognized as an additional factor which, with other conventional pressures, were have a significant weight on the form, scale, and spatial and temporal impact on rural livelihood activities. The distribution of impacts was varying as both the ability to respond to impacts and resources with

which to do so vary across nations. In other cases, impacts were being unexpected, and appropriate responses may not easily be known or implemented in advance (Pradeep and Shane, 2003).

Impacts of climate variability and change on the agricultural sector are projected to steadily manifest directly from changes in land and water regimes, the likely primary conduits of change. Changes in the frequency and intensity of droughts, flooding, and storm damage are expected. Climate change is expected to result in long-term water shortages, worsening soil conditions, drought and desertification, disease and pest outbreaks on crops and livestock, sea level rise, and so on. Vulnerable areas are expected to experience losses in agricultural productivity, primarily due to reductions in crop yields. Increasing use of marginal land for agriculture (especially among smallholder farms) is anticipated so as to cover food shortage arising from productivity decline. The general consensus from the literature is that in the absence of adequate response strategies to long-term climate change as well as to climate variability, diverse and region-specific impacts were become more apparent (Rosenzweig et al., 2002).

Consequently, the likely impacts of climate change on the agricultural sector have prompted concern over the magnitude of future global food production (Bindi and Olesen, 2000; IPCC, 1996). Early global estimates predict (without consideration of CO₂ fertilization effects or adaptation) a 20-30% reduction in grain production. Given the range of warming predicted by the scientific community, regional and local variation in impacts on the agricultural production is likely to be high. However, a rapidly emerging consensus is that the worst impacts were be in tropical regions, such as Ethiopia. As a result, experts predict a spatial shift of crops and agricultural practices away from the tropics toward the temperate and polar regions (IPCC, 2001). Early estimates suggest 4-24% losses in production in the developed countries, and 14-16 % losses in developing countries. Dry land areas (where rainy seasons are already short and significant water shortages are currently the norm) are likely to be among the most vulnerable. Declines in aggregate production are anticipated in most of African countries (for example, Ethiopia, Kenya, and Somalia). Murdiyarso (2000) highlights that rice production in Asia may decline by 3.8% of production levels of 2000 (estimated at 430 metric tons) under likely future climate regimes. The concern with climate change is heightened given the linkage of the agricultural sector to poverty. In particular, it is anticipated that adverse impacts on the agricultural sector were exacerbate the incidence of rural poverty. Impacts on poverty are likely to be especially severe in developing countries where the agricultural sector is an important source of livelihood for a majority of the rural population. From some research estimates, the overall economic

impact of climate change on the agricultural sector could be up to 10 percent of GDP. In Ethiopia, estimates indicate that nearly 85% of the population is dependent on the agricultural sector, and the sector contributes significant percent to gross domestic product (GDP). The agricultural sector (crop, livestock, natural resource extraction, fishery, etc.) is very much vulnerable to climate change impacts such as natural resources degradation, flood, destocking of household assets, etc. With lower technological and capital stocks, the agricultural sector in such poorer developing country is unlikely to withstand the additional pressures imposed by climate change without a concerted response strategy (Crosson, 1997).

2.13.7. Flood induce disaster risk as a Driver of Rural Poverty

Climate change poses huge challenges from household level to global economy and to social development. Its impacts were disproportionately affecting the rural areas in such countries as Ethiopia because their economies are highly dependent on climate-sensitive activities such as rain-fed agriculture. In Ethiopia, agriculture means the whole of live of the Ethiopian and as such only about 3% of the rural households have diversified their livelihood to non-farm activities. The fact that more than 80% of the population depend on this sector means any impact on this sector shall have a grave consequence that can even turn to destitution. That is why in recent it years it has become common to find pastoralists without livestock in Bale, Borena and some part of southern nations and nationalities (Index Mundi, 2014).

At national level, any effect on agriculture was also having impact on the Ethiopian economy. It is predicted that changes in climate were lead to recurrent droughts and heavy rainfall in different parts of Ethiopia, reducing the amount of land that can be used for agriculture and decreasing crop productivity. For example, the 2006 flood in Gambela region damaged about 1650 hectares of maize and reduced crop productivity by 20% as a result of waterlogging of farmland (Gambela Region Disaster Prevention and Preparedness Agency, 2007). This meant a loss of income for the country and also exacerbated food shortages and malnutrition problems in the region.

The impacts of climate change on the environment could also reduce the national income from the export of agricultural products such as coffee, pulses and flowers. Of particular concern is the possible impact on Ethiopia's famous Arabica coffee, which is exported all over the world. Coffee plants are

very sensitive to climate change and there are concerns that Arabica coffee production could become impossible in Ethiopia by the end of this century if the change continues at the current rate.

Ethiopia is home to Africa's largest livestock population, and is the world's tenth-largest producer of livestock and livestock products (MacDonald and Simon, 2011), which make up about 10% of the country's foreign currency earnings (Pantuliano and Wekesa, 2008). Frequent and extensive droughts in the country have a considerable effect on Ethiopia's livestock because decreased rainfall shrinks available water resources and reduces the productivity of grassland and rangeland. In recent year it became evident that households who use to own hundreds of livestock have now less than one third of their 30 years' herd size. Such loss is primarily through death and secondly through selling out to extremely low price to thrive through life threatening moments. Slaughter destocking was the strategy pursued by many of the livestock dependent community, which over time reduced the wealth level of the community and increased their poverty level.

The main causes of livestock deaths in Ethiopia are shortages of water and food during drought (IFAD, 2009; MacDonald and Simon, 2011). Increased temperatures can affect the behavior and metabolism (internal body processes) of livestock, such as a reduced intake of food and a decline in productivity (IFAD, 2009; Thornton et al., 2009). Changes in rainfall and warmer temperatures may also increase the geographical distribution and survival of vectors like flies and mosquitoes that transmit infectious diseases to livestock (IFAD, 2009; Thornton et al., 2009). These impacts on livestock are already being felt in Ethiopia; in the past two decades in Borana zone, southern Ethiopia, there have been losses of livestock associated with drought. The number of animals per household declined on average 'to three oxen from ten; to seven cows from 35; and to six goats, down from 33' (MacDonald and Simon, 2011).

Like drought, flood has a significant impact on livestock. Animals can be drowned or washed away by flood. For instance, more than 15,600 livestock were lost due to flooding in 2006 in SNNPR (EWD DPPA, 2007). Flood also covers large areas of grazing land with water, making it impossible for the animals to find food. In general, in addition to affecting agriculture and livestock, climate change induced disasters usually cause huge damage to property, livelihoods and infrastructure. This occurred in the 2006, 2008 and 2015/16 floods and drought incidences across many districts of the country.

Table 1:Area and Population Affected/under threat by Flood Disaster

NO.	Region	Vulnerable	Affected
1.	Afar	28000	4600
2.	SNNPR	106300	44000
3.	Amhara	47100	47100
4.	Oromia	61300	21900
5.	Tigray	122300	2600
6.	Diredawa	10400	10400
7.	Somalia	87000	43200
8.	Gambela	62000	26100
	Toatal	524400	199900

Source: Flood Disaster in the 2006 (Assefa 2011)

2.14. Conceptual Framework

The Conceptual Framework identified to guide this study is Disaster Risk Reduction. Disaster

Risk Reduction is the systematic development and application of policies, strategies and practices to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards within the broad context of sustainable development. As indicated in the introduction, natural disasters and floods in particular have become frequent and are likely to occur in future due to climate variability. It may therefore, not be feasible to remove the flood risk .What is important therefore is to fully understand the flood risk and the associated effects within the frame work of Disaster Risk Reduction .This can be done by developing the flood hazard and risk profiles which can be used to design appropriate measures to manage and mitigate the floods and build people’s adaptation capacity and resilience(Report on the Regional Stakeholders’ Consultative Workshop on Disaster Risk Management,2004). Despite the increase in the frequency and magnitude, no comprehensive impact assessment study on the socio-economic livelihoods of people has been undertaken. Hence the response to the impact of hazards such as floods has been reactive. There is, therefore, need to establish a proactive as opposed to reactive risk and

vulnerability framework for Disaster Reduction and Mitigation in the country. This is also in line with the Hyogo Declaration (ISDR, 2005).

This coping mechanism framework for sustainable livelihood shows the linkages flood disasters have with livelihood outcomes as a form of coping mechanism. The framework presents the main factors that affect flood victims during floods and typical relationships. When flood disaster occurs, the people in the affected area are vulnerable and subjected to its effects. The vulnerability impacts on livelihood assets are in turn influenced by the livelihood coping strategies as well as governmental/or other institutional policies and mitigating actions.

Flood disaster can trigger the intervention of government agencies or /other non-governmental organizations, private institutions and livelihood coping strategies directly. If the intervention occurs early enough, it minimizes the effects of flooding on the livelihood assets and can lead to a better livelihood outcome. The livelihood assets can be described as human, social, physical, financial and natural. provides detailed description of the individual components. These are linkages between the sustainable livelihood assets. (Human, Social, Natural, Physical Financial assets) and how they are affected during flood disaster. Labor which is a fundamental human resource is usually affected due to displacement of people and the outbreak of diseases. The social network among the people is usually broken due to the displacement of the people. Natural assets like farm lands from which the people derive their livelihoods are normally affected. Infrastructure, such as housing, schools, markets, food stuff trading and other commercial activities are all affected during and after the flood disaster. A major concern however, is that all these livelihood outcome categories should be given the due consideration after the flood disaster. Although often viewed as a donor objective, it is of course shared by many who recognize the long-term benefits of prudent resource use (DFID, 1999).

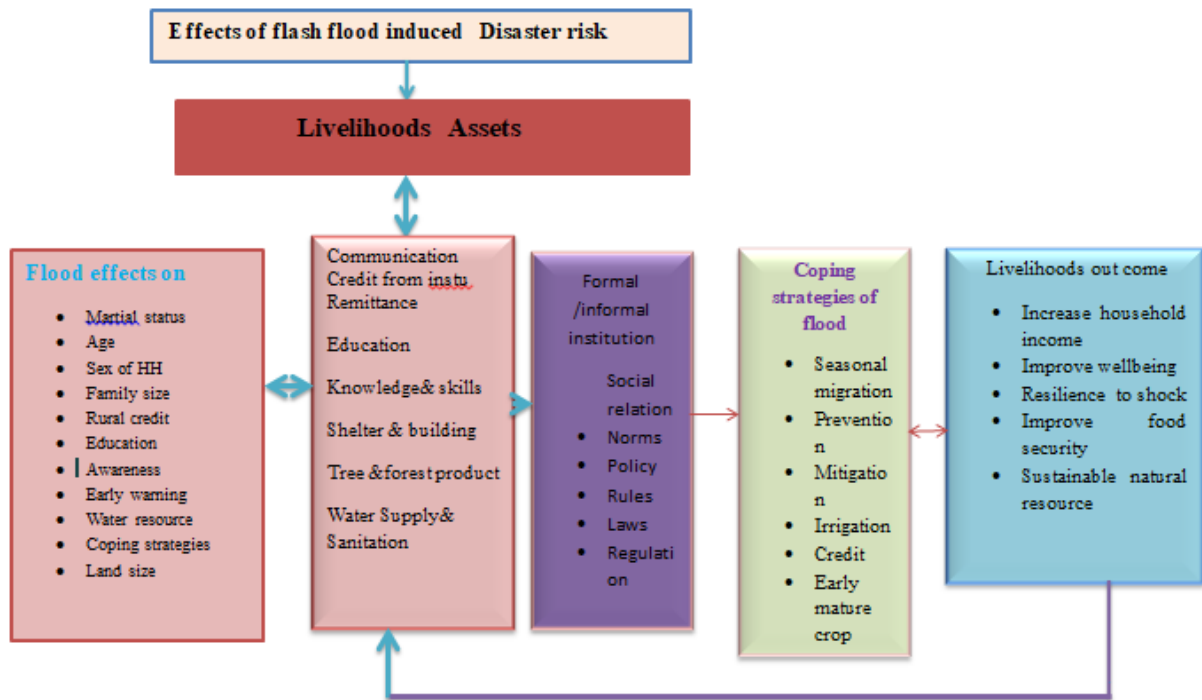


Figure 1: Conceptual Framework

Sources: Adapted from Habtamu and Dawit, 2011 Adopted by researcher 2021

3. DESCRIPTION OF THE STUDY AREA AND RESEARCH METHODS

This chapter outlines the research design and methodology. It presents the study design, sample selection and size. The chapter also presents the study methodology and data analysis. Finally it presents a conclusion on the research design and methodology.

3.1. Descriptions of the Study Area

The study was conducted in Shashogo woreda, Hadiya Zone, Southern Nation Nationality Peoples Regional State (SNNPRS), Ethiopia is one of the 13 zones, 8 special woredas, 126 Woreda and 3,678 rural kebeles in Southern Nation Nationality and People Region (SNNPR) State and its capital is Hawassa. Hadiya zone is divided in to 13 Woredas and four city administration. Based on data (HZA0, 2020), Hadiya zone has total population of 1,547,848 people of which 782,128 men, 765,720 are women and the total HH is 315,887. Rural populations comprise 89.24 % and urban populations number 10.7% of the population with an estimated area of 3,542.66 square kilometers.

Shashogo district is one of 14 administrative districts found in Hadiya zone of the SNNPR, bordered by Halaba Zone to the south and east, Lemo woreda and Kembata Zone to the west, and Silite Zone to the north. The administrative center Bonosha town is 224 Km from Addis Ababa on the southern part of Ethiopia, 117 km west of the regional capital Hawassa and 54 km from the zonal capital Hossana.

The total population estimated from the (SWAO, 2021) is 134,155. Of which 67,820 are male and 66,335 are female. The altitude ranges from 1800 to 2000 meters above sea level with a predominantly dry kola (hot lowlands) agro-ecology. Its total area is estimated to be 32,320 hectares. Topographically, the district has 26,827 hectares (83%) of flatland, 226 hectares (7%) of slopes, and 3,232 hectares (10%) covered by Lake Boyo and its surrounding marsh-fields. Majority of woreda population depend on agriculture. According to Shashogo woreda finance and economic development office report, from the total area of the woreda, 20, 834 hectare of land was used for annual crop production in 2019/2020 production year; from the total arable land 3,561 hectare (cultivated land) was allocated for maize, teff, sorghum, pepper and wheat production

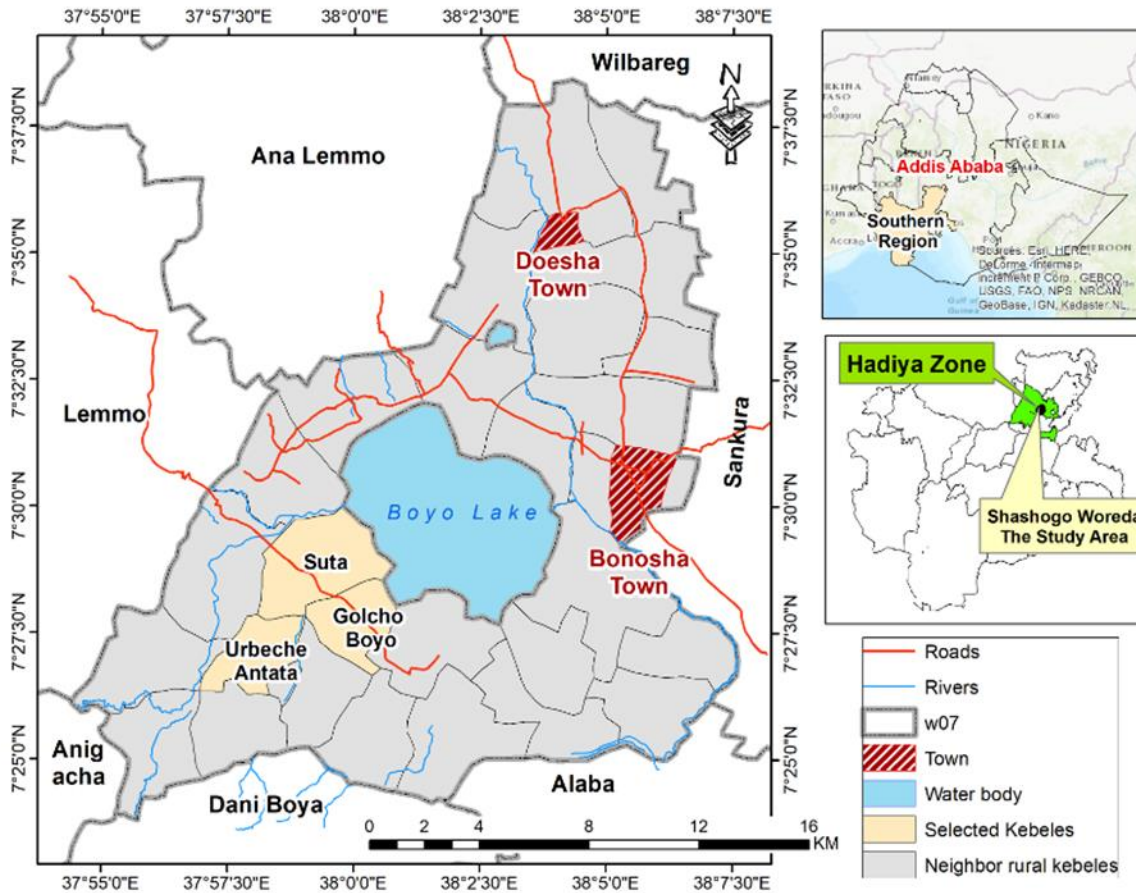


Figure 2: Map of study area (Shashogo Woreda) **Source: Ethio-GIS 2021**

3.2.1. Research Design

Leedy (1997:195) defines studies design as a plan for a study, supplying the general framework for gathering data. MacMillan and Schumacher (2001:166) define it's as a plan for selecting subjects, research sites and data collection procedures to answer the research questions. They further indicate that the goal of a sound research design is to provide the results that are judges to be credible. For Durrheim (2004:29), research design is a strategic framework for action that services as a bridge between research question and the execution or implementation of the research strategy. So, for this study a cross-sectional survey research design was employed, because cross-sectional studies are generally quick, easy, and cheap to perform. They are often based on a questionnaire survey and there is no loss to follow-up because the respondents are interviewed only once. Moreover, mixed research approaches with quantitative and qualitative methods were used for triangulation. That means mixed research approach enables the researcher to investigate multiple viewpoints of both qualitative and

quantitative research and helps to analyze the data using both quantitative and qualitative techniques (Creswell,2009).

3.2.2. Sampling Techniques and Sample Selection Size

To select the sample woreda, kebele and households multistage sampling procedure were employed. At the first stage shashogo woreda had been selected purposively. Because the woreda is prone/vulnerable to flooding disaster and other climate change. At the second stage, there are 36 kebeles in the shashogo woreda. The 36 kebeles was stratified into three agro-ecological zones such as mid altitude, low altitude and high altitude. Out of the three agro ecological zone Three kebele such as Urbecha Antata, Golico Boyo and Suta was selected as purposively sample study area. To determine the sample size, the formula proposed by Yamane (1967: 886).

According to this formula were used to calculate the sample sizes in Tables 2 and 3 and is shown below. A 95% confidence level and $P = .5$ are assumed for Equation 5. these sampled households were distributed to proportionate to total each household selected to represent each village. Following the formula 255 households was selected to the study by Applying this formula $n = \frac{N}{1+N(e)^2}$ Where n is the sample size, N is the population size, and e is the level of precision. When this formula is applied For this study simple random sampling technique was used to select 255 respondents from the three kebeles to make up sample size of the study. There were several approaches to determine the sample size. These include using a census for small populations, imitating a sample size of similar studies, using published table and applying formulas to calculate a sample size. This study applied simplified formula provided by (Yamane, 1967:886) to determine the required sample size.

$$n = \frac{N}{1+N(e)^2} \qquad n = \frac{700}{1+700(0.05)^2} = 255$$

$$N=700 \quad e = 5\% (0.05) \quad n= 255$$

Where n is the sample size, N is the population size, and e is the level of precision. When this formula is applied.

Table 2: The Total number of Sample Rural Households

S.N	Study Kebele	Total HH in the kebele	Agro-ecology	Sample Taken	HHs
1	Urbech Antata	225	Low land	82	
2	Golicho Boyo	295	Low land	107	
3	Suta	180	Low land	66	
Total		700		255	

Source: Sample computed by researcher: (2021).

3.3. Method of data collection

For this study, both primary and secondary data sources were used. Primary data was sourced from the sample respondents. The researcher was used data collecting tools like key informants interview, personal observation, Focus Group Discussion (FGD) and survey questionnaires. Secondary source of information was reviewed to supplement the primary sources of information. Various documents available at Regional, Zone, woreda and kebele levels were reviewed and used to generate secondary source of information. Moreover, books, journal, articles, different GOs and NGOs documents, publications and academic research papers were reviewed to understand the flood induce disaster risk and coping strategies on rural household livelihoods to enrich the findings.

3.3.1. Field Observation

Field observation was conducted in each selectable three kebeles by the researcher, together with natural resource management experts, DAs and model farmers to observe severity of the impact of flood disaster its effects on the local community and farmers' activities by the help of visual photographs and preparing of checklists

3.3.3. Qualitative Key Informant Interviews

To get profound understanding of the flood induce disaster risk management on rural household livelihoods in the study area, exhaustively discussion was held with key informants. The discussion was conducted to identify the impact of flood induce disaster on rural household's livelihoods in exacting and enhancement the conclusion obtained through household survey. For individual in-depth interview was also conducted with the kebeles chairpersons in the study sites, the development agents (DA) of the study kebeles, and the woreda agriculture and rural development office food security desk officer and the woreda administrative office head. The interview was conducted by preparing interview guides. The talks mostly recorded with the acquiescence of the candidate in which the investigator handles the complete interview.

Some notable organizations and individuals at district level included the following:

- ✚ The Shasogo Woreda Disaster Management Committee (Health, Education, Water Affairs, Community Development and Social Services, agriculture, etc);
- ✚ Non-Governmental Organisations (NGOs);
- ✚ Churches;
- ✚ Community Leaders and Practitioners;
- ✚ Local Authorities;

At community level, the interviewees are representatives of the community. It is envisaged that the representatives should give typical perceptions and perspectives on the subject matter..

3.3.4. Data collection procedures

The study was employ descriptive analysis to examine and describe the flood impact on livelihoods component assets on rural livelihood. In this proposal both quantitative and qualitative methods have been applied. The major reason for relying on both methods is that flood impact have a great challenge for rural livelihood hence this concept requires the use of varied methods so as to come up with the valid and credible results. Accordingly, quantitative and qualitative data was obtain from different primary as well as secondary sources.

3.3.5. Data collection tools

Data was collected from the sample group through questionnaire; key in formats interview, and focus group discussion. Questionnaires was the main source of information to collect data from the rural households of the kebele and the other main tool, use face-to-face interview with the administrative bodies of each kebele.

3.3.6. Questionnaire

The primary data was include in depth close and open ended questions and semi structured interviews. Cognizant to the above, questionnaires was prepare to the target population of the study area, and additionally, for the ease of respondents the questionnaires translate to local language Amharic. Moreover, the semi structured interviews were have been conducted with higher Woreda and kebele officials as key informants. Questionnaires was prepare and accomplished by households in the 3 kebeles and has been evaluated the livelihood resources/assets, the livelihood diversification strategy option, the types and characteristics of non-farm activities existing in the study area and the key constraints and opportunities for non-farm rural diversification in sustaining the livelihood of the rural Woreda. Totally questionnaires were administered to households of the selected kebeles' residents.

3.3.7. Interviews

Interviews have been held with the key informants, like administrative body of each kebele, the Woreda level office of agriculture and rural development, and the Woreda micro-finance institution and Woreda experts. It includes how flood affect the livelihoods components and which components are more vulnerable to flood disaster .What kinds of strategies were followed?

3.4. Focus Group Discussion (FGD)

In addition to structured questionnaires and key informant interviews, focused group discussion have been conducted through (3) focus groups that are selected from each kebele (which comprise eight (8) persons in each group) with elders and key informants like farmers, development agents, relevant professionals and administration office at all levels to access detailed information.

FGD is one of the major data collection instrument. The purpose of the FGD is to dig out the of flood induce disaster risk and coping strategies activities for the rural households in order to sustain their livelihood, and to assess the role which cannot be gained through in-depth interview. The FGD was conducted by the principal investigator being the moderator. The role of the moderator were have been stimulating participants to air out their ideas, moderating during the discussion and coordinating the discussion process. Two professional experienced and active note-takers were also have assigned to record the points raised by participants from the data collectors with previous experience, their duties has been listing topics discussed, monitoring reaction of group participants as well as ensuring that the discussion was well record.

3.5. Data Analysis

Data for this study were analyzed through descriptive and inferential statistical tools. Hence, information was generated from key informant interview; focus group discussion and personal observation was analyzed qualitatively. Also the respondents' data were analyzed by statistical analysis system software (Statistical Package for Social Sciences software version 25.0) and various descriptive statistics (mean, frequencies, percentage) and inferential statistics such as (chi-square test, t-test and Bi-variant logistic regression and Mann-kendel trend test).

3.5.1. Model specification (Logistic Model)

Choosing the appropriate statistical model was determined by the characteristics of variables that the researcher proposed to investigate. The statistical model was used to establish the relationship between the flooding disaster and rural households. Typically, binary regression analysis model was widely used in most economic and investigation because of the availability of simple computer packages as well as the ease of interpreting the results. This data analysis was used to examine the effects flooding disaster on rural household livelihoods. According to Gujurati (1995), the functional formula of the Logistic regression model is presented as follows:

3.5.2. BINARY LOGISTIC REGRESSION MODEL SPECIFICATION:

The logistic regression model is econometrically specified as P_i denotes used to show the probability of the impact of flood disaster risk on rural HH livelihood as:

$Y_i = 1$ where $\exp(Z_i)$ stands for the irrational number e to the power of Z_i . For general logit model the following logistic regression equation has been used.

The model is written as

$$P(i) = \frac{1}{1 + e^{-Z(i)}} \dots \dots \dots (3)$$

The model also written as

$$\text{But } (1 - P_i) = \frac{1}{1 + e^{Z(i)}} \dots \dots \dots (4)$$

In fact, Z_i is a linear function of m explanatory variables (X_i) and is specified as:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m \dots \dots \dots (5)$$

β_0 =is the intercept/constant and $\beta_1, \beta_2, \dots, \beta_m$ =logit parameters (slopes coefficient) to be estimated

The slope tells how the log-odds in favor of the of flooding disaster on HH livelihood as independent variables change by a unit.

$$\text{Therefore, } \frac{p_i}{1-p_i} = \frac{1+e^{Z(i)}}{1+e^{-Z(i)}} = e^{Z(i)} \dots \dots \dots (6)$$

The stimulus index Z_i is also referred to as the log of the odds ratio in favor of participation. The odds to be used can be defined as the ratios of the probability effect of flood disaster risk on HH livelihood (P_i) to the probability that is not ($1-P_i$).

$$\frac{p_i}{1-p_i} = \frac{1+e^{Z(i)}}{1+e^{-Z(i)}} = e^{\beta_0 + \sum_{i=1}^m \beta_i x_i} \dots \dots \dots (7)$$

Taking the natural logarithms of the odds ratio of equation (7) was result in what is known as the logit model as indicated below:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \ln(e^{\beta_0 + \sum_{i=1}^m \beta_i x_i}) = Z(i) \dots \dots \dots (8)$$

If the disturbance or error term ϵ is taken into account, the logit model becomes:

$$Z(i) = \beta_0 + \sum \beta_i X_i + \epsilon \dots \dots \dots (9)$$

Dependent variable effect of flood induced disaster risk i.e. positive and negative effects, β_0 = constant X_i = effect flood induced disaster on rural HH livelihoods, β_i = coefficients, ϵ = error term.

The model is estimated using the iterative Maximum Likelihood Estimation (MLE) procedure. MLE is concerned with picking parameter estimates that imply the highest probability or likelihood of having obtained the observed data. This estimation procedure yields unbiased, efficient and constant parameter estimation.

Table 3: Variable definitions and measurement

VARIABLE	Type and definition	Measurement	Expected Sign
Dependent variables			
Effect of flash flood disaster	Dummy, participation in the	Damaging	-
Independent variables			
1. Household size	Continuous, household size	No. of household member	+/-
2. Sex of household head	Dummy, sex of household head	1If male, 0 otherwise	+/-
3. Size of cultivated land	Continuous, land holding size	Hectare	+/-
4. Level of education	Continuous, education status of household	Years completed	+/-
5. Age of household	Continuous, age of household head	Years completed	+/-
6. Coping strategies	Explanatory	Ways of Managing Skill	+/-
7. Early warning	Services provision	Service Level	+/-
8. Water resources availability	Explanatory	Water availability	+/-
9. Rural saving and credit	Explanatory	Beneficiary/access of saving and credit	+/-
10. Awareness on flood disaster risk Management	Explanatory	Awareness about Flood induced disaster risk management	+/-
11. land size of HH	Continuous	Hectors	+/-

Source: Own Computation, 2021

3.6 .Ethical Considerations

Nowadays, ethical consideration in research is supported by many organizations to ensure that the research is conducted ethically. According to Clifford and Valentine (2003) the ethical consideration argument further believes that: Ethical behavior protects the rights of individuals, and communities who are involved, or affected by the research taken. Ethical behavior was helps guarantee conducive environment for the continued conduct of research. It maintains public trust.

As argued by Kitchin and Tate (2000:35) ‘research ethics are considered with the extent to which the researcher is ethically and morally responsible to his/her participants, the research sponsors, the general, public and his/her own interest’.

Taking this idea in to account, we tried to be ethical in a manner that were not disappoint my respondents. Initial contacts has made with the camp leaders. I introduced myself and explained the purpose of the research. Then after, I met sample households and asked their willingness to fill questionnaires. The same procedure was employed for the selection of participants for FGD and interview. After these all, I was show my commitment through availing myself on the intended time to conduct questionnaire or interview, and FGDs, having patience when my respondents were out of track in replying for the question I was rays and informing them the purpose of the research and ensuring them that the information given were not be revealed for anyone.

4.RESULT AND DISCUSSION

In this chapter, the data obtained through household survey, focus group discussions, key informant interviews were presented. To make the finding more meaningful information gathered through focus group discussions, key-informant interviews and observation are integrated with the household's survey analysis when appropriate. Analysis and interpretation was made on the assessment of flood induced disaster risk management on rural households' livelihoods by taking Shashogo Woreda from Hadiya Zone, and for this study, a total sample of 255 rural households from three selected kebeles of the study area.

Also, all the eligible households in the selected kebeles responded to the questionnaire, which means that all the selected 255 rural households who had completed the questionnaires was taken as the study household. The study tried to illuminate the percentage distribution, count, Chi-square, t-test and regression analysis the associations between the variables. Moreover, the findings of the results were used for appropriate discussion and analysis of the study as whole and mainly for the study area. Accordingly, the preferred variables were used in the final conclusions and recommendations of the study. The result is divided into four major parts. The first part presents Socio-economic and demographic characteristics data in relation to the impact of flood induced disaster risk management on rural household's livelihood in the study area. The second part describes the discussion of Flood impacts on rural Hose holds community. The last part discusses households' perception, coping/adaptation responses to flood induced disaster risk management.

4.1. Socio Economic profile of the respondents

There are important opportunities to adapt to climate change and to enhance health equity. Methods to adaptation have evolved from initial infrastructure-based interventions to a more development oriented approach that aims to build broader resilience to climate risks. This includes addressing the underlying causes of vulnerability, such as poverty, lack of empowerment, and weaknesses in health care, education, social safety nets and gender equity. (WHO, 2011).

4.1.1. Sex, Family Size, Age, Marital Status and Educational Level of the Respondents

The study tried to assess the impact of flood induced disaster risk management and its determinates on rural households' livelihoods on 255 rural households residing in three rural kebele. Sex of household is important variable for determining flood induced disaster impact on rural household livelihoods. Women and men differ in their roles, behaviors and attitudes regarding actions that could help to alleviate climate change. There is also evidence of sex differences in relation to the health and safety risks of new technologies to reduce greenhouse gas emissions. Such facts should guide extra targeted, extra powerful efforts to result in more healthy and environmentally pleasant policies. Sex effects of climate change have been agreed as an issue requiring greater attention by the commission on the Status of women. Gender norms, roles and relations are important factors in determining vulnerability and adaptive capacity to the health impacts of climate change

Women's and men's vulnerability to the impact of extreme flood disaster events is determined now no longer best via way of means of biology however additionally via way of means of variations of their social roles and duties (Easterling, 2000; Wisner et al., 2004). Although they vary, those roles and duties exist in all societies. The expectation that women achieve their roles and responsibilities as occupations of their families often places extra burdens on them during risky flood induced events. The anticipated function of fellows as monetary companies for his or her households frequently locations more burdens on them with inside the aftermath of such events. The investigations results showed that out of the 255 respondents, 52.9% of the respondents were male and while 47.1% of were female.

Marital status of household is one aspect of determining demographic characteristics of sampled households. Female and children specially are disproportionately distressed by flood brought about catastrophe risk . In instances of crisis, females have a tendency to live domestic with their children, whilst guys flow away to search for opportunity method of survival. Women additionally have fewer alternatives to discover different approaches of creating a living, specifically on the grounds that girls' literacy fee isn't even 1/2 of of that of guys. Women also are now no longer given a say in family selections and are regularly with out coins financial savings or property to promote to shop for meals and different simple items. Regarding marital status 52.2% of the respondents were married and 38.8% of respondents are single, 4.7% was divorced and 4.7% were widowed The study conducted by

Meskerem (2011) shows that illiteracy is common among the rural society in Ethiopia. The study area households also showed difference in their educational level. This education level is probable to have an implication on household livelihood. The educational status of the respondents depicted in Table 4.1 reveals that 37.3% of the respondents were illiterates and 32.2% of the respondents were able to read and write while 17.3% of the respondents attended primary (Grade 1-8) and the remaining 13.4% attended secondary school and above 12 levels. The survey results shown that the greater part of the family size of the respondents lies between 6 and 10 (43.9%) and 10, 32.2% while the remaining (23.9%) of the respondents were greater than 10 family sizes. From the survey data we can decide that near to half of the households were family sizes from 6-10. If the family has limited number of children, they were having enough land for their kids and hence, they can protect the forests...etc. Generally, high and low family sizes have different impressions to affect the flood induced disaster. Nothing seems like the past. On the have a look at area, the trouble is getting worse. The temperature, shortage of food, land degradation, deforestation and rainfall situation is worsening. FGD Households, the survey findings show that most of them were aged Above 60years of 20.4% and 40-59years of them are 23.5% ,20-39years of the house are productive age to protect flood impact easily different ways' 16.9% , 16-19 years of household are 17.6% and below15 year of them of 21.2% more affected by flood induced disaster as FGD and KII said .during flood time even the dead man funeral sermon was not possible as the result of the reason we shift all the time other places .not only this the children , women and Elder was highly affected by flood disaster risk like one old men said that the women was not urinate properly as a men .

4.1.2.Means of Rural Households Livelihoods in the Study Area

Livelihood activities are the means of income for the rural poor people/community. All the activities are attached with natural resources and high dependency on these activities can threaten the livelihood to continue as it is (Robledo et al, 2005). A livelihood approach gives more emphasis to link the assets of natural resources, land, man power and others with the different activities that help to generate income for survival (Ellis, 2000). Livelihood activities are the means of income for the rural poor people. All the activities are attached with natural resources and high dependency on these activities can threaten the livelihood to continue as it is (Robledo et al, 2005).

Household livelihoods diversification is “the process by which rural families constructs a various set of activities and social support talents of their conflict for survival and with the intention to enhance

their requirements of living” (Ellis, 1998, p. 4). According to Ellis, this manner consists of family coins earnings, in-type transfers, social establishments and networks and blessings derived from social services. Functionally, this concept of diversification is related to the drivers and consequent family techniques to have interaction in extra earnings interests outdoor of the number one livelihood activity. According to the respondents’ data, the majority 96.9% of households were dependent on agriculture/crop production, (1.6%) of livestock rearing, while the remaining respondents depended on off-farm activates like daily labor (1.6%) and the rest of Renting out land, poetry trade and Remittances was 0% . When we see agriculture from the point of livelihood it is dominantly livelihood activity. Agriculture is one of the main economic activities of a country and can create a link between human beings and natural resources. Particularly, rural communities are very dependable on it (Awraris M, 2012).

This method agricultural merchandise is taken into consideration the main supply of income in the study communities and grain production is the major activity of the sample households. Non-farm/off-farm livelihood activities are vital to supplement the income gained from agricultural activities, but few sampled households were engaged in off-farm/non-farm livelihood activities which are indications that the livelihood strategies pursued by rural households.

another sources of livelihood other than agriculture (off farm activity) According to the respondents’ data, they respondents said Yes /NO, (31.4% was Yes, and No response was(68.6%) were as yes respondent households are depending Off farm activity by working as daily labor and bee keeping.

Table 4: Demographic and Social-economic Characteristics of respondent

Sex of household		Female		Male		Total	
		N	%	N	%	N	
Age of head of Household	Below15 year	21	20.0	34	22.7	55	21.6
	16-19 years	15	14.3	30	20.0	45	17.6
	20-39 years	19	18.1	24	16.0	43	16.9
	40-59years	26	24.8	34	22.7	60	23.5
	Above60 years	24	22.9	28	18.7	52	20.4
	Below15 year	21	20.0	34	22.7	55	21.6
	Total	105	100.0	150	100.0	255	100.0
Marital Status of the respondent	Married	52	49.5	81	54.0	133	52.2
	Single	41	39.0	58	38.7	99	38.8
	Divorced	6	5.7	5	3.3	11	4.3
	Widowed	6	5.7	6	4.0	12	4.7
	Total	105	100.0	150	100.0	255	100.0

Source: Field survey, Jun2021

Table 5: Socioeconomic characteristics of the respondents

Sex of household		Female		Male		Total	
Educational level of the respondent		N	%	N	%	N	
	Illiterate	42	40.0	53	35.3	95	37.3
	Able to read and write	31	29.5	51	34.0	82	32.2
	Primary school	16	15.2	28	18.7	44	17.3
	secondary School	10	9.5	6	4.0	16	6.3
	Above grade 12	6	5.7	12	8.0	18	7.1
	Total	105	100.0	150	100.0	255	100.0
Means of livelihood you get in study area	Livestock rearing	0	0.0	4	2.7	4	1.6
	Renting out land	0	0.0	0	0.0	0	0.0
	Agricultural Crop production	105	100.0	142	94.7	247	96.9
	Working as daily labor	0	0.0	4	2.7	4	1.6
	poetry trade	0	0.0	0	0.0	0	0.0
	Remittances	0	0.0	0	0.0	0	0.0
	Total	105	100.0	150	100.0	255	100.0
Another sources of livelihood other than agriculture (off farm activity)	No	73	69.5	102	68.0	175	68.6
	Yes	32	30.5	48	32.0	80	31.4
what could be an activity please specific	Total	105	100.0	150	100.0	255	100.0
		73	69.5	104	69.3	177	69.4
	Bee keeping	12	11.4	16	10.7	28	11.0
	Petty trade	0	0.0	0	0.0	0	0.0
	Laborer	20	19.0	30	20.0	50	19.6
	Handcraft	0	0.0	0	0.0	0	0.0
	Total	105	100.0	150	100.0	255	100.0

Source: Field survey, Jun2021

4.1.3.Landholding by the respondents and land is affected by flood

As it is stated repeatedly, the livelihood of the study area depends on crop and livestock production. Crop production depends on access to arable land (its size and quality) while livestock rearing depends on the availability of grazing land and water. On the other hand, off farm activities practiced in the area, such as handicrafts, sale of fire wood and charcoal are highly rely on the availability of natural resources such as vegetation for handicrafts and fire wood/charcoal production for sale. Therefore, access to natural resources and household food security condition is directly related in the study area (MeskermAbi, 2011).

Land is one of the most significant factors of agricultural production. As in most of the highlands of the country the landholding of the farmer in the study area is very small (Hussein et. al,2006, MeskermAbi ,2011). Landholdings continually diminished both in size (due to redistribution among family members) and quality (due to continuous cultivation leading to soil nutrient mining and erosion). Children percentage the holdings in their households as they get to adulthood ,Therefore, average land holding sizes have been steady going down. All secondary information sources also confirm such finding. For instance, the Shashogo woreda Agricultural office estimates the average landholding to be 0.5 hectares. Sampled households responded that population pressure, poor land management practices, removal of vegetation and river flood as a major cause for the reduction of farm lands in the study area. The survey result shows that, (96.9%) percent of households had access to land for agricultural use while (3.1%)percent lack access to farmland for agricultural use. According to the survey results indicated that half (45.1%) of the respondents' access land holding size owned >0.5hectares and 40.4% of have >1 hectares of farmland and>2of them have were {14% } in(Table:6). During the focus group discussion in study kebele, it was highly fragmented landholdings that emanated from the higher density of population and all house hold affected by flood disaster the said that three kebeles are the most vulnerable to flood and out of 255 house hold survey 100% was taken from them .

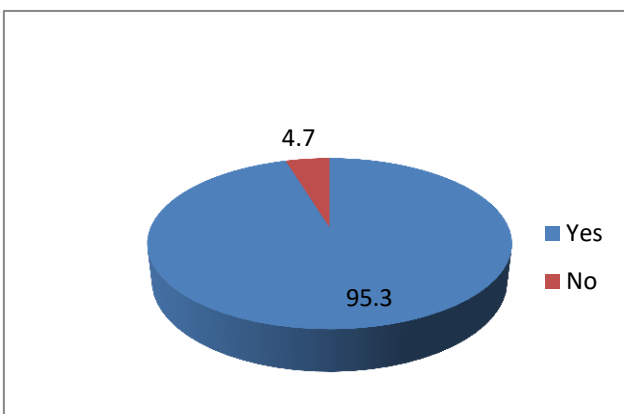
Table 6: Land Holding by the Respondents (Hectares)

Land Access and Holding size		Respondents	Percent
Hold land is affected by flood	Yes	255	100.0
	No	0	0
	Total	255	100.0
Land Holding Size in hectare	>0.5 hector	115	45.1
	>1hector	105	40.1
	>2hector	37	14
	Total	255	100

Source :field survey Jun2021

4.1.4.Flood induces disaster risk on livestock in the Study area.

Livestock play a vital role in farming systems of the studied farmers. Livestock contributes to the examine kebeles in numerous approaches inclusive of serving as a source of food, manure, income, transportation and traction power (AstawsegnZelege, 2013) .The flood also caused losses of the



livestock like goat/sheep, chicken, and cow/oxen. As the animal husbandry is the second one biggest profits of livelihood after agriculture, sweeping of a number of the farm animals and deaths through flood of many others from unidentified

Figure 3:domestic animals damaging by flood induce disaster

illnesses after the flood had effect at the livelihood of the people.. Food disaster of the farm animals is one of the important troubles for the duration of any floods on this look at vicinity. When the water stage of flood became improved day through day, the farm animals became shifted with inside the better region of the residence in addition to a few respondents stated additionally they shifted their animal to the closest embankment. The most wetlands of the look at vicinity have been below the water for the duration of the flood length and for this region food for livestock as well as shelter was a great problem according to the respondents. During flood time the cattle be afflicted by exclusive varieties of fitness associated issues very frequently, and it is very difficult to manage the medical service for sick livestock. Sometime these cattle need to be shifted at animal hospital far from the locality. According to the respondent the study area livestock animals was damaged by flood (95.3%)was Yes ,and No respondent was (4.7%)

4.1.5.Effect of Flood induce disaster risk on Rural Households Livelihood

Flood is probable to impact crop productivity directly through changes in the growing environment, but also indirectly through shifts In the geography and occurrence of agricultural pests and diseases, related influences on soil fertility and organic function, and related agricultural biodiversity. The rain fed yield changes are driven by both precipitation and temperature changes; the irrigated yield effects are from temperature changes alone. As (IPCC, 2007) concluded, slight warming decreases yields in seasonally dry and low-latitude regions. Flood induced Disaster affects virtually all aspects of agricultural and other water-intensive activities and has impact on a large proportion of households, with far-reaching consequences throughout the economy.

Like in most rural parts of Ethiopia, the source of livelihood is agriculture. However, as specified in the preceding section, the area, particularly the kola part of the woreda is characterized by unreliable and erratic rainfall. Therefore, unreliable and erratic rainfall during the rainy season results in loss of upper most and fertile soil and decrease soil fertility through soil erosion and this eventually leads to decrease in crop yield and food insecurity. Respondents' awareness, views and opinions regarding flood induce disaster and variability matters both in designing mitigation policies as well as formulating adaptation strategies. If the public perception of risk differs from policy maker's perception, implementation was being misunderstood neglected or even opposed, (Maharjan and Joshi,

2013). Besides, the degree to which an environment is affected by flood induced disaster depends on one hand on the level of perception by individuals and the other on mitigation and adaptive capacity to the change phenomenon (Gbetibouo, 2009). Cognizant of this importance, farmers were asked whether they perceived long term flood induced disaster risk and variability in their area and its impact on livelihood. Accordingly, majority of 86.3% of the respondents replied that there is flood impact disaster and is flood totally damaged and only (7.8%) said that (1.2%) The flood has no impact it is stationary their land the remain 4.7% have no idea about flood impact in the study areas. One woman noted in a focus group discussion focus group discussion that: Since we were born here we have never experienced such flood induced disaster and concerning farming we have a very good piece of land such that even when others were getting nothing, According flood impact one men on behalf of women he told that during flooding at summary season the women didn't excrete their urine as properly why and they excreted as amen by standing (FGD).

In addition to structured questionnaires and key informant interviews, focused group discussion were have been conducted through (3) focus groups that are selected from each kebele (which comprise eight (8) persons in each group) with elders and key informants like farmers, development agents, relevant professionals and administration office at all levels to access detailed information.

FGD is one of the major data collection instrument. The purpose of the FGD is to dig out the of flood induce disaster risk management activities for the rural households in order to sustain their livelihood, and to assess the role which cannot be gained through in-depth interview. The FGD was conducted by the principal investigator being the moderator. The role of the moderator were have been stimulating participants to air out their ideas, moderating during the discussion and coordinating the discussion process. Two professional experienced and active note-takers were also have assigned to record the points raised by participants from the data collectors with previous experience, their duties has been listing topics discussed, monitoring reaction of group participants as well as ensuring that the discussion was well record.

According to the household surveys respondent said that their is Flood impact {86.3%} of them have awareness, the flood has totally damaged of {7.3%,} but the flood has no impact it is stationary of {0.9%} and {4.6%} of them have no Idea about flood impact in the study area .

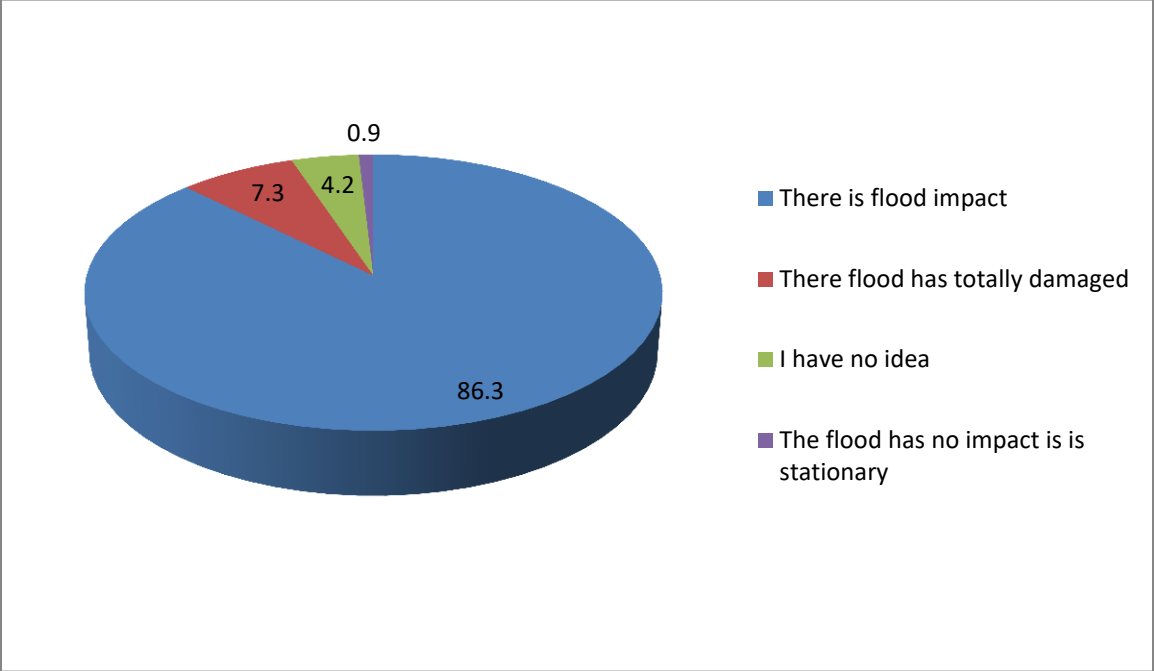


Figure 4: Awareness of respondents about flood induced disaster risk management in the study

Source: Field survey, Jun 2021

The effects of the flood on the following livelihoods like Crop production ,crop(stocks), Livestock, Healthy, Water(Access),Sanitation(access),Infrastructure ,Housing, Property and Education according to the respondent at selected Kebele Medium(3.9%) and (96.1%) of they said that the kebeles were said that V.high

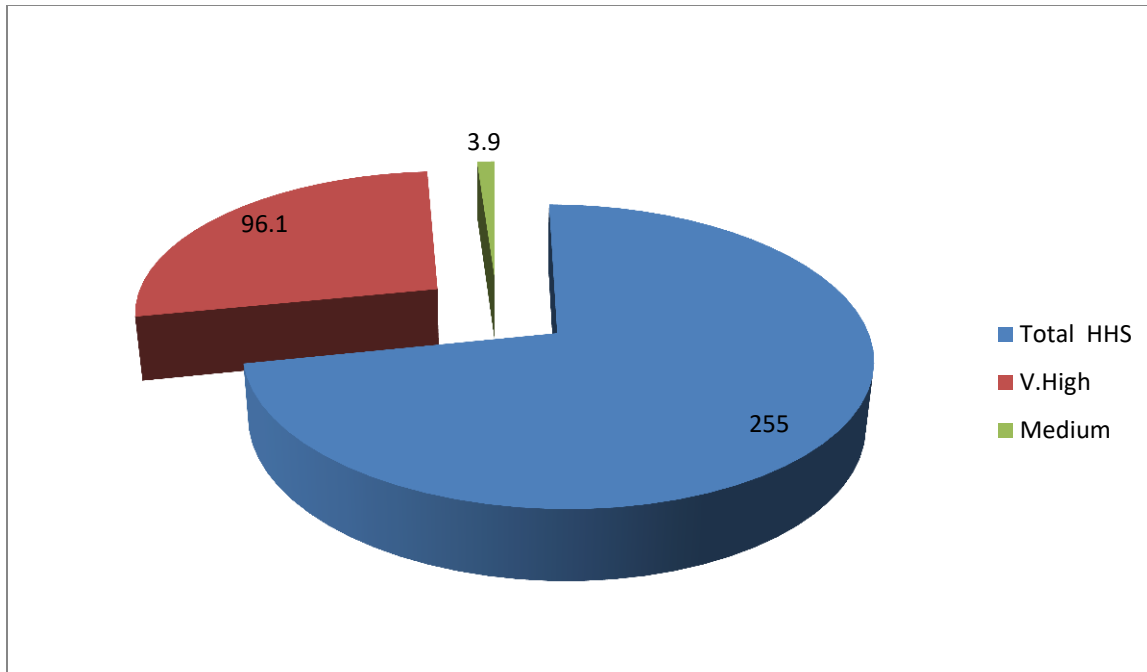


Figure 5 :The effects of the flood on the livelihoods Sources : field Survey Jun 2021

4.1.6.The major challenges of flood posed on livelihood

According to the respondents FGD and KII, Loss of their livestock and Crop yield reduction was (97.6%), Health problem was (.8%) Shortage of pastoral land(0%) and Damaging of infrastructure(1.6%)

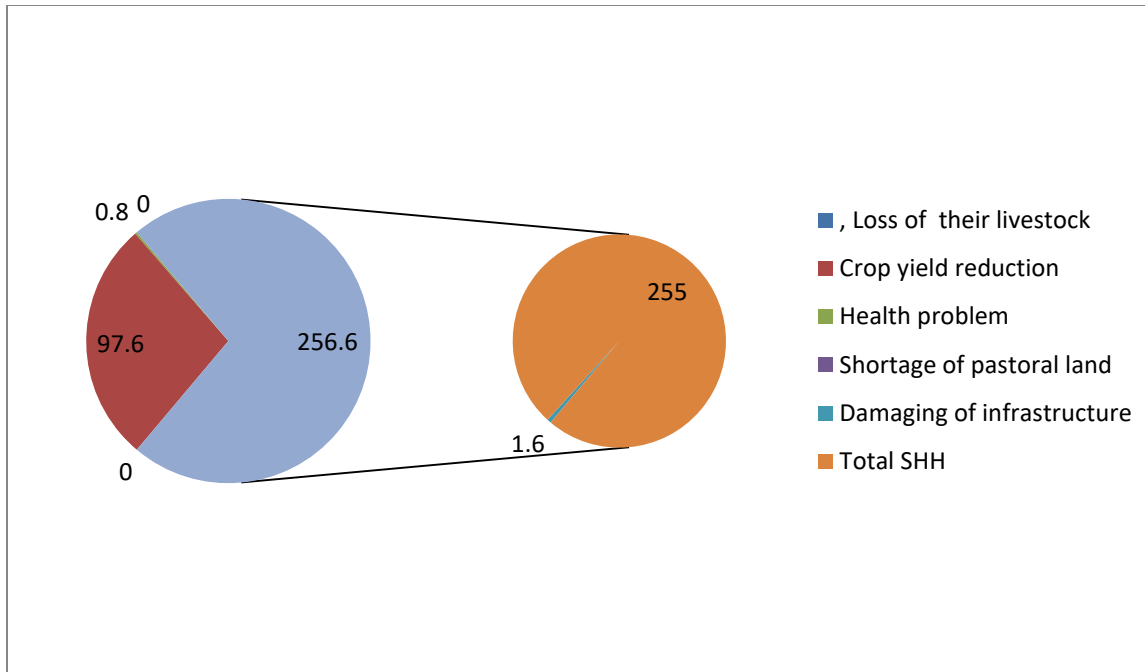


Figure 6: The major challenges that effects flood posed on the livelihood of the respondents

Sources : field survey by researcher

Perceive/observe the flood effect pattern of locality or village by the respondents

As the respondents said that the flood observation was (95.4%) were very high and (4.6%) was Moderately observed by the respondents .and change in the timing of flood in the study area the respondent said N255(95.3%) was Yes and (4.7%) NO

4.1.7. The Timing of the Rain Fall

In generally, three seasons exists in Ethiopia. The first, is the main rain season from June to September, the second is the dry season from October to December/ January, and the third is the small rain fall season from February/March to May, known locally as Kiremt, Bega and Belg respectively. The timing and reliability of rain fall in the study area has been significantly unpredictable. In the old days, the belg rain used to start in the late March and extends up to late May, farmers use the rain to cultivate crops like barley, maize and roots like potato. Apart from the cultivations of the abovementioned crops, these crops are harvested from May to June leaving the field for Maher cultivations (the main rain season) cultivations of mainly Wheat, *teff*, sorghum, maize and other crops (Astewasegn,2014). As it has been on the Table 6. Majority, (96.1%) of the surveyed households

agreed that the rain comes very late and goes very early, rain goes early in the October increasing moisture stress and making cultivate difficult and eventually causes crop failure, while (3.9%) of the respondents said that the rain of household heads responded that the rain comes and goes early and Comes early and goes late(0%) . From the analysis, the major challenges of the households in the study area were the inconsistency of the rainfall, i.e. the rain comes late and goes late. This makes the difficult the agriculture activities and livelihoods of the respondents. The following remarks had been given by one of the respondents: ‘‘Nowadays it is common to face unexpected and unreliable river flooding and appearances of unknown pests. Thus seasonal changes have lowered the production of food crops and cash crops. This situation attests to how the recent weather conditions are unpredictable.

Table 7:Characteristic of flood due to timing and observed on in crop production by respondent

Character of due to timing			By come late and goes early the change have observed in crop production by respondent		
	Frequency	Percent		Frequency	Percent
Comes and goes early	10	3.9	Decrease in long cycle crop	8	3.1
Comes late and goes early	245	96.1	Decrease in crop yield	247	96.3
			Increase in crop yield	0	0
			NO change in production	0	0
Total	255	100.0	Total	255	100.0

Sources: Field survey from Study area July 2021

4.1.8. Vulnerable to such problem like economic shock, health ,price fluctuation

According to the respondent the study area was affected (92.9%) by such problem the Study area affected by Drought (4.7%), High price of goods and commodity (1.6%) Shortage of water supply(0%) and the majority of the respondents are affected by Food shortage (93.9%).

4.2. Housing

Housing Among the three hundred (255) sampled households, 60% indicated that their houses collapsed due to excessive impacts of floods while the rest had their houses undamaged. Furthermore, within the number of households who indicated having had their houses affected by floods, 87% were male headed households with the remainder being female headed households (refer to figure below). Of the households whose houses collapsed due to floods, 93% were married and 6.5% single . The

implication is that since the married heads of households are the majority and the family sizes are large, they may not be able to be integrated within unaffected households due to size of the houses.

Households Whose Houses Collapsed Due to Floods

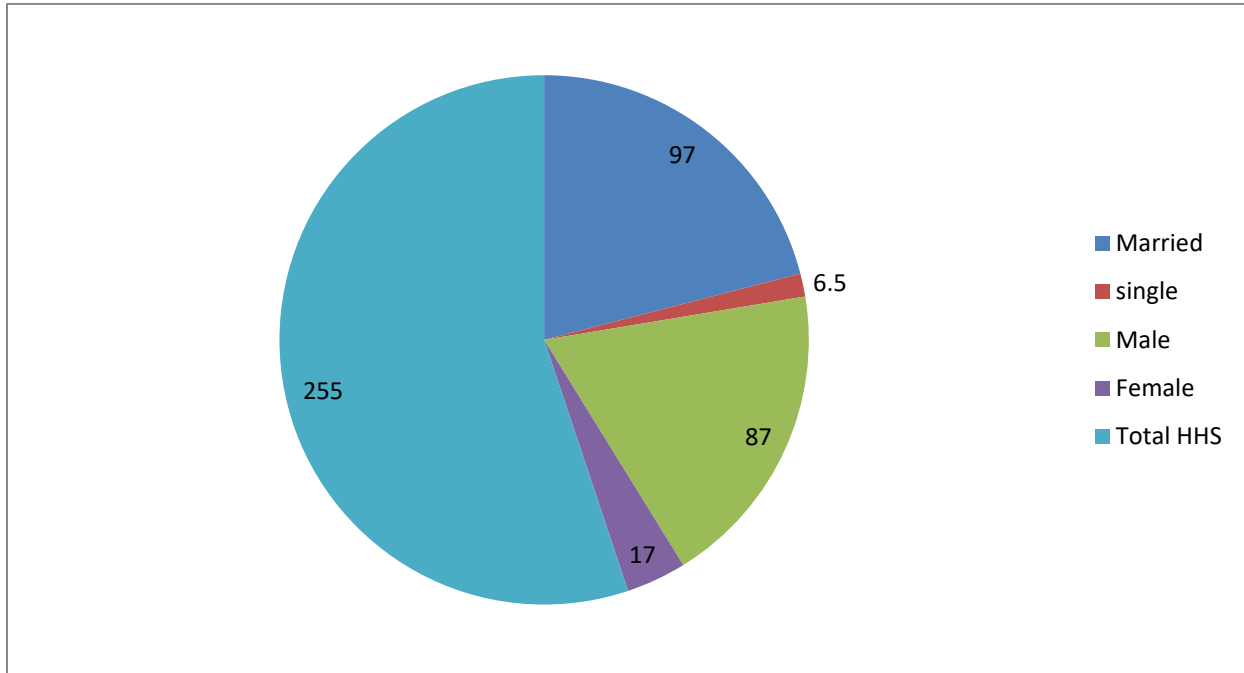


Figure 7: Households whose house collapsed due to floods by sex and Martial Status

Source: field survey July 2021

About 45% of the households whose houses were impacted by floods were forced to relocate to other alternative areas while the remainder continued to stay within their home states. The community discussions revealed that some displaced households sent their children to stay with other relatives. This in a way disrupted their pattern of life and social networks. For those who have moved temporary to higher grounds, they have returned to their usual residence. Discussion with these households indicated that we moved to higher ground and hill area every year until to flood back up

4.3.1.Impacts of flood induce disaster on Crop Yield

According to FDRE (2011) study, by 2020 in Ethiopia, the yields from agriculture could fall by 50 % because of the adverse effects of climate change like rise in temperature, drought, flood, erratic rainfall and others. Climate change has been recognized by different researchers as having potentially severe

impacts on livelihood and development. Being a developing country, Ethiopia's agriculture contributes about 42–45 % to its gross domestic product, employs more than 80 % of the population and generates more than 85 % of foreign exchange earnings. Livestock systems in developing countries are characterized by rapid change, driven by factors such as population growth, increases in the demand for livestock products as incomes rise, and urbanization.

Flood induced disaster is likely to impact on crop productivity directly through changes in the growing environment, but also indirectly through shifts in the geography and prevalence of agricultural pests and diseases, associated impacts on soil fertility and biological function. The rain fed yield changes are driven by both precipitation and temperature changes; the flooded yield effects are from temperature changes alone. As IPCC, (2007), concluded, slight warming decreases yields in seasonally dry and low-latitude regions. Climate inconsistency affects virtually all aspects of agricultural and other water-intensive activities and has impact on a large proportion of households, with far economy. Comparable in most rural parts of Ethiopia, the source of livelihoods in the study area. However, as indicated in the previous section, the study woreda is characterized is unreliable and inconsistent rainfall.

According from the surveyed households, overwhelming number, 96.3%, of the respondents reported the effect of flood induce disaster as a major cause for crop production yield reduction, None of the respondents no assumed that there is no change in crop yield due to flood induce disaster, around 3.7% of the respondents said the change of the flood induced disaster system has an adverse effect on long season crops. While the remaining 0% of the surveyed households no responded that there is an increase in crop yield due to climate change or variability. As shown on Table 7. The yield of major crops in the woreda indicates fluctuating growth, in spite of the increasing agricultural land from year to year.

Table 8: Impacts of flood induced disaster on the crop yield

Impacts of Flood induced Disaster on the crop yield	Frequency	Percent
1 Decrease crop yield	251	96.3.0
2 Increase in crop yield	0	0
3 No change in production	0	0
4 Decrease of long cycle crops	4	3.7
Total	255	100.0

Source: Field survey, Jul 2021

4.3.2.Crop production has decreased and the reason by the household respondent in the study area

All most all of the sampled households said yes (100%) indicated that their crop decrease were damaged by floods . As the reason is show that Cultivated land was submerged by flood (92.1%), Lack of awareness about flood impact on community(1.9%), Shortage of land for crop(2.8%) and the remain (2.8%) of the respondent was mentioned the crop production was decreased other factors .

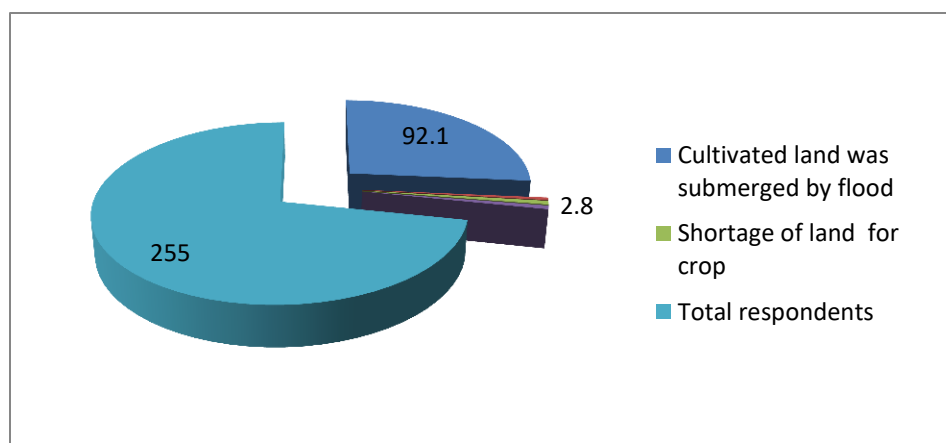


Figure 8: Crop production decreasing reasoned by respondent in field survey

4.3.3. Impact flood induced disaster risk on Households Livelihoods

According to FAO (2010), the rising of temperature and variation of rainfall patterns have direct effects on crop yields. Price fluctuation is one of the indicators that show the impact flood induced disaster on agriculture. The primary effect of flood induced disaster on human welfare is the change in calorie availability and an increasing number of malnourished children. Flood induced disaster risk likely to affect either food price or production and nutritional security hence, income disparities and availability of food for the society is very vulnerable to food insecurity (Keulen et al, 1998).

According to the surveyed households', over whelming number (92.6%) of the respondents reported the effects of flood induced disaster as a major cause for shortage of food supply due to river and flashflood damaging crop, (5.6%) of the respondents said the Flood induce disaster was the climate system has an adverse effect on drought, While the remaining (1.9%) of the respondents said the flood induce disaster risk the climate system has an adverse impact due to by high price of goods and commodities.

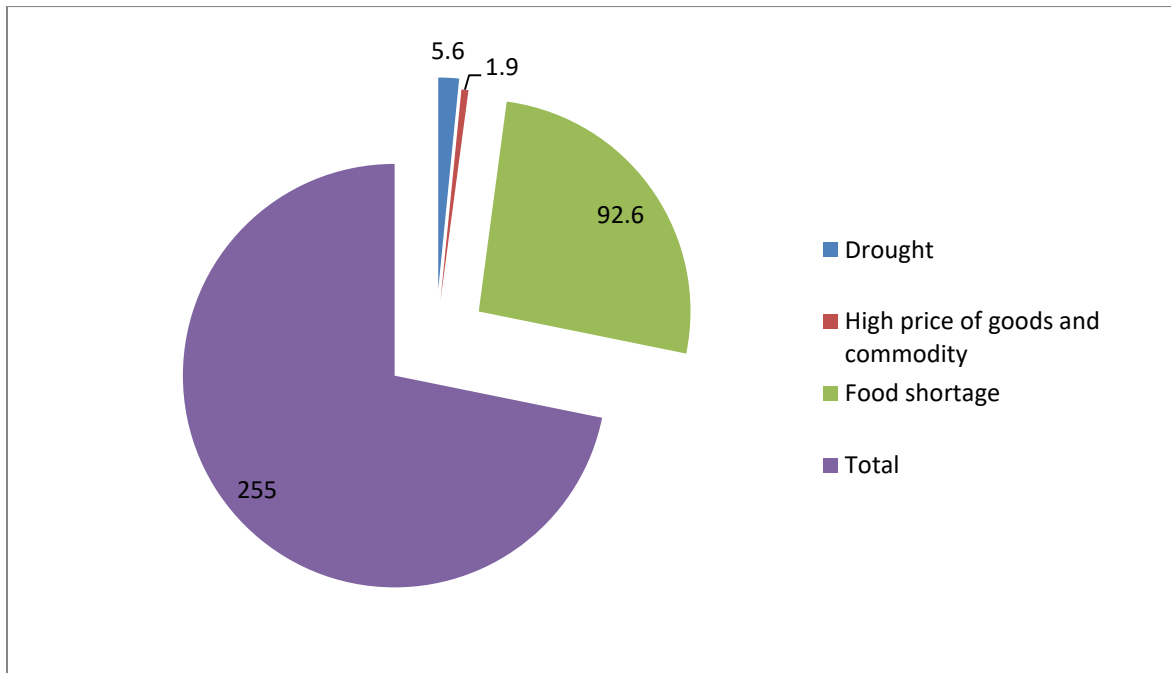


Figure 9: The Vulnerability households by flood induce disaster in the study area

Source: Field survey, Jun 2021

4.3.4. The reason of flood induced disaster risk on household livelihoods of people in the study area.

According to the study survey the reason in the study area was mentioned by the respondents were (68.7%) was Insufficient technology/infrastructure, (10.2%) was Lack of management skill,(8.6%)Poverty to cope the shock easily,(5.5%) of Soil erosion,(2.4%), by Climate change, while the remains (1.6%), and (2.4%)was happened by Lack of information on flood impact and weather variability, Deforestation and Weak Capital/asset were respectively. As we observed from data Insufficient technology/infrastructure was the main reason for flood induced disaster risk the study area this shows in the table that below.

Table 9: Cause of flood induced disaster risk on household livelihoods of people in the study area.

Sex of household The reason of flood induced disaster risk on household livelihoods of people in the study area.	Female		Male		N	Total
	n	%	n	%		
Lack of information on flood impact and weather variability	2	1.9	4	2.7	6	2.4
Weak social capital/asset	0	0.0	0	0.0	0	0.0
Poverty to cope the shock easily	8	7.6	14	9.3	22	8.6
Poor administration/policy	0	0.0	0	0.0	0	0.0
Insufficient technology/infrastructure	63	60.0	112	74.7	175	68.6
Climate change	4	3.8	2	1.3	6	2.4
Soil erosion	10	9.5	4	2.7	14	5.5
Deforestation	2	1.9	2	1.3	4	1.6
Lack of management skill	14	13.3	12	8.0	26	10.2
Weak Capital/asset	2	1.9	0	0.0	2	.8
Total	105	100.0	150	100.0	255	100.0

Source :Field survey by researcher Jun 2021

4.3.5. Group of the society which is most impacted by and vulnerable to flood induced disaster in the study area

According to the impact of flood disaster in the study area was Elderly and children(74.1%), Male headed households,(11.8%) Female headed households (8.4%), while the remain (5.5%), was Land less and the poor. As the result show that Elder and children were more affected by flood induce disaster in the study area .

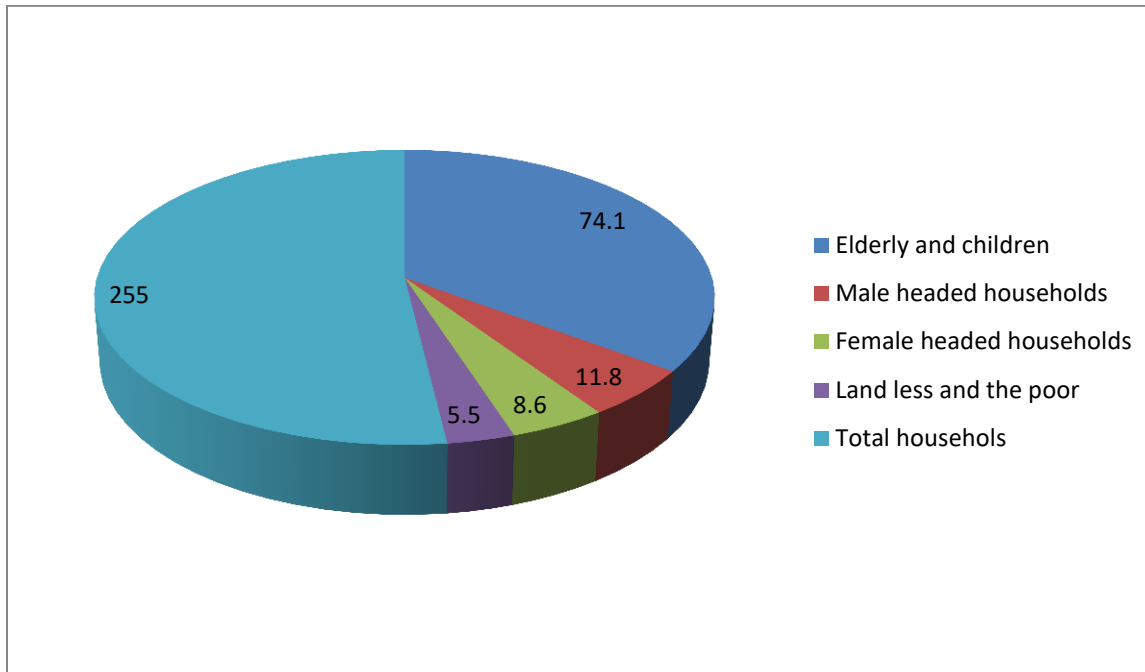


Figure 10: Group of the society is most impact by and vulnerable to flood induce disaster

4.4.1. Impact of flood induced disaster risk on water availability in the study area

Many countries in tropical and subtropical parts of Africa are expected to be vulnerable to the impact of global flood induce Disaster. Even so without the impact of flood water balance is dwindling, it makes the situation very harsh therefore, water supply and water availability is a major problem for a number of countries in the region. The problem of sustainable water supply is a major challenge for African countries and flood induced disaster risk exacerbates an already problem of water supply in rural areas (Alemayehu, 2012).

Water sources are a critical constituent of the equation in safeguarding sustainable rural livelihoods especially in conditions where there is lessening rainfall. The study also required to understand the state of water sources in relation to flood induce disaster risk taking place. Focus group discussion participants consistently agreed that water availability was generally decreasing as a result of over fellow of the river and discharge of Boyo lake flood amounts in the study area. According to the information obtained from Shashogo woreda water resource development office, the woreda is endowed with all types of water resources, such as pipe, rivers, springs ponds and ground water. However, the efforts of water sector to develop household water supply is being constrained by climate variability in the area.

Accordingly, majority of the respondents (7.1%) responded there were challenges of pure water availability, while the remaining (92.9%) of the respondents able to get water. This implies that most of the households' in the area are not suffering from shortage of availability. The result of survey data revealed that; (89%) of households get water from pipe lines, (1.6%) was from unprotected spring, the remaining (9.4%) of the them get from protected spring water, Majority of the households' in the areas get water from pipe lines, ponds and unprotected spring to drink. However, the amount of water in the ponds, unprotected spring and protected spring decreasing from year to year with increasing heavy rainfall amount which forms sedimentation layer. Households those who get water from pipe lines mainly, women and children, travel long distance to fetch water for livestock and household consummation. But most of the pond and springs water already drying in the winter season due to drought, heavy flooding formation of sediment and rainfall shortage. Some FGD participants in Golicho Boyo kebele indicate that, "scarcity of water supply exacerbates the vulnerability of our livelihoods. We need water for irrigation purpose but it is difficult to access. Even though most households in the study area use piped water, the rate of water accessibility for human and livestock consumption is not sufficient.

Table 10: Sources of water availability in the study area

Source of Water	Frequency	Percent
1 Protected spring	24	9.4
2 Unprotected spring	4	1.6
3 Pipe lines	227	89
Total	255	100.0

Source: Field survey, April 2021

4.4. Educational facility and impact of flood in the Study area

All the sampled households indicated availability of education facilities in their communities. Furthermore, 100% of the sampled households indicated that school infrastructure was damaged due to floods in one way or another. The study showed that 100% of the sampled households indicated that school going children experienced disruption due to floods. The disruption was attributed to various reasons such as School submerged /surrounded by water (64.7%) Bridge culvert washed or submerged (19.6%).the remain (15.7%)was road impossibility. From this data the educational facility was more affected by School submerged /surrounded by water according to the respondent.

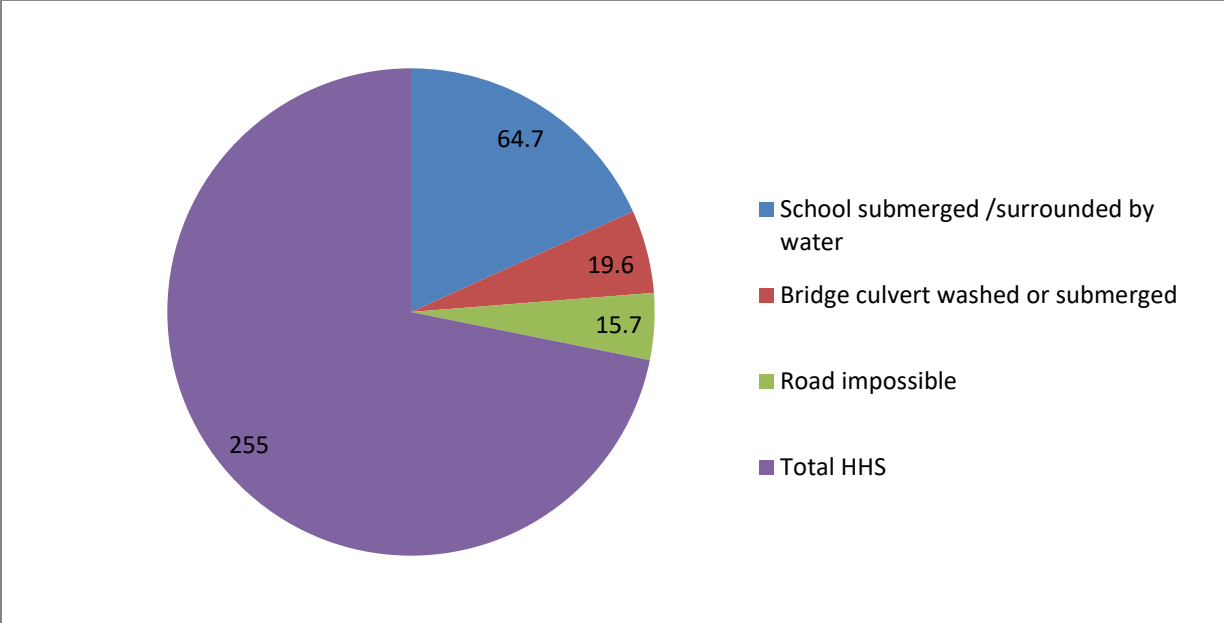


Figure 11:Effect of flood on Education

Source :HH field survey by researcher July 2021

4.5. Flood induced disaster Risk Shocks Concerned and Vulnerability to Health issue

As noted by different studies and researchers, climate change/ variability are posing a serious threat on the health and socio economic condition of the societies. For example, Kovats, et al, (2003), stated that climate change is likely to have major effects on human health via changes in the magnitude and frequency of extreme events, floods, wind storms and droughts.

Accordingly, almost all (100%) of the respondents agreed that flood induce disaster is adversely affecting their health, of respondents. According to the respondents’ data revealed that flood related shocks in the area were (100%) of by river flood and Boyo lake over fellow , (100%) of the respondents shocked by recurrent malaria/fever. In the same way, participants of focus group discussion highlighted that flood induced disaster risk is posing negative effects on health of their families. In this regard, members of the focus group discussion reported that flooding and high temperature are the main drivers of health problems of their families. They noted that water and vector borne diseases get favorable conditions for the presence and transmission of diseases like Malaria/fever . Based on the survey results recurrent flood, unpredictable river flood and ,flash are the major shocks concerned on the human health in the study area.

Table 11: A household member experienced by disease in the study area

A house hold member experienced by disease	Frequency	Percent
Diarrhea	-	-
Cough	-	-
Malaria/fever	255	100
Measles	-	-
Other		-
Total	255	

4.5.1.Flood related disaster that faced over last10 Years and type of flood shock concern by study area According to flood induced disaster risk shock in the study area is Loss of Human life(.8%).Seasonal migration(98.4%) Human health disruption(.8%) and the main cause for the Flood induced disaster related problem that in the study area was Heavy rain/flashflood (4.7%)and River flood (95.3%) as the survey showed that the study area is more shocked by river flood.

4.6. Coping Mechanisms and Strategies Followed by Respondents to Flood induced Disaster risk at study area

Traditional and present-day coping mechanisms to flood induced disaster and extremes in Ethiopia include changes in cropping and planting practices, reduction of consumption levels, collection of wild foods, use of inter-household transfers and loans, increased petty commodity production, temporary and permanent migration in search of employment, grain storage, sale of assets such as livestock and agricultural tools, mortgaging of land, credit from merchants and money lenders, use of early warning system, food appeal/aid (UNDP,2012). Coping strategies are actual responses to crises on livelihood systems in the face of unwelcome situation; therefore they are termed as short term responses (Berkes and Jolly, 2001). Usually, the local communities are already undertaking various coping and adaptation mechanisms in response to the adverse impacts of environment change and variability. Thus, to assess the types of coping strategies they are using the surveyed household heads were asked two types of question. According to the respondents' data in the households used different coping mechanisms to resist the bad floods seasons. Thus, {66.6% } of the households coping by Applying new

cropping system and irrigation,({15.7%} of respondents by Diversification of crops and livestock, {3.9%} of the respondents through planting grass cover, {7.1%} of the respondents' by Migration, while the remaining {2.8%} respondents coping by using of early maturing crop {3.5%} by Clamping on the tree and House roof , from this we concluded that Applying new cropping system and irrigation during flood season and Migration are the major coping mechanisms among the others in the study area.

Table 12:Coping Mechanisms to flood induced disaster risk management in the study areas

	Coping Mechanisms	Frequency	Percent
1	Applying new cropping system and irrigation	170	66.6
2	Diversification of crops and livestock	40	15.7
3	planting grass cover	10	3.9
4	Migration	18	7.1
5	Use of early maturing crop	9	3.5
6	Clamping on the tree and House roof	8	3.1
7	Total	255	100.0

Coping Strategies to Flood induced disaster risk change and Variability

Source: Field survey, July 2021

4.6.1.Managing to coping flood induced disaster risk management practice in the study area .

The survey established that sampled households employed a range of coping strategies due to the floods. The most important coping management were By getting remittance from relative(56.5%), Through loan(11.1%) , Renting of land (10.2%), By membership social institution(6.5%), Sell of livestock(6.5%), Others(5.6%),and the list one is Reducing number of meals(3.7%). As the result of the data shows that majority of the community in the study area were manage to cope the flood by By getting remittance from relative .see

Table 13: Managing to coping flood induced disaster risk management practice in the study area

Managing to coping flood induced disaster risk management practice in the study area	Frequency	Percent
1) Reducing number of meals	8	3.1
2) Through loan	24	9.4
3) By getting remittance from relative	152	59.2
4) Sell of livestock	18	7.1
5) Renting of land	22	8.6
6) By membership social institution	14	5.5
7) Others	18	7.1
8) Total	255	100.0

Source own house hold field observation July 2021

4.6.2. Access to get credits from institutions during flood related hazards in the study area

According to credits from institution during flooding in the study area was showed that No credit respondent (96.9%) and yes respondents (3.1%) from this data the study area there is no credit to manage and cope up the flood induce disaster risk management in this area. Access to affordable credit increases financial resources of farmers and their ability to meet transaction costs associated with various adaptation options when necessary Nhemachena and Hassan (2008). Likewise, (MeskermAbi, 2011). Rural credit has emerged as alternative source of cash income for rural households with financial constraints. Households' need rural credit to purchase agricultural inputs such as chemical fertilizers, improved seeds, and farm implements and for startup capital to participate in nonfarm income generating activities. During the catastrophes of food scarcity farmers need credit services to purchase food item and feed their households. Hence, access to credit services plays a significant role to ensure household livelihoods. Some key informants noted that, most of the households use money through credit to fill their cash deficit rather than using to create some productive assets such as buying livestock. The outcomes of study show that, majority, (96.9%) of the households couldn't get rural credit access and 3.1% of the households got access of rural credit

services. As a result, about (96.9%) percent of households could not access credit services from formal institutions due to inconveniency of methods of lending institution and unfavorable payback period which is restricted with harvest time when grain price is low at market hence require high amount of food crop to sale out. KI indicated that, households who faces financial problem obtain rural credit from private money lenders in some cases but require high interest rate for the rented money. To sum up, though private money lenders require high interest rate and cause mistrust, households access credit services easily during crises. This clearly shows that households adaptation efforts to the changing climatic is being constrained by shortage of access to credit services in the woreda.

Access of credit services in the study Respondents

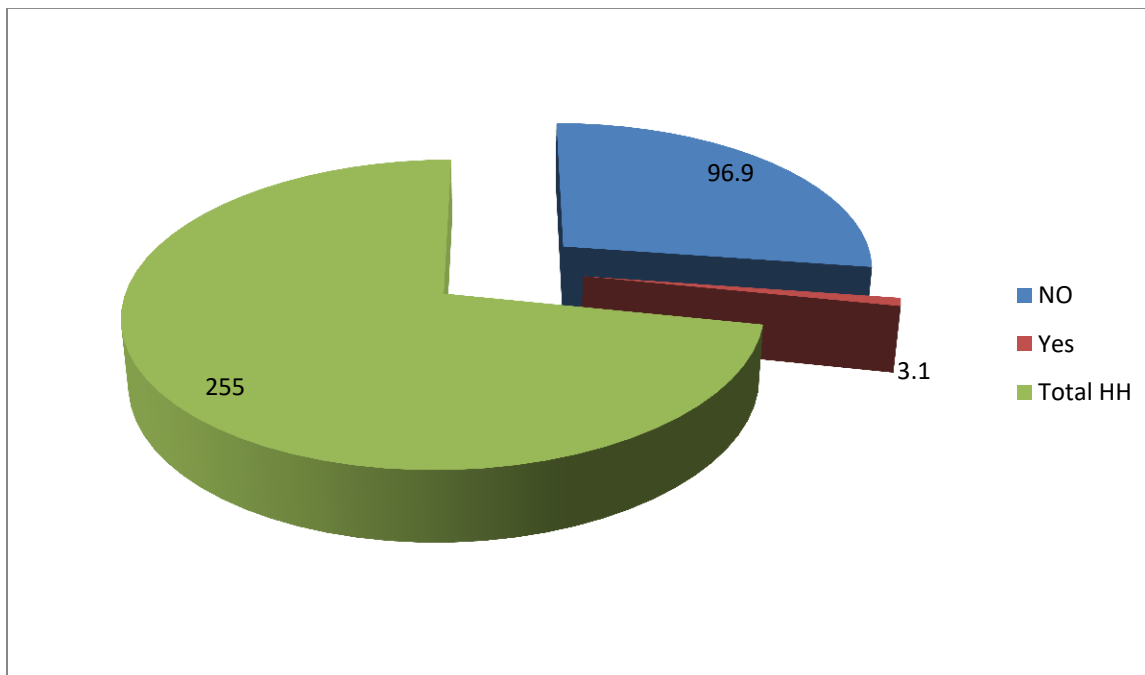


Figure 12: Access of credit services in the study area by Respondents

Source: Field survey, July 2021

Table 14 :The association between flood's effect on livelihood of households and demographic and socioeconomic factors

	Has flood affected your livelihood							X2 stat	P-value	Conc. (significance to 5% error)	
	No significant effect				Yes severe effect						Total
	N	%	N	%	N	Total					
Sex of HHH											
	Female	13	44.8	92	40.7	105	41.2	0.18	0.67		
	Male	16	55.2	134	59.3	150	58.8				
	Total	29	100.0	226	100.0	255	100.0				
Marital Status of the respondent	Not Married	9	31.0	113	50.0	122	47.8	3.705	0.05	**	
	Married	20	69.0	113	50.0	133	52.2				
	Total	29	100.0	226	100.0	255	100.0				
Educational level of the respondent	Illiterate- not gone to school	19	65.5	158	69.9	177	69.4	0.234	0.63		
	Literate- Gone to school	10	34.5	68	30.1	78	30.6				
	Total	29	100.0	226	100.0	255	100.0				
awareness about flood effects of your kebele?	There is no serious flood impact	19	65.5	150	66.4	169	66.3	0.008	0.93		
	There is a serious flood impact	10	34.5	76	33.6	86	33.7				
	Total	29	100.0	226	100.0	255	100.0				
Have you practiced coping strategies against flood hazard	No	0	0.0	31	13.7	31	12.2	4.528	0.03	**	
	Yes	29	100.0	195	86.3	224	87.8				
	Total	29	100.0	226	100.0	255	100.0				
Do you have access to get credits from institutions during flood related hazards	NO	26	89.7	221	97.8	247	96.9	5.594	0.02	**	
	Yes	3	10.3	5	2.2	8	3.1				
	Total	29	100.0	226	100.0	255	100.0				
Do you get early warning information before the occurrence of flood related shock?	NO	27	93.1	198	87.6	225	88.2	0.747	0.39	not sig.	
	Yes	2	6.9	28	12.4	30	11.8				
Do you have access to potable water?	No	6	20.7	22	9.7	28	11.0	3.564	0.05	**	
	Yes	23	79.3	204	90.3	227	89.0				
	Total	29	100.0	226	100.0	255	100.0				

Source: Field survey July 2021

Table 15; Mean land size, family size and age of HHs comparison between household who perceive their livelihood is affected or not

Has flood affected your livelihood?										t stat	P- value	Conc. (significance to 5% error)
No significant effect					Yes severe effect							
	Mean	S	N	Mea s	N	Mea s	N	Total				
Family size of the respondent	1.5	.7	29	2.1	.8	22	2.0	.8	25	-3.9	0	*
Age of head of Household	35.0	19.0	29	36.7	16.6	22	36.5	16.9	25	-0.5	0.611	not sig.
How much is your land	1.6	.7	29	1.7	.7	22	1.7	.7	25	-1.1	0.252	not sig.

Source: Field survey, March 2021

4.7. Logistic regression model analysis

The Binary logistic regression model was employed to analyze factors that determine the flood induced disaster risk effect in the Table 16. The variables in the models were 11 that included: sex, family sizes, marital status, and Size of cultivated land, awareness on flood induced disaster risk Management, educational level, Rural saving and credit, Water resources availability, Coping strategies, Early warning information about flood.

Logistic regression analysis studies the association between a categorical dependent variable and a set of independent (explanatory) variables. The name logistic regression is used when the dependent variable has only two values, such as 1 and 0 or yes and no. The name multinomial logistic regression is usually reserved for the case when the dependent variable has three or more unique values, such as married, single, divorced, or widowed. Although the type of data used for the dependent variable is different from that of multiple regressions, the practical use of the procedure is similar. The binary logistic regression model was employed to analyze factors determine the flood induced disaster risk and coping strategies in. The variables included in the model were 11 that included sex, age, education level, family size, marital status, land access, awareness about flood induced disaster risk

management , coping strategies , and management skill, early warning and information dissemination and about flood induced disaster , access to rural credit and service, community based to overcome flood measure. The goodness of fit measures state that the model fits that data well. The likelihood ratio test statistics exceed the chi-square critical values with 11 degree of freedom at less than 5% probability levels indicating that the hypothesis that all the coefficients, except the intercept are equal to zero is rejected. The value of Pearson chi-square test shows the overall goodness of fit of the model at less than 5% probability level.

As observed in Table16, the Nagelkerke was 0.333; meaning that 33.3% of flood induced disaster risk affect rural household livelihoods was due to 11 variables entered in the model. This classification is the result of cross-classifying the outcome variable with a dichotomous variable whose values are derived from the assessed logistic probabilities. In this method, estimated probabilities are used to predict group membership. They said that, if the model predicts group membership accurately according to some criteria, then this is thought to provide evidence that the model fits.

As indicated in Table16 among the 11 variables used in the model 7 variables were significant with respect to flood induced disaster risk at different probability level. Those all significant variables were positively and negatively influence the community participation in flood induced disaster risk and copings strategies while, the rest 4 explanatory variables were not showed significant influence on the effects of flood induce disaster risk on rural livelihoods. Furthermore, the significant variables including sex of households, family size, educational status, Age of the respondents on flood induced disaster risk and coping strategies.

Table 16: Parametric estimates of logistic regression fit for whether or not a Household's Livelihood is affected by flood results

S.N	Variables	B	S.E.	Wald	Df	Sig.	Exp(B)
1.	Sex(1)	.635	.553	1.321	1	.250	1.888
2.	Age_cont	.046	.027	2.786	1	.095	1.047
3.	Marital_status(1)	1.905	.629	9.181	1	.002**	6.722
4.	Family size	1.150	.343	11.263	1	.001**	3.159
						*	
5.	Educ_illiterate(1)	-.165	.555	.089	1	.766	.848
6.	Totsie	.749	.428	3.057	1	.080	2.115
7.	coping strategies(1)	20.420	6047.539	.000	1	.997	738429660.84
8.	warning(1)	-2.938	1.141	6.630	1	.010	.053
9.	sourcewater2(1)	-1.805	.894	4.080	1	.043	.164
10.	Getcrdt(1)	2.713	1.119	5.883	1	.015	15.076
11.	Awareness_of_flood(1)	.839	.899	.869	1	.351	2.313
	Constant	-4.023	1.922	4.381	1	.036	.018
Pearson χ^2 Value				47.181	DF=11	P=0.000	
-2log likelihood				133.479			
Nagelkerke				0.333			

a. Dependent variable - livelihood of households is affected by flood hazards or not (0- No, 1 Yes)

Source: Model output, 2021*** Significant at 1% and * Significant at 5% level

4.7.1. Elaboration on significant explanatory variables in Logistic regression model analysis

1. Family size of HHs: It was found to be an important variable in the effects of flood induced disaster risk of rural household livelihoods. The Variable household family size sizes shown that it is positively significant at (P=0.01) probability level, which was presumed. This implies other things kept constant, the odds favoring flood induced disaster risk on rural livelihoods decreased by a factor of 3.159 for household livelihoods. This result is consistent with indicated that household family sizes positively and significantly affect the flood induced disaster risk and at t-test was- 3.9 and the p value is Equal to zero.

2.Age of Household Head (AGE): It is defined as the period from the respondent birth to the time of the interview and is measured in years. Rural households mostly devoted their time or base their livelihoods agriculture. Age of household head also matters for effect of flood induced disaster risk management . The older the household head, inadequate working capacity and other related factors. As result, the chance for such a household to be flood induced disaster is high and hypothesized that it has a positive relationship with dependent variable, that means productive age had to cope up easily flood induce disaster risk than old aged headed household. This refers is the odd ratio was increase by 1.047

3.Marital Status(MSTUT): Considering the marital status of sampled households as hypothesized, Marital Status has a positive relation with effect of flood induced disaster risk . This variable influences flood induced disaster risk coping strategies 5% levels of significance. This result supports to study married and unmarried respondent house hold participation condition. Marital Status increase probability of coping strategies increases by about $P=0.02$ and the EXp was positivity increasing by factor 6.722 marital status was very important variable with dependent variable .

4:Early warning information : An early warning system (EWS) is technology and associated policies and procedures designed to predict and mitigate the harm of natural and human-initiated disasters and other undesirable events. Early warning systems for natural hazards include those designed for floods, earthquakes, avalanches, tsunamis, tornadoes, landslides and drought. Other systems exist for a variety of events including missile launches, road conditions and disease outbreaks. The United Nations' International Strategy for Disaster Reduction (ISDR) recommends that early warning systems have the following four components: according to this definition the study area survey showed that 88.2 % of them are answer to No early warning and 11.8% of the respondent said that Yes, depending from this finding the variables have negative relationship ($P =0.001$) and odd ratio is 0.53 so this figures was showed that a house hold no have early warring information was highly affected by flood induce disaster risk at at study area

5:Water availability: Flood damage to serious infrastructure, such as water supply and sanitation (WSS) systems, transport routes and health facilities, disrupts the provision of basic human supplies. WSS systems are critical determinants of human health limits. Pathogens can attack water sources with a universal effect on catchment activities, environments and health. If drinking-water sources

become polluted and no effective treatment can be provided through the water-supply facilities, then flood victims do not have access to safe water and this increases the risk of infection and disease. By reminding of this above view the community in the study area water source is protected springs 9.4%, Unprotected springs 1.6% and pipe line 89% water availability was positively significant the chi square is 3.528 and at P-value 0.05 was highly significant this was showed that those whose house hold used Unprotected springs 1.6% was Highly affected by health related diseases.

6: Coping strategies : Household responses to flood catastrophe in a lot of approaches which may be categorized as ex-ante techniques and ex-submit techniques, in which the most consists of threat discount and threat mitigation techniques are taken through the families in pre-threat periods, at the same time as the latter refers to threat coping techniques to get over screw ups in submit-catastrophe periods. In a submit-catastrophe period, families undertake exceptional coping techniques which include mortgage arrangements; sale of assets, livestock, or labor; transient migration; clearing savings; dwelling on charity; receiving emergency aid from outside actors; starvation. Successful coping can also additionally foster families to get over the effect of a catastrophe. Increasing livestock diversification, Seasonal migration with your cattle in search of hill area, Sale of weak and old animals before the flood season, decreasing the number of livestock, Cattle fattening and others. from this survey Seasonal migration with your cattle in search of hill area was the preferable option to cope up flood induced disaster risk is Positive coloration with chi-square 4.528 and p-value 0.03 the which means more than 87.8% of the community has coping strategies and the rest of 12.2% of them were not coping strategies from this point of view they prefer seasonal migration than other option..

7. Access to credit and service of HHs: It was found to be a significant variable in the effects of climate alteration of rural household incomes. The Variable households' access of rural credit and service showed that it is statistically and significant at (P=0.02) probability level, which was presumed. This implies other things kept constant, the odds favoring flood induce disaster risk on of rural credit decreased by a factor of 15.076 and the chi-square 5.594 for household livelihoods. This result is consistent with Anteneh (2016) who indicated that rural credit and service of households statistically and significantly affect the flood induced disaster. The **Pearson correlations** (** Correlation is significant at the 0.02 level (2-tailed). There is a positive relationship between household livelihoods in the study community statistically significant (at p =0.000).

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. SUMMARY

Flooding is one of the maximum common and detrimental environmental dangers that arise yearly international United Nations International method for Disaster Reduction (UNISDR, 2015). The frequency and severity of flooding also are growing in lots of components of the sector related to populace pressure, urbanization and weather change (Hirabayashi et al., 2013; Jongman et al., 2014).

Ethiopia's topographic traits have made the u . s . quite prone to floods and ensuing destruction and loss to life, economic, livelihoods, infrastructure, offerings and fitness system (DPPC, 2007). Although agriculture is predicted to play a key position in making sure meals safety and normal economic development, Its overall performance is mostly constrained, among different things, through degradation, unreliable climate situations and underdeveloped technology. The livelihood of many millions of farmers in Ethiopia is critically challenged by the Flood disaster. Due to the fast growth of population in Shashogo Woreda, humans are exploiting herbal plants and lengthening cultivation, that have brought about land degradation and deterioration of the ecosystem. As an end result, the region has turn out to be at risk of erosion and flood occasions. Shashogo Woreda has various topography starting from very flat to dissected plateaus. Such remedy kinds are pretty distributed, whilst the very flat a part of the complete region in Shashogo Woreda takes approximately 85 % of all flat regions with inside the complete catchment. Such a topographic setup is assumed to were producing heavy flooding on the low and flat regions thereby widening the seasonal length of Boyo Lake inside the coronary heart of the Shashogo Woreda.

Thus this study intended to *Assessment of flash Flood Induced Disaster Risk and coping strategies on Rural Household Livelihoods of People: In Shashogo Woreda particularly in selected three rural kebeles*. The main findings of the study are summarized below:

- ❖ According to the respondents' data, the majority {96%} of households were dependent on agriculture/crop production, {1.6%} of livestock rearing, while the remaining respondents depended on off-farm activates like remittance daily labor {1.6%} When we see agriculture from the point of livelihood it is dominantly livelihood activity in the study area but the Renting out the land of the area was {None} of the farmers were Volunteer to rent the farm land due to flood induced disaster risk . However, the majority {45.1%} of the respondents possess a land size

which extends from >0.5 ha to 1h, while very few of the respondents possess a land holding of >1 and 2 above ha.

- ❖ According to from the surveyed households, an overwhelming number, {96.3%} of the respondents reported the effect of flood induce disaster risk as a major cause for crop production yield reduction, {None} of the respondents no assumed that there is no change in crop yield due to flood induce disaster , around {3.7%} of the respondents said the change of the flood induced disaster system has an adverse effect on long season crops. While the remaining 0% of the surveyed households no responded that there is an increase in crop yield due to climate change or variability. This refers to the reason is given As the reason is to show that Cultivated land was submerged by flood {92.1%} Lack of awareness about flood impact on community{1.9%} Shortage of land for crop{2.8%} and the remain {2.8%} of the respondent was mentioned the crop production was decreased other factors.
- ❖ According to the survey data households', over whelming number {92.6%} of the respondents reported the effects of flood induced disaster as a major cause for shortage of food supply due to the river and flashflood damaging the crop, {5.6%} of the respondents said the Flood induce disaster was the climate system has an adverse effect on drought, While the remaining {1.9%} of the respondents said the flood induce disaster risk the climate system has an adverse impact due to by high price of goods and commodities.
- ❖ flood induced disaster risk on household livelihoods of people in the study area According to the study survey the reason in the study area was mentioned by the respondents were {65.7%} was Insufficient technology/infrastructure, {12%} was Lack of management skill,(7.4%)Poverty to cope the shock easily,{6.5%} of Soil erosion,{2.8%}, by Climate change, while the remains {2.8%},{1.9%} and {0.9%} was happened by Lack of information on flood impact and weather variability, Deforestation and Weak Capital/asset were respectively. As we observed from data Insufficient technology/infrastructure was the main reason for flood induced disaster risk in the study area. This leads to Group of the society which is most impacted by and vulnerable to flood induced disaster in the study area According the impact of flood disaster in the study area was Elderly and children{73.1%} ,Male headed households,{11.1%} Female headed households (9.4%), while the remain {6.5%}, was Land less and the poor. As the result show that Elder and children were more affected by flood induce disaster in the study area .

- ❖ All the sampled families indicated the availability of training centers in their communities. Furthermore, {100%} of the sampled households indicated that school infrastructure was damaged due to floods in one way or another. The study showed that {100%} of the sampled households indicated that school going children experienced disruption due to floods. The disruption was attributed to various reasons such as School submerged /surrounded by water {63%} Bridge culvert washed or submerged {18.5%} the remain {18.5%} was Road impossibility. From this data the educational facility was more affected by School submerged /surrounded by water according to the respondent.
- ❖ Accordingly, almost all {100%} of the respondents agreed that flood induces disaster is adversely affecting their health, of respondents. According to the respondents' data revealed that flood related shocks in the area were {100%} of by river flood and Boyo lake over fellow , {100%} of the respondents shocked by recurrent malaria/fever. In the same way, participants of the focus group discussion highlighted that flood induced disaster risk is posing negative effects on the health of their families. In this regard, members of the focus group discussion reported that flooding and high temperature are the main drivers of the health problems of their families. They noted that water and vector borne diseases get favorable conditions for the presence and transmission of diseases like Malaria/fever . Based on the survey results recurrent flood, unpredictable river flood and ,flash are the major shocks concerned on the human health in the study area.
- ❖ The major coping mechanisms used by respondents include According to the respondents' data in the households used different coping mechanisms to resist the bad floods seasons. Thus, 63.0% of the households coping by Applying new cropping system and irrigation, {18.5%} of respondents by Diversification of crops and livestock, {4.6%} of the respondents through planting grass cover, {7.4%} of the respondents' by Migration, while the remaining {2.8%} respondents coping by using of early maturing crop {3.7%} by Clamping on the tree and House roof , from this we concluded that Applying new cropping system and irrigation during flood season and Migration are the major coping mechanisms among the others in the study area.
- ❖ Accordingly, the data shows that Coping Strategies an overwhelming number {64.8%} respondents responded Seasonal migration with their cattle in search of hill area and

{13.9%} by Sale weak and old animals before the flood season, {10.3%} of the respondents were used other coping strategies, while [8.3%] of the respondents used decreased livestock numbers as coping strategies. The remaining {1.9%} by Increasing livestock diversification and {0.9%} of the respondents coping strategies namely and Cattle fattening households' livelihoods. During focus group discussion in particular, described that the above coping strategies were being practiced for several years in this area, but it did not bring any change. The reason they suggested this problem is that, the ever decreasing grazing land and decreasing availability of water coupled with the absence of sufficient medication for their cattle. Therefore, the occurrence of a single extreme event subsequently results in heavy loss of cattle. From the table Seasonal migration with your cattle in search of hill area, Sale weak and old animals before the flood season and another Off farm activates are the main coping strategies trained in the in the area during bad/worse seasons.

5.2.CONCLUSIONS

The result of the study shows that, flood induced disaster risk is a major driver of vulnerability in the study area. The amount of flood induced disaster risk in the area is very increasing from year to year. This is affecting agricultural practices (crop production, livestock rearing) and the educational facility) which are very sensitive to flood induced disaster risk .

The livelihood problem in the study area is provoked by ever increasing floods, decreasing degraded environment, (decreasing fertility of soil, and high poverty of the communities). Because of flood induced disaster shocks and vulnerability the vegetation covers and grazing areas of the woreda have deteriorated and finally, it caused a shortage in food supply (65.7%) Insufficient technology/infrastructure. There is variability in the timing of rainfall which in turn affecting the cropping pattern and the whole process of crop production. The rainfall in the study area shows inconsistency i.e. (96.3%) the rains com late and goes early.

Generally, farmers in the study area are very vulnerable due to flood induced shocks and the low adaptive capacity of the community to flood induced disaster risk management . Other variables like, having infertile land, low education status, large family size, and the like increased the effect of flood households among the society.

The current adaptation/coping strategies that the local people used are not planned, coordinated, and not sufficient. So that it could not fully support the local people to sustain their life. Even though the woreda government institutions are trying to take some intervention measures, it faces several short comings like institutional inter- connectedness, equity, efficient governance etc. Therefore, it is not as efficient to overcome the existing flood induced disaster risk related problem in the area.

5.3. Based on the findings of the study the researcher forwarded the following recommendations

- There should be a thoughtful policy to constrain communities, especially in rural areas, to build houses using strong materials and far from the flood susceptible regions in addition to the peak from the flood degree have to be considered
- The Ministry of Agriculture and Cooperatives should, thru Extension Services inspire Communities to growth cultivation and tree plantation at the upland to be able to enhance meals protection and family level.
- Construction of canal must be taken into consideration to entice the extra water. This may be used for irrigation
- Tree plantation want to be advocated the various village human beings outdoor the network regions that ought to defend or reduce the flood induced disaster risk
- Government and key Stakeholders should engage the communities and local authorities in making them aware of the flood induced disaster risk in protection by changing from rain feed to irrigation or used early mature cropping .this is which was possible follow NDRC policy in the study area and early warning information dissemination were highly recommendable
- Community initiated mitigation measures have to be promoted to construct network resilience. In the lengthy term, network primarily based totally floods early caution machine for flood have to be developed.
- Multi-sartorial techniques to flood mitigation in place of the unmarried zone have to be promoted and should be link it to the impacts of flood on various aspects of society.

Paradigm Shift in Disaster Risk Management is highly I recommend

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**ADDIS ABABA UNIVERSITY
COLLEGE OF DEVELOPMENT STUDIES
CENTER FOR FOOD SECURITY STUDIES**

Appendix I: Introduction

My name is Yishak Alemu I am a master's student in **Addis Ababa University College of Development Studies** in (specialization of Food Security Studies). I am doing my MSc thesis on: *Assessment of Flash Flood Induced Disaster Risk and Coping Strategies on Rural House Hold Livelihoods of People: in Shashogo Woreda, Hadiya Zone, Ethiopia*. Thus, I would like to express my appreciation in advance for your cooperation in giving me your time and being committed for the success of this work.

I. General characteristics of respondents

1. Name of the *kebele*----- Date of interview-----
2. Respondents name ----- (Not obligatory)
3. Enumerator's name ----- signature-----
4. Checked by -----signature -----

II. Socio-economic and demographic characteristics

1. Sex of household: Male Female
2. Family size: (1) 1-5 (2) 6-10 (3) Above 10
3. Age of Head of Household
(1) Below 15 year (2) 16—19 years (3) 20—39years (4) 20—59year (5) above60 years
3. Marital status: (1)Single (2) Married (3) Divorced (4) widowed
4. What is your educational level? 1). Illiterate 2.Able to read and write 3.Primary school
4.Secondary School 5. Above grade 12
5. What is your means of livelihood or how do you get your livelihood? (multiple response is possible).
1. Livestock rearing 2. Renting out land 3. Agriculture (Crop production)
4. working as daily laborer 5. petty trade 6. Remittances 7. Other (specify).
6. Do you have another source of livelihood other than agriculture (off farm activity)?
1). Yes 0). No
7. If your answer to **Q, no 6** is 'yes', what could be that activity, please specify

1. Bee keeping 2. Petty trade 3. Working as laborer 4. Working hand crafts 5. others specify

8. Do you hold land is affected by flood ? 1) Yes 0) No

9. If your answer for Q, no8, is 'yes', how much is the total size of your land is affected ?

Hectare/ -----Timed, -----

10. Do you have livestock (domestic animals damaged by flood)? 1) Yes 0) No

11 What was the effects of the flood on the following livelihoods

Area	Effects of flood on	
	Level of Effect	Comments/ Reasons
	1= Moderate 2= Severe	
Crop (Production)		
Crop (Stocks)		
Livestock		
Health		
Water (Access)		
Sanitation(Access)		
Infrastructure		
Housing		
Property		
Education		

Appendix II

A, Flood impacts on rural Hose holds community

1.) What is your awareness about flood effect of your *kebele*?

1. There is Flood impacts 3. The floods has not impacts (it is stationary)

2. The flood has totally damages 4. I have no idea 5. If other(specify)

2) What are the major challenges that effect flood posed on your livelihood?

1. Shortage of pasture land 2. Loss of livestock 3.crop yield reduction 4. Healthy problem

5. Damaging of infrastructure 6. Others (specify).

3). How do you perceive/observe the flood effect pattern of your locality or Village?

1. V. high 2. Medium 3.Low. 4. I don't know .

4). Is there a change in the timing of flood in your area? 1) Yes 0) No

5). If your answer is 'yes', how do you characterize it?

1. comes early and goes late. 2. Comes and goes early 3. Comes late and goes early

6). If your answer for **Q, No5**, is comes late and goes early, what changes have you observed in crop production?

1. decrease in crop yield 3. No change in production

2. Increase in crop yield 4. Decrease of long cycle crops 5. Others

7). Are you vulnerable to such problems like economic shocks, health, price fluctuation?

1. Yes 0. No

8). If yes, which one of the following affects your life?

1. Drought 2. Disease .High price of goods and commodities 3 .Food shortage

4. Shortage of water supply 5. Others(mention)

9.) Do your household get **sufficient water** in the whole year? 1 .Yes 0).No

10.) What is the **source of water** for your household? 1. Rivers (Stream) 2. ponds

3. Protected springs 4. Unprotected springs 5.pipe lines 6. Dams water

11.) Do you think that **Crop production** has increased or decreased in your village or locality? 1.
Increased 2. Decreased

12.) If your answer for **Q No11** is decreased, what do you think is the reason?

1. cultivated lad was submerged by flood 3. shortage of land for cropping

2. lack of awareness about flood impact on community 4. others (specify),

13.) Have you ever faced any Flood related disaster over the **last 10 years**?

1)Yes 0). No

14.) If your answer for question **No13**, is 'yes', what type of flood shock is your concern?

1. Loss of Human life 3. Crop pests and diseases

2.Seasonal migration 4. Human health disruption 5. others

15.) What do you think is the **main cause** for the Flood induced disaster related problem that you specified in **Q No, 14** in the study area?

- 1. Deforestation
- 2. heavy rainfall/flashflood
- 3. river flood
- 4. Absence of sustainable farming system
- 5. Others (specify).

16.)What are the main coping strategies that you employ during floods

17). What is your main source of animal feed at the present time?

18.)What do you think is the possible **coping methods** to minimize the impact of flood induce disaster risk management on your livelihood?

- 1. Applying new cropping system and irrigation
- 2. Safety net program(PSNP)
- 3. Diversification of crops and Livestock
- 4. Planting grass cover.
- 5. Migration
- 6. Use of early maturing crops
- 7. clamping on the tree and house roof
- 8. Others (specify).

19.) Which group of the society is most impacted by and vulnerable to flood induce disaster and variability?

- 1. Female headed households'
- 2. Male headed households
- 3. Land less and the poor
- 4. Elderly and children

20). Based on your answer to **Q No 19**, why do you think, you are more vulnerable to the effect of flood variability?

- 1. Lack of information on flood effect and weather variability
- 2. weak social capital/assets
- 3. Poverty to cope the shocks easily
- 4. Poor administration/Police
- 5. Insufficient technology/Infrastructure
- 6. Soil Erosion
- 7. Climate change
- 8. Deforestation
- 9. Lack management skill
- 10. Weak capital/assets

21.) Are there any education facilities in your area? 1 = Yes 0 = No

22). Was there any damage to school infrastructure (classroom blocks, teacher's houses, toilets) due to the floods? 1 = Yes 0 = No

23).Did any of the school going children in your household experience any disruption in an attendance due to the floods?

1= Yes 0 = No

24.) If the answer to **Q22,23** above is yes, why? (Indicate main reason)

Road Impassable 1)

Bridge Culvert washed away or Submerged 2)

School submerged/ surrounded by water 3)

25.)Are there any health facilities in your area? 1 =

Yes 0=No

26).Was there any damage to health facilities due to the floods? 1 =

Yes 0=No

27).Was there any disruption in access to health services due to the floods? 1 =

Yes 0=No

28.) Did any of the household members get sick during the floods? 1 =

Yes 0=No

29.)Which of the following diseases were experienced by the household members who got sick?

Diarrhea 1

Cough/ARI 2

Malaria/Fever 3

Measles 4

Others Specify_____5

Appendix III

B. Adaptation methods to impacts of flood and variability

1. What is the shared property of your locality or your area?

1. Pasture land 2. Water resource 3.Forest 4.Others. (specify)

2. Have you observed any flood impacts on resource you mentioned in **Q, No, 1?**

1 Yes 0) No

3. Did you take any community based measure to overcome the observed flood impacts?

1 Yes 0) NO

4. If yes, what is that measure you have taken to overcome flood problem?

13.) What must the local GOs must do to reduce impact of Flood on livelihoods, DRR and poverty reduction? -----

Appendix, IV

Interview Questions for Focus Group discussions (FGD)

1. What do you think are the local flood effect in your *kebele*?
2. Do you think flood posed negative effect on your household livelihood? If Yes, please explain it.
3. What are the more vulnerable livelihood sectors in your Keble (peasant association)?
4. Do you think any measure to prevent flood effect ? Who should have the main responsibilities to do this?
5. How do you perceive your crop production? Increasing decreasing
6. How do you cope up or adopt the effect of flood induced disaster on your livelihood?
7. Have there been flood extremes (river floods and flash flood) In the last 10years? Which one is your main concern?
8. Have you ever been participated in community based environmental participation(CBEP) in your Keble?
9. What are the main challenges that hinder your coping mechanisms?
10. What is the role of traditional institutions in coping climate related hazards?

Appendix V

A Check list for Key Informant Interviews with experts from SWARD office and DAs

Name -----and Position/profession-----

1. Is there any form of flood effects in your woreda/district? If, 'Yes', please explain it-----

2. What you think is the effects of flood on the livelihoods of farmers?
3. Who are more vulnerable to the adverse effects of flood and vulnerability?
4. What are the local coping mechanisms used to reduce flood related risks in woreda /district ?
5. What is the role of institutions like GOs, NGOs, in facilitating adaptation to floods impact in your woreda/
6. Are the local GOs working in integration with agencies in Zonal, regional and national adaptation programs(NAPAS)? If, not why?
7. Do local communities take part in making decisions with regard to adaptation mechanisms and how to implement CBA in woreda level? If, yes, how / please explain it. If not, why Please explain it.
8. What are the main challenges to undertake CBA/community based Activity to flood effects in your woreda, and how do you think it can be improved?

Appendix VI:

Collapse of rural house by flood in study area and FGD Picture



Source: Golicho Byo keble Effect of Flood Picture taken by Community 2021



Source :Sample of Photo FGD at Study area computed by researcher at Golich,Suta and Urbach kebele respectively 2021

Declaration

I, the undersigned declare that this thesis is my genuine work and that all sources of materials used for the thesis have been duly acknowledged and I also seriously declare that this thesis has never been presented to any other institution anywhere for the award of any academic degree, diploma, or certificate.

Name: Yishak Alemu

Signature: _____

Advisor: TemesgenTilahun (PhD) Ass. Professor

Signature: -----