

UNIVERSITY OF EDUCATION, WINNEBA

**EXPLORING SOCIO-ECONOMIC EFFECTS OF ANNUAL
FLOODING ON THE RESIDENTS OF SABOBA DISTRICT IN
NORTHERN GHANA**



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NORTHERN GHANA**



**A thesis in the Department of Social Studies Education,
Faculty of Social Sciences, submitted to the School of
Graduate Studies, in partial fulfilment
of the requirements for the award of the degree of
Master of Philosophy
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MAY 2023

DECLARATION

Student's Declaration

I, John Tachin Liyab, declare that this thesis with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature:

Date:

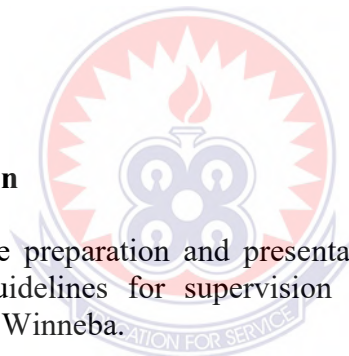
Supervisor's Declaration

I hereby declare that the preparation and presentation of work were supervised in accordance with the guidelines for supervision of thesis as laid down by the University of Education, Winneba.

Name: Dr. ALEXANDER NII ADJEI SOWAH

Signature:

Date:



DEDICATION

This thesis is dedicated to my late Dad, Mr. Liyab, my Mum and my wife Ms. Euphemia and the members of the Liyab's family.



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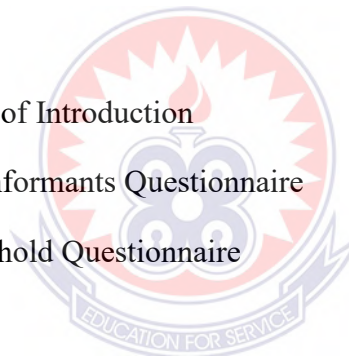


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GLOSSARY

CHPS	Community-based Health Planning and Services (compound)
DCD	District Coordinating Director
FFGD	Female Focus Group Discussion
FGD	Focus Group Discussion
GES	Ghana Education Service
GHS	Ghana Health Service
GIS	Geographic Information System
GMET	Ghana Meteorological Agency
GSS	Ghana Statistical Service
JHS	Junior High School
MFGD	Male Focus Group Discussion
MOFA	Ministry of Food and Agriculture
NADMO	National Disaster Management Organization
NGOs	Non-governmental Organizations
ODK	Open Digital Kit
SDA	Saboba District Assembly
SHS	Senior High School
SMC	Saboba Medical Centre
SPSS	Statistical Product and Service Solutions
WVG	World Vision Ghana

ABSTRACT

This study explored the socio-economic effect of annual flooding on the residents of the Saboba district in the northern region, Ghana. The study examined the causes of flooding in the district, the consequences flood has on residents' socio-cultural lives, household agricultural productivity and income and the coping mechanisms of residents in the district. Data was gathered using focus group discussions, key informants' interview, observation and questionnaires. The study district was clustered into three zones (Saboba, Kpalba and Wapuli zones) purposively for the data gathering. The research participants for the interviews were selected using a purposeful sampling technique, while multi-stage sampling technique was used for the quantitative data. The findings, suggested that the topography and the overflow of the Oti river tributaries of the Saboba district were some of the causes of the annual flooding. There was an association between low yield and income due to unfavourable weather and the erratic rainfall pattern. Also, it was shown that weak communal bonds were crippled in among the members of the communities due to poor harvest yields. As a result, demotivated community members to celebrate or perform annual harvest festivals that served to bring families and relations together. Besides, it was indicated that there was an association between flooding and planting, harvesting times and the availability of labour. Additionally, household were displaced, smallholder farmers were affected as the poor roads obstructed access to farm inputs and the markets. Waterborne diseases proliferated and the educational system was disrupted due to the annual flooding incidence on the Saboba district. However, the residents coped either autonomously or through institutional support. The study recommends that government organisations, thus NADMO tasked with managing flood disasters should be better funded and staffed with well trained personnel to enhance their ability to deal with the annual floods in the district. Household members and major community stakeholder engagement should be encouraged to gather insights into their experiences with the causes of flooding and how to mitigate them. Central government through the district assembly should harness its national programmes such as one village one dam construction to trap the excess water from River Oti and use it for irrigation to enhance food security and income in the district.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Globally, flooding and its damaging effects on people have become a source of great concern to both developed and developing countries. The growing incidence of annual flooding has been researched and findings observed have shown that its occurrences have adversely affected people's lives in the areas of their sources of livelihood, agriculture, property, infrastructure and the environment (Douglas, 2017).

Douglas (2017) further stresses that flooding occurs as a result of torrential rainfall that overflows drains and channels with insufficient capacity to evacuate all the water that flows into them. He added that frequent rains and main rivers breaking their banks can result in extreme flooding as well. Similarly, flooding occurs when normally subsurface water table rises to the ground surface, and water emerges into basements and ground-level rooms in buildings which tend to harm both urban and rural communities across the globe (Vásquez, 2015). Moreso, flood incidences are experienced when excessive water flows into normal drylands. In other words, it is an inundation of normally dry areas caused by rising water in an existing waterway such as river, stream or drainage ditch (Musyoki, Murungweni & Thifhulufhelwi, 2016).

Literature available accounts for several different factors that cause flood events across the world, including the topography of a landscape, anthropogenic activities such as unregulated urbanisation, poor or non-existent drainage systems, poor waste management system, weak implementation of planning laws and corruption, intense rainfall and climatic changes (Youssef, Sefry, Pradhan & Alfadail, 2016; Echendu, 2020). Musyoki et al., (2016) corroborated that physical causes of flood incidence

include precipitation, topography, vegetation, soil type and run-off patterns, whilst human factors contributing to flooding are primarily associated with the development and land use patterns. Hooli (2016) added that changes in socio-environmental dynamics associated with urbanisation, inappropriate spatial planning, and population growth have disturbed some river systems and, coupled with torrential seasonal rains, have aggravated flood events among several societies.

It is also noted that the growing global population appears to play a role in flooding disasters (Arora, 2019). This is due to the fact that as the human population grows, so does the demand for food, putting pressure on agricultural land utilisation. As a result, poor agricultural practises such as bush burning, animal overgrazing, continuous cropping, tiling of lands along river banks for farming, and other similar practices expose the landscape to erosion, making the environment vulnerable to flooding. These man made activities, according to the author, tend to affect weather patterns, resulting in unpredictable precipitation patterns, leading to frequent floods, or droughts which create unfavourable human situations in some regions.

It is noted that, in recent times, climate change can partially be attributed to the severity of recent floods across the globe (Osei, Amekudzi, Omari-Sasu, Yamba, Quansah, Aryee & Preko, 2021). These authors believe that climate change has resulted in an erratic rainfall pattern, which leads to abrupt torrential rains that the ground cannot absorb, resulting in flooding. Besides, flooding can be caused by faulty infrastructure developments and poor drainage systems (Osei et al., 2021). Flooding in the Guinea coast of West Africa, for example, has been worse in recent years, with worsening effects due to high-intensity rains paired with insufficient infrastructure and poor drainage systems.

From the foregoing, it suffices to note that developing countries are more vulnerable or at a greater risk to flooding dangers since some cities, towns and villages are beset with poor socio-economic infrastructure, rising population, insufficient resources, a lack of preparedness, and low adaptive capacity and skills (Carter, Cavan, Connelly, Guy, Handley & Kazmierczak, 2015). As a result of this rainfall variability, other researchers have established that citizens of developing countries such as Ghana are projected to be highly vulnerable to the incidence of floods (Mensah & Ahadzie, 2020). Similarly, Parvin, Shimi, Shaw and Biswas (2016) postulate that global hydrological cycles are expected to accelerate by climate change because of increased precipitation and reduced evapotranspiration, river discharge will correspondingly increase on a global scale which suggests an increase in the future frequency of floods occurrence in many regions across the world.

Additionally, Amekudzi, Yamba, Preko, Asare, Aryee, Baidu and Codjoe (2015) emphasised that rainfall affects the schedule of agricultural activities in a developing country like Ghana, in the areas of land preparation and to crop selection and planting to harvesting time. The ability to analyse and forecast the on-set and cessation of the rainy season is thus critical to the performance of agricultural activities in Ghana especially in the flood prone regions. Variability in the on-set and cessation of the rainy season poses socio-economic and developmental challenges by threatening food security and poverty among the populace. This is plausible because of irregular and severe delays in rainfall patterns which have an impact on the country's overall food output, particularly cereals and grains (maize, millet, soya bean, and rice) and livestock rearing which happen to be the country's main staple diet and source of income or livelihood.

The flooding phenomenon comes along with varied socio-economic effects on people and their locality. For instance, flood occurrences isolate towns, cut critical roads and highways off, and significantly affects lives, agriculture and properties (MacMahon, Smith & Lawrence, 2015). Correspondingly, considerable portions of agricultural land are flooded, and food supply chains system are significantly impacted. For example, food costs rise, food quality deteriorates, and access to food is curtailed (MacMahon et al., 2015).

There is evidence of farmers in Nigeria suffering from seasonal floods that resulted in reduced crop yields, low income, and the spread of waterborne illnesses, putting citizens' livelihoods at risk in their communities (Ojeh & Orivoh, 2014). Floods had a detrimental influence on people's socio-economic livelihoods in agriculture, education, housing, and property, as asserted in a study on the impact of floods on people's socio-economic livelihoods in Zambia (Mwape, 2009). These weather dynamics in the forms of floods and droughts, have characterised the savannah regions of Northern Ghana in recent times. Studies have shown that flooding incidence has impacted on residents' socio-economic life patterns in the areas of smallholder farming practices, household food security, family displacement, and the spread of communicable diseases (Antwi, Boakye-Danquah, Owusu, Loh, Mensah, Boafo & Apronti, 2015).

Annual flooding occurrences, in effect, have a wide range of consequences for man's social and economic interactions. This is because, during flooding, the yoke of suffering falls at the knees of the victims, worsening their already dire circumstances as the cost of accessing and obtaining social services skyrockets, exacerbating the victims' already precarious socio-economic situation. The population of Saboba

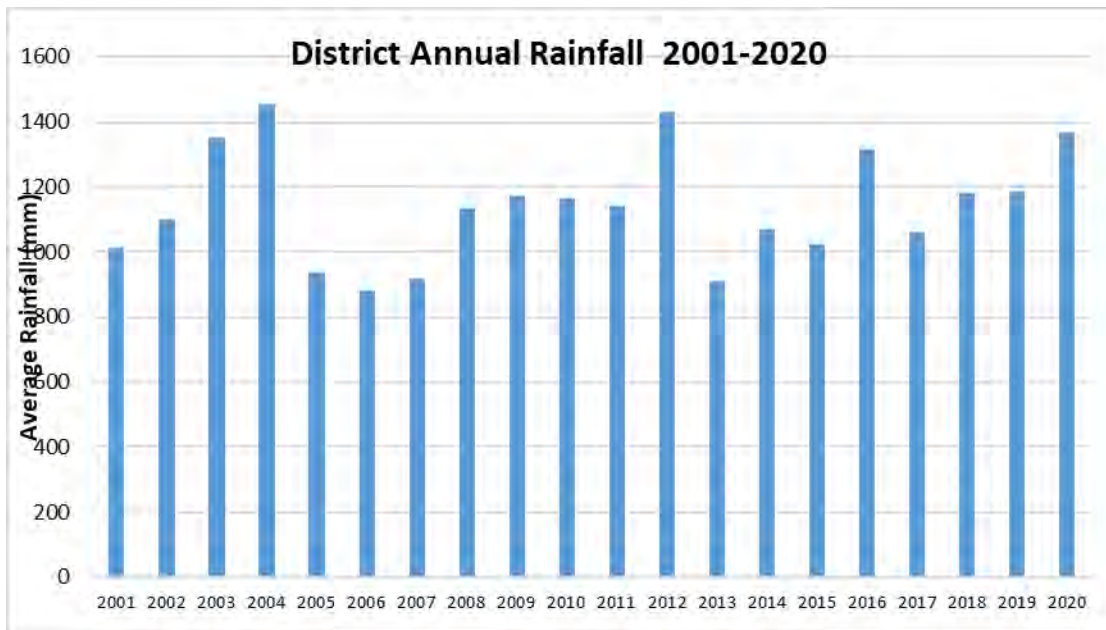
district is 65,706, accounting for 2.7 per cent of the entire population of the Northern region. Approximately 91 per cent of the population lives in rural areas, with agriculture accounting for up to 93 per cent of households in the district (GSS, 2014). Flooding, drought, wildfires, and dust storms are all regular occurrences in Saboba and the surrounding area. Many towns in the district are progressively experiencing annual floods during the wet seasons, which has a negative influence on people's ability to survive and respond.

Annual flooding in the area has resulted in the displacement of residents, as the annual flood incidence has forced many to relocate to other parts of the country because they can no longer make a living on their land. Similarly, it appears that the people of Saboba live in a harsh environment, as Saboba is prone to yearly flooding with no immediate solution to overcome this perennial havoc. This annual floods is frequently blamed for destroying feeder roads by causing big potholes. As a result, lorry fares are quadrupled during certain seasons, and vehicles are sometimes unavailable due to breakdowns caused by the route's numerous potholes. The annual flooding is also said to cause damages to the main routes joining neighbouring places like Yendi, Tatale, Chereponi, and Gushiegu to Saboba. The floods subsequently cuts off these towns from the Saboba community bringing daily businesses to a halt. During the flood, the metallic bridges that link Kpalba which is (4.8m) high and Wapuli to Saboba are usually submerged, cutting off these areas from Saboba with commuters either risking crossing these stretches covered by the floods with the locally constructed canoes whose safety and reliability cannot be vouched for.

As a result of these unfavourable seasonal conditions, smallholders farmers in the Saboba District are exposed to flood-related problems such as illnesses, indebtedness, food shortages, and low household earnings. The psychological effects of this annual flooding disaster include stress, depression or sadness, and suicide. The inability of farmers to return farm resources borrowed from colleagues or friends and family relations in the event of crop failure and low incomes was most likely the cause of these as observed by Ndamani and Watanabe (2016). This implies that food shortages in agricultural homes could lead to unhappiness, illness, and even death among populace.

Households that rely largely on natural resources for their sources of livelihood as well as those with relatively low income incurred more losses from flood events than households with higher incomes, according to studies on the impact of flooding on rural communities (De Silva & Kawasaki, 2018). It has also been observed that impoverished individuals choose to live in hazard-prone locations, generally rural, since they lack the financial or other resources to live elsewhere, making them more exposed to natural disasters such as flooding (Hoeven et al., 2015).

According to Ghana Meteorological Agency (Gmet, 2021) the annual rainfall report figures in the Saboba district, have been observed to be rising steadily over the years and particularly during the peak of the rainy season. The district's variability in weather pattern is assumed to have potentially contributed to the increasing risk of annual flooding in the area.

Figure 1 .1: Annual Rainfall Patterns of Saboba District [2001-2020]

Source: Ghana Meteorological Agency (2021)

1.2 Statement of the Problem

Saboba is situated in a low-lying flat floodplain and is engulfed by river Oti with numerous tributaries. Parvin et al., (2016) observe that, most of the time, the volume of generated run-off that exceeds the drainage capacity of a downstream river network, renders flat floodplain areas most flood-prone. This assertion mirrors the topographical features of Saboba district. Thus, Saboba district is a low lying area, and fairly undulating. Due to the clayey nature of the soils, the land is generally poorly drained with a lot of marshy areas. When heavy rains occur, some parts of the district experiences flash floods and high surface water run-offs due to the topography. Saboba has seen an increase in total annual precipitation in recent years, which has been found to partially result in perennial flooding amidst other contributory factors. For example, the total annual rainfall in 1990 was 593.9mm, 1262.4mm in 2000, and 1365.94mm in 2020 (Gmet, 2021).

The majority of the communities and people constituting about ninety five (95%) in Saboba district live in rural areas (GSS, 2014), their lives and livelihoods are directly or indirectly dependent on agricultural land, livestock, fishing and petty trade. Frequent and devastating flooding jeopardises the socio-cultural lives, economic and the livelihoods of the inhabitants. It is demonstrated that the impacts of flood on livelihood are considered a critical issue, especially in rural areas where people's livelihoods depend heavily on agriculture and livestock rearing.

Aslo, changes in rainfall intensity, volume, and duration have been proven to have significant consequences in fields such as agriculture, water resource management, and flood control (Osei et al., 2021). These researchers went on to say that a protracted lack of rain could lead to more dry spells, which are bad for crops and animals production, whereas an increase in precipitation is good for agriculture but can aggravate flooding. These observation can be experienced similarly to the climate and weather patterns of the Saboba district, where I have observed that rainfall is highly unpredictable, with residents experiencing late on-set and early cessation of rains, resulting in yearly rainfall patterns that are constantly altering. This means that unpredictable rainfall patterns will have a significant impact on those who rely on land and water bodies to support themselves and to earn a living or survive (Parvin et al., 2016; Osei et al., 2021).

Flooding has a severe impact on people's social lives as well as their overall economy, according to Parvin et al., (2016). Standing crops, cattle, poultry, housing, transportation and communication networks, educational and institutional buildings, and other social facilities have all suffered significant damages. These findings by Parvin et al. (2016) in Bangladesh mirror the threat that floods pose to the Saboba

district in Ghana's northern region, where they are harming daily activities, water supply, sanitation, health, and economic structures. The combined consequences of annual floods on residents, the economy, and physical infrastructures pose a threat to the livelihoods of the inhabitants of Saboba district's rural poor. As a result, the poor must constantly fight to manage these effects in their daily lives, and when coping mechanisms fail, residents become even more exposed to flooding negative impact (Parvin et al., 2016). Knowing the specific consequences of floods on small-scale farmers' and home owners' lives and agricultural output in rural areas, as well as how they cope with the situation, can aid in the planning and implementation of successful flood risk reduction programmes. When the rural poor's coping strategies are supported by the uncertainty of future climatic changes, they are safeguarded from increasing vulnerabilities to natural disasters such as flooding.

Although there are many published works on flooding, for instance: Otomofa et al., (2015) carried out a study on evaluating the impacts of flooding on socio-economic activities in Oleh. Also, impact analysis of flood in Accra, Ghana. (Asumadu-Sarkodie, Owusu & Rufangura, 2017). Causes, impacts and coping strategies of floods in Ghana: a systematic review (Mensah & Ahadzie, 2020). Besides, a study on the impact of flooding on social services in Tamale (Hafiz, 2014). Musah and Akai (2014) conducted a study on the effects of flood disasters on livelihood coping mechanisms in Tolon/Kumbungu district of northern region of Ghana and Kursah (2013) a study on the application of GIS in flood detection for road infrastructure planning in the north-eastern corridor of Northern Ghana.

In spite of the fact that many publications have been done on flooding in Ghana, not much have been conducted on the socio-economic effects of the annual flooding in Saboba district vis-à-vis flooding on socio-cultural lives, agricultural productivity and income and the residents survival mechanisms. Hence, this study was to explore the socio-economic effects of annual flooding on the inhabitants of Saboba.

1.3 Purpose of the Study

The purpose of this study was to explore the socio-economic effects of flooding on the inhabitants of Saboba district in the northern region, Ghana.

1.4 Objectives of the Study

The following research objectives were used to guide the study:

1. Examine the causes of flooding in the Saboba district.
2. Explore the effects of flooding on the socio-cultural lives of the inhabitants of the Saboba district
3. Examine the influence of flooding on agricultural productivity and income of households in the Saboba district
4. Explore the coping strategies of flooding of the residents of the Saboba district.

1.5 Research Questions

The study was guided by the following research questions:

1. What are the causes of flooding in the Saboba district ?
2. What are the effects of flooding on the socio-cultural lives of the inhabitants of the Saboba district?
3. What are the effects of flooding on agriculture yields and income of the residents of the Saboba district?

4. What are coping strategies of flooding of residents of the Saboba district?

1.6 Significance of the Study

This study contributed to knowledge the factors accounting for the perennial flooding in the Saboba district, the effects of the flooding on the socio-cultural lives of the people, the socio-economic effects of annual flooding on the inhabitants of the Saboba district and the coping and resilient strategies of the residents. Besides, the findings of the study may serve as a supporting document to the district assembly in their policy discussion with regard to town planning and development agenda in the district.

Also, the study draws the attention of government and other duty bearers on the extent to which annual floods impact on the livelihoods of households of the study site in relation to agricultural productivity, transportation, marketing, income, education and health accessibility. The study findings add up to the existing body of knowledge and literature on flood events for further research.

1.7 Delimitation of the Study

This study was bounded to three zones which communities' were flood prone within the district, thus, Kpalba zone (*Sambuli, Kuntuli, Kuncha, Moagbar*). Saboba zone (*Dokondo, kiteek, Buagbaln, Kpegu, Sanguli, Gbangbanpon, Nambiri*) and Wapuli zone. This study was limited to the objectives of the study: Examine the causes of flooding in the Saboba district, explore the effects of flooding on the socio-cultural lives of the inhabitants in the district, examine the influence of flooding on agricultural productivity and income of household heads in the Saboba district and finally, to explore the coping strategies of flooding on the inhabitants of the Saboba district. In spite of all these delimitations, sequential exploratory mixed methods

approach using Focus Group Discussion (FGD) and questionnaire were deemed appropriate and useful research instruments to unearth the socio-economic effects of flooding on the inhabitants in the Saboba district.

1.8 Operational Definition of Key Terms

The following terms used in this study have been operationally defined as follow:

- Displacement of people – in this study refers to a person whose dwelling unit or home has been extensively damaged or destroyed as a result of a flooding incident.
- Flooding - occurs when normally subsurface water table rises to the ground surface as a result of heavy rainfall, overflow of river banks and water emerges into basements and ground-level rooms in buildings, on farm fields and on roads which tend to disrupt the daily activities of both urban and rural communities' inhabitants.
- Food security - when members of a household, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.
- Household head - someone who the other household members acknowledged as being in charge of them or as someone who is in charge of taking the primary responsibilities and key decisions of the upkeep of the household members.
- Rainfall variability – Is linked to risks such as late onset and early cessation, or short and prolonged dry periods, and or drought with a high frequency and moderate-to-severe intensity. Thus, heavy rainfall in some years and little or no rainfall in others.

- Resilient - the capacity to withstand or to recover quickly from difficulties or shock or the ability to spring back into shape after a flooding situation.
- Smallholder farmer – these are farmers who owned small plots of land on which they grow subsistence crops and one or two cash crops. They rely almost exclusively on family labour and rainfall to meet their production needs, and typically retain a portion of the harvest for the household consumption.
- Socio-cultural - refers to a wide array of societal and cultural influences that impact a group of people's thoughts, feelings, behaviors, and ultimately health outcomes.
- Socio-economic - Social and economic factors such as the ways people interact with one another or their family structures, income, education, employment, community safety and social support.
- Stakeholders - in this study denotes duty bearers or policy implementers in the Saboba district such as, Heads of departments, the traditional leaders and household heads.

1.9 Organisation of the Study

This study was structured into five main chapters. Chapter One comprised the background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, delimitation of the study and operational definitions of terms.

Chapter Two dealt with the literature review of the study, which was categorized under theoretical framework, ecological resilience theory on flooding concepts, empirical review and conceptual frameworks of the study. The third chapter focused

on the research paradigm, research approach and design, the setting of the study, population of the study, sample size and sampling techniques. Then methods of data collection, data analysis and ethical considerations.

The fourth chapter dealt with data analysis and discussion of the findings. Chapter Five focused on the summary, conclusion and recommendations.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter covered the theoretical review of related literature, the main theory that underpinned the study, an empirical review which took a critical look at related studies of people relevant to the topic or in relation to the topic under investigation and the conceptual framework of the study.

The ecological resilience theory (Holling, 1996) on flooding was the main theory that underpinned this study and was discussed under the theoretical review. This was followed by an empirical review of the major concepts which included:

1. Factors accounting for the causes of flooding events.
2. Social effects of annual flooding.
3. Economic effects of annual flooding.
 - i. Flooding on agricultural productivity
 - ii. Flooding on small scale farming
4. Coping strategies of victims of flooding events.

The next review was the conceptual framework for the study. The conceptual framework focused on Khan (2011) analysis on the causes of flood and its associated socio-economic damages on humans and the environment.

2.2 Theoretical Framework

2.2.1 Ecological resilience theory on flooding

The idea of resilience to disasters has a long history in ecology and engineering. However, its application to natural hazard management is relatively recent and as such, what defines resilience to floods remains ambiguous, despite the increasing

attention given to the concept of resilience in flood hazard management systems (Liao, 2012).

However, Holling (1996) distinguished two types of resilience thus, engineering and ecological. He demonstrated that engineering resilience is the rate or speed of recovery of a system following a shock. On the other hand, ecological resilience assumes multiple states and is seen as the magnitude of a disturbance that triggers a shift between alternative states.

Holling (1996) further states that resilience describes three aspects of changes that occur in an ecosystem over time: Firstly, the ability of systems to absorb changes in state variables, driving variables, and parameters and persist. Secondly, the size of a stability domain or the amount of disruption a system could withstand before shifting into a different conformation. Thirdly, change is surprising and discontinuous in nature, such as the collapse of fish stocks or the sudden outbreak of spruce budworms in forests (Gunderson, Allen & Holling, 2012). They, therefore, described resilience as how fast a variable that has been displaced from equilibrium returns to that equilibrium.

Similarly, Liao (2012) presents a model on urban resilience to floods as a basis for alternative planning practices and argues that river cities require management and coping approaches based on resilience rather than resistance. Holling (1996) therefore, uses the term resilience to describe observed ecosystem dynamics and challenges the conventional ecological paradigm of equilibrium that assumes a predetermined stable state for every ecosystem to which it eventually returns after a disturbance. This is essentially a return time or time of recovery from natural disturbances.

Empirical studies show that some ecosystems never stabilise due to frequent disturbances. Multi-equilibriums also exist when the ecosystem stabilises after a disturbance but in a different state or form. It can be concluded on these bases that the ecosystem is characterised by a different set of structures and processes, and returning to the previous ecosystem is extremely difficult if not impossible and as such, resilience is pronounced as the system's ability to absorb disturbances and persist (Holling, 1996) and this implication was situated in this study area where the inhabitants of Saboba district were faced with the annual flooding incidence over the years and yet the residents persist to dwell in this flood prone area.

This resilience theory was adopted to this study and findings suggested that periodic floods were learning opportunities for cities to become a better fit for extreme floods; therefore, flood hazard management should focus on building resilience as opposed to maintaining stability. Because flooding is inherently a part of the normal urban dynamics, resilience is neither flood resistance nor recovery to predisaster conditions; both are simply a means to an end of stability (Holling, 1996).

It was in this light that the researcher shared the ecological resilience model that discusses the amount of a disturbance that causes a transition between alternative states to survival more appropriate to underpin the study. This model was in line with the propositions of Holling (1996) who sees flooding as irresistible but the ability of a community to develop resilience towards flood disasters. Resilience theory, therefore, suggests that periodic floods are possible at any given time and space as such flooding is inherently a part of humans and should be seen as learning opportunities for cities and towns to become a better fit for extreme floods; therefore, flood hazard management should focus on building resilience as opposed to maintaining stability.

The relevance of ecological resilience theory in this study, refers to the ability of a system to resist or absorb disturbances, such as flooding and to remain functional under a wide range of rainfall intensities. Flood resilience, generally means that damages are minimized during times of flooding resulting in less risk to people and infrastructure and ensuring that there is ample room for flooding and river adjustment to occur where the opportunity may exist.

Ecological resilience theory is highly relevant and applicable to this study on flooding in Saboba district, because it provides a valuable framework for understanding and addressing the complex dynamics of flooding in the study setting. Ecological resilience theory helps researchers and policymakers understand the interactions between various components of the ecosystem, such as the natural environment, human communities, and infrastructure. In the case of flooding in Saboba district, it can provide insights into how these components are interconnected and how changes in one area can affect the entire system.

This theory can be used to identify vulnerabilities within the socio-economic factors that contribute to flood risk. Besides, it helps to understand how communities can adapt to and recover from flood incidence. This involves assessing factors like early warning systems, emergency response plans, and community resilience strategies. It also facilitates policy and management decisions, by understanding the system's resilience, policymakers can develop strategies involving local communities in decision-making processes, that can enhance the adaptive capacity of communities, protect critical natural infrastructure, and promote sustainable land use planning.

2.3 Factors Accounting for the Causes of Flooding Events

Usually, frequent rains that lead to main rivers breaking their banks and overflowing their excess water on the dry land result in flooding (Vásquez, 2015). Pluvial flooding comes about due to overland flow and ponding before the run-off enters any watercourse, drainage system, or that cannot enter it because the network is full to capacity, and this usually is caused by intense rainfall (Prokic, Savić & Pavić, 2019). They further stressed that the issue of flooding is enhanced in cities with insufficient or non-existent sewer systems.

In addition, Prokic et al., (2019) perspective on flooding is that it occurs when the rainfall rate exceeds the capacity of water drains to evacuate the water and the capacity of the ground to absorb water associated with short-duration rainfall that exceeds 20 – 25 mm per hour (Prokic et al., 2019). These authors finally stipulate that floods occur due to rainfalls of smaller intensity over more extended periods on a ground surface that is impermeable due to developed settlements and, or saturation on land surface (Prokic et al., 2019). In another development, it is explained that the hydrological characteristics of a basin, run-off magnitude, moisture condition, and drainage area or topography type can occasion flooding in an area (Acosta-Coll, Merelo, Peiro & De la Hoz, 2018).

The occurrence of floods due to high-intensity rainfall is relatively common. However, it appears that the frequency with which they are happening, their impacts on human lives, damage and disruption are increasing very likely, because of other possible causes which this session delved into. Generally, flooding events and their causes have been attributable to rainfall patterns, topographical features, climate change, deforestation and the overflow of rivers and dams across several regions of

the world (Vásquez, 2015). Deforestation is emphasised as one of the localised human causes of flood incidence because deforestation results in increased run-off and often a decrease in channel capacity due to increased sedimentation rates. It has been observed again that increasing global temperatures drive excessive rains, thereby leading to flooding occurrences among communities. Again, natural factors such as heavy rainy season rainfall, intense convection rainstorms, geological and anthropogenic factors have been explored and observed to be contributing significantly to flooding incidence (Youssef et al., 2016).

2.4 Empirical Review

Blöschl, Hall, Viglione, Perdigão, Parajka, Merz and Živković (2019) carried out a study on changing climate both increases and decreases European river floods. The findings in the study showed that climate change has led to concerns of increasing river floods resulting from the greater water holding capacity of a warmer atmosphere. They explained that in the northern European region, floods are mostly caused by increased autumn and winter rainfalls combined with high soil moisture, but in the southern European region, floods are caused by decreased precipitation and increased evaporation. It was observed that the flooding phenomenon across the European continent has been greatly attributed to causes of climate change, and it was further indicated that there will be an increase in the frequency and intensity of rainfall events throughout Europe as a result of these climatic changes vis-à-vis weather variability (Prokic et al., 2019).

In another related study on urbanisation, rainfall, and flooding causes in Houston (Zhang, Villarini, Vecchi & Smith, 2018) they discovered that urbanisation has been linked to flooding. They claimed that increases in urbanisation are expected to lead to

faster run-off and more significant peaks due to the large reductions in infiltration, or the amount of water the ground can absorb amidst torrential rainfalls.

Similarly, Miller and Hutchins (2017) in a study, the impacts of urbanisation and climate change on urban flooding and urban water quality: A review of the evidence concerning the United Kingdom, have corroborated that urbanisation and increasing rainfall intensity increased drainage overflow volumes, resulting in more frequent and severe pluvial flooding in an environment or a locality. Furthermore, constructional growth and developments have resulted in a rise in asphalt and concrete pavements, leading in increased run-off throughout numerous drainage areas, indicating less infiltration and more extensive run-off for a given rainfall value. As a result, floods in human areas are characterised by increases in population and urbanisation, as well as flat or low-lying clay terrain as mirrored (Zhang et al., 2018).

Amoako and Frimpong-Boamah (2015) studied three-dimensional causes of flooding in Accra using a mixed-methods approach. The findings of the study showed that climate variability has been connected to variations in rainfall and temperature patterns, which cause floods and soil erosion in Accra and its environ. They also confirmed Vásquez's (2015) findings by establishing that the intensity of rainfall events has a significant impact on the occurrence of flooding.

Poor physical planning with the spread of uncontrolled urbanisation or residential construction in flood-prone areas, defects in the drainage network, and poor management of surface water resources are some of the other factors that have contributed to the incidence of flooding among settlements (Amoako & Frimpong Boamah, 2015; Zhang et al., 2018). For example, they have stated that poor physical development control and waste management practises in Accra, as one of Africa's

fastest-growing metropolises, have resulted in a change in Accra's natural hydrology as a result of heavy precipitation and increasing peak run-off discharge, which leads to annual floods in Ghana's capital city.

Furthermore, a study on the effective adaptation to rising flood risk (Jongman, 2018) argues that urbanization subsequently leads to an increase in non-permeable surfaces and a lack of natural drainage and as such this condition introduces new flooding problems among communities which did not exist earlier. Armah, Yawson, Yengoh, Odoi and Afrifa (2010) in a study on the impact of floods on livelihoods and vulnerability of natural resource-dependent communities in Northern Ghana, also, found out that during the rainy seasons, the water supply of the upper watersheds of the white and black Volta, along with local precipitation, causes a build-up of rivers and dams, resulting in flooding of a considerable area of Northern Ghana. Also, excessive rainfall, along with the annual overflow or spillage of the Bagre Reservoir in Burkina Faso, causes serious flooding in numerous communities in the regions.

2.5 Effects of Flooding

2.5.1 Social effects of flooding

Natural calamities have always wreaked havoc on people's social freedom in their communities. For example, flooding incidence limit people's rights to basic necessity of life such as food, shelter, clothing, family togetherness etc as a result of environmental damages and displacement of families and friends. It is frequently observed that indigenous members of a community become directly reliant on the community's natural resources and materials to support their daily needs, such as food, fuel, and money generating, medicine, and spiritual purposes. This indicates that

flood events will surely impact the availability and distribution of these resources, as well as the local population's stability (Vásquez, 2015).

Furthermore, flooding has a detrimental impact on community cohesiveness since communal brawls and confrontations emerge during this season between small scale farmholders and cattle or livestock rearers over the availability of sufficient land area to cultivate crops and for the grazing of the animals on the same parcel of land at the same time. This terrible circumstance emerges when livestock husbandry is seen concentrated in a larger proportion of the population, who demand more room and space to graze their animals than the community's small scale farmholders (Vásquez, 2015). As a result, manifested communal tensions can lead to mistrust or a lack of confidence, thereby eroding social cohesion and causing long-term discord among families, clans and the communities at large.

Bell, Brown, Conlon, Herring, Kunkel, Lawrimore and Uejio (2018) in a study, changes in extreme events and the potential impacts on human health espoused that extreme weather and climate-related occurrences have been shown to have a negative impact on human health, resulting in sickness, injury and at times death. Floods, for example, have been known to disrupt the delivery of crucial public health care and deliveries, electrical networks, and food due to infrastructure inaccessibility or malfunction. In addition, rainy season on-set and cessation dates affect the transmission of vector-borne diseases, as the life cycle of the disease transmission vectors is sensitive to the variability and changes in temperature and rainfall. For example, the mosquito population is likely to increase rapidly during the rainy seasons as revealed the study, variabilities in rainfall onset, cessation and length of rainy season for the various agro-ecological zones of Ghana (Amekudzi et al., 2015).

In assessing climate change-related events on the rights of subsistence in the rural coastal communities of Ghana. The study findings suggested that weather unpredictability was discovered to be a direct and indirect danger to human rights, robbing millions of people of their right to subsistence. The right to life, good health, appropriate food, and housing are frequently denied (Golo & Eshun, 2018). Besides, in the wake of these flood disturbance, the socio-cultural life of the residents is highly disrupted and or disorganised. For instance, the fact that the majority of the rural residents rely on the seasonal harvest to organise their social and cultural obligations such as annual festivals, funerals and dowries were affected due to poor yields, low income and the inaccessibility of roads to farms and market places.

2.5.2 Economic effect of flooding events

Countries faced with extreme climatic events such as annual floods tend to suffer unduly from development infrastructure. This is so because huge amounts of money that could be used in improving the quality of life of its citizenry are diverted in assisting the population, and in reconstruction after flood disasters (Vásquez, 2015). For example, people who reside in flood-prone areas are frequently drawn to the area's economic benefits and, as a result, are subsistence small-scale agriculture producers. Extreme events such as flooding has resulted in large economic losses, particularly in agricultural productivity thus, floods do affect the farm timing cycle for planting, weeding, yields and income as well as livestock production (Vásquez, 2015). This implies that flood occurrences set in damages on standing crops, cattle, poultry and homes. This finding implied that floods robbed people of their principal sources of income, leaving them with few means to cope within their hopeless predicament.

Flood victims in disadvantaged areas lose their jobs and their money, limiting their ability to prepare for respond to and recover from future floods (Parvin et al., 2016). In a related study on analysis on causes of flood in Jeddah city in Saudi Arabia, revealed that floods are among the most frequent and costly natural disasters in terms of human and economic losses among nations (Youssef et al., 2016). It can be inferred therefore that some of these natural disasters in economic sense cut across the setbacks in transportation and communication networks, as well as educational and institutional structures.

Further evidence gathered on economic effects of flooding incidence estimated that flood occurrence is expected to increase with economic growth, urbanisation and climatic change. This claim has been supported by the fact that evidence of increasing floods in Northern and Southern European regions have resulted in increasing economic losses and the washing away of a lot of houses, cars and infrastructures (Blöschl et al., 2019).

Flooding is observed to have both direct and indirect impacts on people such as losses in economic terms, the damaging or destruction of private buildings and urban infrastructure, the loss of human lives, and the degradation of water quality are not left out of floods effect on people (Szewrański, Chruściński, Van Hoof, Kazak, Malgorzata, Tokarczyk-Dorociak & Żmuda, 2018).

Furthermore, flooding caused by heavy rain is a common cause of weather-related interruptions in the transportation sector of an economy. As a result, air, sea, and land transportation are all subjected to massive traffic congestion, resulting in a great deal of inconvenience and delays in movements that have a significant impact on productivity and services (Pregolato, Ford, Wilkinson & Dawson, 2017).

2.5.3 Flooding effects on agricultural productivity

Saqib, Ahmad, Panezai and Rana (2016) carried out a study by examining the effects of socio-economic factors on risk attitudes of farmers in a flood-prone area of Pakistan. The study disclosed that farmers were threatened on their agricultural productivity and income in the forms of loss to seed stocks, animal shelters, fertilizers and agricultural machinery. They further elicited that floods come with huge damages to agricultural crops, fisheries, forestry, livestock that die or suffer from infectious diseases and at times displacement of the animals.

Saqib et al., (2016) have also claimed that production risks connected with variations in crop yields and livestock as a result of unpredictable meteorological conditions, as well as the occurrence of disease and pests, which affect the market value of their produce, were sources of risk factors in agricultural productivity and income. They also discussed the financial dangers that farmers faced in terms of being able to pay their other bills while still having enough money to invest in their farming operations. At the same time, these small-scale farmers were exposed to marketing risks, such as seasonal price changes in agricultural goods or commodities (Saqib et al., 2016). Moreso, agricultural productivity and income of the smallholder farmers were affected in times of floods because the agriculture sector was highly dependent on variations in climatic conditions, making it a risky initiative for the farmers (Osei et al., 2021). Similarly, climate variability risks agricultural output because the rising severity and frequency of extreme weather conditions substantially damaged agriculture produce, land, availability of labour and market prices (Ullah, Shivakoti & Ali, 2015).

Osei et al., (2021) have corroborated that changes in the intensity and duration of rainfalls have major consequences on smallholders agriculture, water resource management, and flood control. These researchers went on to say that a protracted lack of rain could lead to more dry spells, which are bad for crop and animal production, whereas an increase in precipitation is good for agriculture but can worsen flooding that subsequently affects farm produce and income.

Further observations have shown that flooding has been linked to the destruction of food crops and seed stores on farms and in seed shops, resulting in a drop in food output and household income. Starvation can result from a decrease in food production, which can endure for months after a flood disaster (Armah et al., 2010).

In contrast to the negative impacts of flooding outlined, a study of the effects of floods on agricultural productivity in Bangladesh found that monsoon floods are critical to the agrarian economy and small-scale farmers' survival (Banerjee, 2010). He argued that floods provide water for crop production, recharge the groundwater table, replenish soil fertility, and promote fish production in the region, according to the findings of the study. Periodic flooding was thus observed to induce higher aquatic production in macroinvertebrates, resulting in the reproduction of fish species that forage in floodplain settings.

Another study on the impacts of floods in South Asia, the findings corroborated that floods are necessary for the replenishment of soil for agricultural production and fisheries for people's long-term survival. Flood plains also serve as significant economic corridors for transportation (Shrestha & Takara, 2008). For example, studies on the rivers of civilization and sediment of the Tigris and Euphrates rivers respectively, (Macklin & Lewin, 2015; Husain, 2021) demonstrated that flooding

occurrence, benefited ancient settlements along the Tigris-Euphrates Rivers in Mesopotamia, Egypt's Nile River, and China's Yellow Rivers, where frequent floods delivered minerals, nutrients, and deposited alluvium materials that nourished the land for agricultural output and fish farming endeavours.

2.5.4 Flooding effect on small scale farmers' income

Parvin et al., (2016) espoused that flood disasters disproportionately impact the poor in a community. They observed that the poor suffer the most and are more affected by any form of natural disaster. For them, poverty is a significant contributor to people's vulnerability to flooding, and as such frequent floods lead to increases in poverty among small scale farmers.

The effects of frequent flooding leads to a lack of demand for daily labour and the inability to work because agricultural fields are inundated. This recurrent floods result in the loss of wage labouring prospects. This unfavourable situation forces the poor to incur more costs in order to respond to flood situations while still earning enough to maintain their families. Because of their lack of daily income, the impoverished in the community frequently experience money scarcity. Their possibilities of overcoming this situational dilemma require them to borrow money, primarily from high-interest money lenders (Parvin et al., 2016).

Additionally, seasonal floods frequently result in animal losses, agriculture destruction, food storage destruction, bridge destruction and market facility destruction. Local people who are informally employed who would have produced to sell, buy, or retail are harmed by the unsupported flooding, leaving them unable to earn a living (Armah et al., 2010).

2.6 Coping Strategies of Residents to Flooding Events

Indigenous people rely on natural resources for subsistence and are particularly vulnerable to disasters such as floods. Farmers in flood-prone areas must consequently adhere to coping techniques on a continuous basis. In these uncertain conditions, residents' decisions are dependent on their perceptions of the surroundings, the information available at the time, and their attitudes (Ullah, Shivakoti & Ali, 2015).

Natural disaster risk reduction or mitigation can be achieved by following specific guidelines such as incorporating disaster prevention, preparedness, and vulnerability reduction perspectives into national sustainable development policies, increasing local capacity (institutions) for hazard resilience, and incorporating risk reduction into the design and implementation of emergent infrastructure. Similarly, spatial planning, constructional measures, risk acceptance, behavioural adaptation, information systems, technological flood protection, and improving natural water retention in catchment areas have all been identified as flood response capacity measures or mechanisms (Prokic et al., 2019).

Also, there are accounts on non-structural measures that are witnessed to have yielded favourable responses to flood victim-survivors. Here, the strategy deployed is by promoting direct interaction with people through training, local management systems, early warning systems for people and public information (Acosta-Coll et al., 2018). Besides, there have been other structured adaptation measures involving the on-site improvement of infiltration plan and rainfall water recycling with green roofs, permeable or porous pavements, practising rain gardening and urban rainwater harvesting (Szewrański et al., 2018).

Otomofa et al., (2015) further suggest that community-based flood warning systems and reliance on traditional knowledge on floods should be developed and put in place to alert the residents against severe flooding. They again recommended that improved varieties of crops that will be highly resistant to floods, early yielding cereals and grain seeds, early ploughing interventions should be provided to farmers for cultivation.

Moreover, flood coping mechanisms in flood risk-prone areas have had farmers addressed production risk through savings, agricultural credit, irrigation and migration to cope with the risk at the time (Ullah, Shivakoti & Ali, 2015). Similarly, a study on the socio-economic losses of flood and household coping strategies disclosed that the flood victims coped with the flood events through borrowing from the informal sector, assets disposal or local aid, migration and governmental cash grants (Hyder & Iqbal, 2016). A study on coping strategies of households affected by flooding in Sekondi-Takoradi, Ghana, showed that the most familiar coping strategies adopted by residents in the communities were temporary vacation of homes, transfer of relevant properties to neighbours, support from families and friends and building of flood steps (Danso & Addo, 2017).

2.7 Conceptual Framework

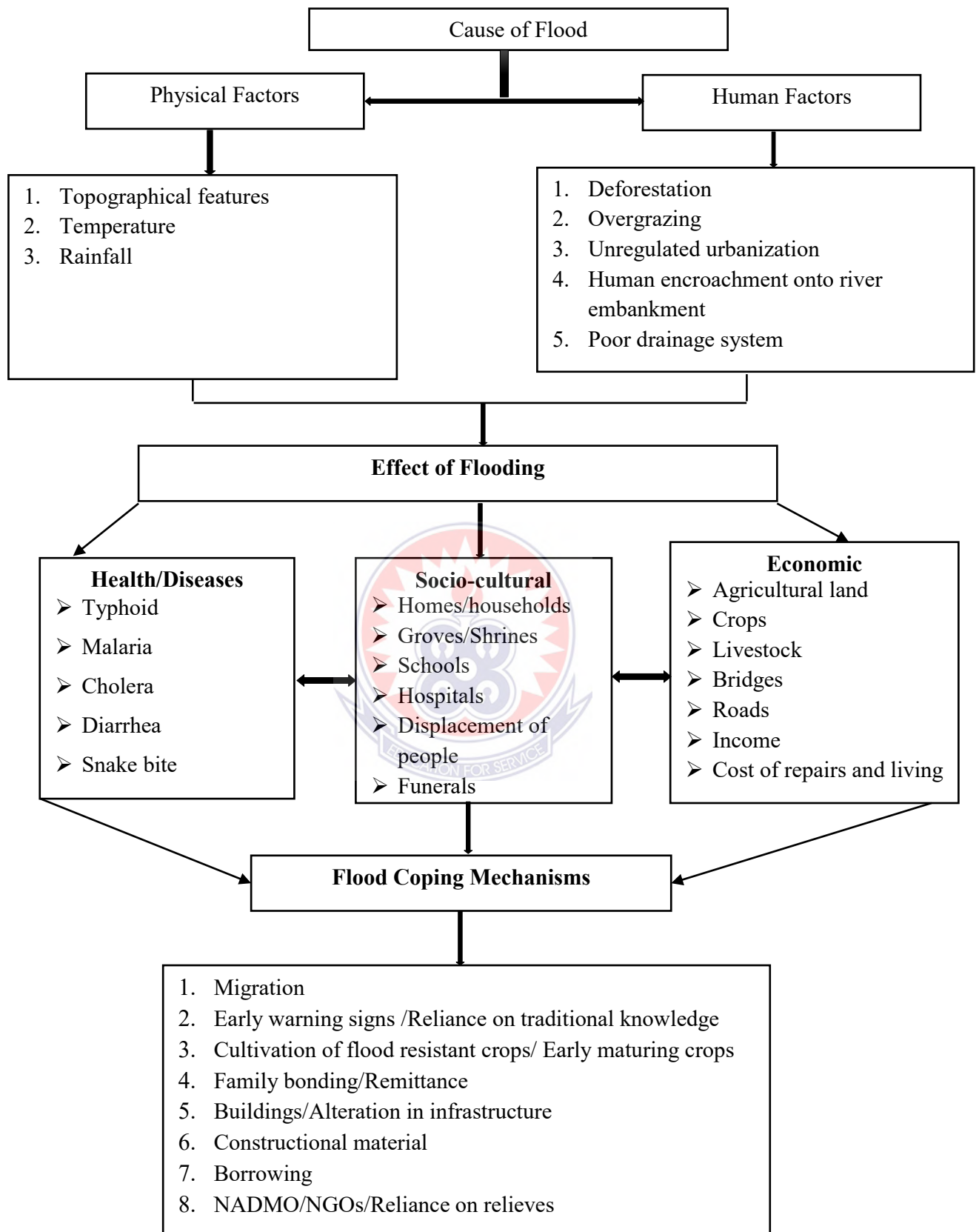
This conceptual framework highlights the interconnectedness between the causes, effects, and coping mechanisms of flooding. It provides a holistic view of the subject, allowing for a better understanding of the complex dynamics involved and guiding the development of strategies to mitigate the impacts of flooding. The framework established that the dominant causes of flooding are associated with either natural or human factors or both (Khan, 2011). Naturally, flooding situation was experienced

due to heavy rainfall, topography and temperature. Whilst human factors attributable to flooding events emanated from deforestation, unregulated urbanization, overgrazing, encroachment onto river embankment and poor drainage system.

The flooding incidence subsequently resulted in social and economic effects: Loss of life and injuries, displacement of people, damage to infrastructure (roads, bridges, and buildings), interruption in essential services (water, electricity) and economic losses (property damage, crop failure, business disruption). Also, the environment was affected in the areas of soil erosion and water pollution. This undesirable social condition further affected the flood victims' health and psychological well-being. For example, flood victims experienced malaria, typhoid, snake bite, trauma and stress, anxiety and fear.

The inhabitants remained resilient through various coping mechanisms such as early warning systems emergency response planning, migration, family support and many more. According to the study's theory, flood victims are pushed to acquire specific coping mechanisms during flooding in order to remain robust to the season (Holling, 1996). The conceptual framework has also evoked certain socio-economic repercussions of annual floods on the research setting's victims.

Figure 2.1: Conceptual Framework



Source: Adapted (Khan, 2011)

This frame work implies that the topography, temperature, and rainfall patterns of a given place have a role in the physical causes of flooding situation. Flooding was exacerbated by human activities such as deforestation, overgrazing, unregulated urbanisation, encroachment on river embankments, and inadequate drainage systems within towns and cities.

Furthermore, the social effects of the flood events were seen among the affected communities in the areas of building destructions and submerging of traditional shrines or worship centres such as the grooves, displacement of family members, disruption of school activities, and residents' inability to perform annual rituals such as the performance of funerals of departed loved ones due to poor harvest.

However, the framework suggested that migrating from flood-prone areas, heeding to early warning signals, cultivating flood-resistant crops and support from family members and friends or relatives, also by borrowing, and support from government and its agencies such as NADMO, NGOs or philanthropists were all sources of coping or survival mechanisms of the flooding victims.

2.8 Summary

The literature review demonstrates that flooding events are caused mainly by natural incidences like changes in weather patterns, topography or soil type of an area and the activities of humans such as urbanisation, farming, deforestation, construction and the ineptitude of leaders. These flood events deteriorate the normal functions of life, affecting homesteads, agricultural land, income, socio-cultural life of a people and their daily activities, water supply, sanitation conditions, and economic structure. These combined impacts on society, the economy, and physical infrastructures jeopardise the livelihoods of both the rural and urban poor. The poor are consistently

obliged to constantly struggle to cope with these impacts of the floods and manage their livelihood through family bonding and friend support, intervention from government agencies and NGOs.

In conclusion, ecological resilience theory offers a comprehensive framework for studying and addressing flooding in the district. By understanding the dynamics of the socio-ecological system, identifying vulnerabilities, and promoting adaptive strategies, resilience theory can contribute to more effective flood risk management and sustainable development in the face of increasing flood threats.



CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses the study's philosophical paradigm; the research approach that was used to achieve the study's objectives; the research design; the outline of the setting of the study and other methods followed in conducting the study. The chapter further discusses the population, sample size and sampling techniques proving justifications for the choices made. In addition, the data collection methods and how the data was analysed and interpreted were briefly discussed, along with ethical considerations observed in the entire research process.

3.2 Philosophical paradigm of the Study

The positivist believes that reality exists irrespective of our knowledge (Grix, 2018) and that the social environment is something that is disclosed to us rather than something that we make (Miller & Brewer, 2003). The positivists believe that 'objective knowledge' is achievable because researchers can observe a fixed and unchanging reality. As a result, Positivism believes that natural scientific methodologies and practises should be applied to the social sciences (Denscombe, 2002). As a result, positivism's epistemological assumption is that we learn about the world through our sense experiences and the collection of numerical facts (Miller & Brewer, 2003). The interpretivist views reality as a complex social construction of meanings, values, and lived experience, stands in opposition to the positivist understanding of social reality and how it may be known (Cohen et al., 2000). Here, data for interpretivist research is obtained from the interpretations people give to their situations and experiences of reality.

The pragmatists argue that using only one way of data collection to generalise a conclusion about a social phenomenon is insufficient, and that using both methods to collect both qualitative and quantitative data is necessary to fully address a study subject. As a result, the pragmatist adopts the realism theoretical idea and pragmatic philosophy (Kuranchie, 2021). The usage of this strategy helps to validate each other's findings in the sense that it provides a more believable study output by comparing the outcomes. It also serves as a foundation for conducting the next step of a study by assuring triangulation.

In this study therefore, the researcher used the pragmatic paradigm because knowledge is dynamic and as such, it is not possible to uncover the truth about the world exclusively through one scientific method as espoused by the positivist paradigm neither is it possible to ascertain social reality as subscribed by the interpretivist paradigm (Kuranchie, 2021). The pragmatists indicate that knowledge is perceived as being both constructed and based on reality of the world we experience. Hence, this philosophical stance to explore the socio-economic effects of annual flooding on the inhabitants of Saboba district in the northern region of Ghana,

3.3 Research Approach

In this study, the mixed methods approach was used to explore the socio-economic effects of annual flooding in the Saboba district. This research approach combines qualitative and quantitative methods in a sequential manner to explore a research problem or question. It involved an initial qualitative phase followed by a quantitative phase, with the purpose of building on and complementing the findings from each phase.

In using mixed methods approach, there were a number of factors that influenced the researcher's choice. The rationale for using this approach was to achieve triangulation logic since there is no single approach that can fully capture all of the study's relevant elements. The combination of qualitative and quantitative methodologies allowed the researcher to cross-check data collected using various methods, ensuring that the study's findings were valid and reliable (Creswell & Creswell, 2017).

Another justification for combining qualitative and quantitative approaches in this study was to assist the researcher to converge and reconcile the qualitative data with the quantitative data of the respondents for in-depth understanding and credible results on the socio-economic effects of annual flooding and the coping mechanisms for the survival of the people in the Saboba district. Thus, combining the two methodologies in a single study, the researcher's claim for validity of his or her conclusions was enhanced if they can be shown to provide mutual confirmation (Bryman, 2017; Plowright, 2018).

Furthermore, the rationale to employ the mixed methods approach in the study was to afford the researcher the opportunity to explore the phenomenon in details from more than one angle for a better and broader understanding of issues pertaining to the socio-economic phenomenon of the flooding event in the study area (Creswell & Creswell, 2017). Besides, the mixed methods approach was preferred in general because it combines qualitative and quantitative research which is rigorous in nature because it entails mixing statistical trends and tales to investigate human and social issues and conditions.

Hence, the use of multiple methodological approaches in this study enhanced a more reliable information as well as unearthing new information on the socio-economic effects of annual flooding in the Saboba district.

3.4 Research Design

The design for this study was exploratory sequential mixed methods design. With this design, the researcher starts off with the qualitative phase of data gathering and interpretations and corroborates the results with quantitative phase of data. In this design, the researcher was empowered to go beyond the ‘why’ and explain or illicit responses that go beyond the phenomenon of study: socio-economics effects of flooding on the inhabitants of the study area.

The advantage of this design is that the qualitative results typically informed the types of participants to be selected for the quantitative phase and the types of questions that were asked of the participants. The overall intent of this design was to have the quantitative data help explain in more details the initial qualitative results, thus it was important to tie together or to connect the qualitative results to the quantitative data gathered.

In addition, the design offers the researcher adequate information, which connects empirical evidence to the initial research questions as mirrored by (Punch, 2009; Yin, 2015). Furthermore, Creswell and Plano-Clark (2011) claim that once there is enhanced general knowledge of the research situation, the qualitative phase can be followed-up with a quantitative phase to generalise and test what was learned from the initial exploration.

Creswell and Creswell (2017) espoused that under the exploratory sequential mixed methods design, the researcher starts with the qualitative research phase and investigates the perspectives of participants. In this phase, the research participants were interviewed one-on-one with the support of an interview guide developed based on the research questions. The interview guide was divided into five sections to elicit responses on the causes and the participants' opinions on the socio-economic effects of floods, and their understanding of flood victims' coping techniques in the study area (Terrell, 2012). Hereafter, the data was examined and the information gathered used to create a quantitative phase of the study with the support of a structured questionnaire to solicit responses from key informants and households who were purposively proportionally selected respectively.

3.5 The Setting of the Study

This study was conducted in the Saboba district of the northern region of Ghana. The district is bounded by River Oti, an international boundary for Ghana and the Republic of Togo and the Tatale district to the East, Chereponi district to the North, Gushiegu and Karaga districts to the West, Yendi to the Southwest, and Zabzugu to the South. The district covers an approximate land area of 1,751.2km² (GSS, 2014).

The population of Saboba district is 65,706 representing 2.7% of the Northern Region's total population (Population & Housing Census, 2010). Males constitute 49.2 % and females represent 50.8 %. About 91% of the population is rural. About 2.5 % of the District's total population has one or other form of disability. The proportion of the male population with disability is slightly higher 2.6% than females 2.4%. The types of disability in the District include sight, hearing, speech, physical, intellect, and

emotion. Persons with emotional disability recorded the highest of 23.5 %, followed closely by sight disability 23.4% (GSS, 2014).

Similarly, GSS (2014) outlined that Saboba district has markedly seasonal type of climate, with two distinct seasons, dry and rainy seasons. The dry season lasts from November to April and sometimes up to May. During this period of the season, the dry North Easterly Winds, popularly known as the harmattan, blow over the Sahara Desert have a terrific dehydrating effect on the people. Saboba experiences a unimodal rainfall with an erratic pattern starting from April/May and ending in October/November. Mean annual rainfall is between 900mm and 1200mm. Rainfalls are characterized occasionally by heavy thunderstorms, and floods occur at the peak period of July to September. Saboba district is a low-lying area, and fairly undulating land. Due to the clayey nature of the soils the land is generally poorly drained with a lot of marshy areas. The soils of the district are predominantly clayey and suitable for rice production usually cultivated extensively around the Kpalba, Sambuli, Sanguli and Gbangbanpon and Nambiri lowlands (GSS, 2014). Also, there is considerable soil erosion in the district due to inappropriate farming practices and rampant burning of the vegetative cover. Invariably, some of these human activities have profound effect on the weather pattern of the study area which seems to be one of the predisposing factors leading to perianal flooding of the area.

The study area has some sites of historic, scientific and tourism attraction and potentials. This includes the Human Bones at Kpegu, the Sacred Stone at Wapuli, the Gold Coast Policeman at Zagbeli and an ox-bow lake in River Oti at Buagbaln (GSS, 2014). The District's economy is dominated by agricultural productivity with about 70% of the working population engaged in agriculture. Besides, fishing in River Oti

and hunting are practiced in the district. Other economic activities of importance are commerce, agro-based small-scale industries and income generating activities.

The main crops produced include millet, sorghum, fonio, beans, maize, rice and groundnuts. Other food crops cultivated in the area include cassava, yam and vegetables (okra, tomatoes and pepper). Cotton and soya beans are some of the industrial crops and cash crops grown in the District (GSS, 2014). The district is endowed with a good breed of cattle, sheep and goats. Pig farming is an important activity in the District because the pigs are mostly consumed during funerals and Christmas festivities. Also, poultry like guinea fowls, turkey, fowls and so on are reared on a smaller scale (GSS, 2014).

Figure 3.1 Shows an insert map of Saboba district with the study communities which have been clustered into Saboba, Kpalba and Wapuli zones.

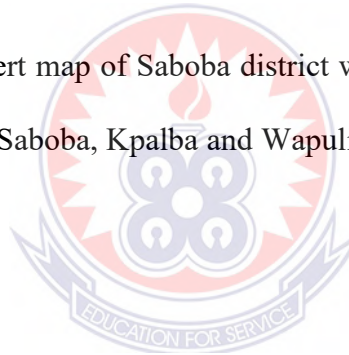
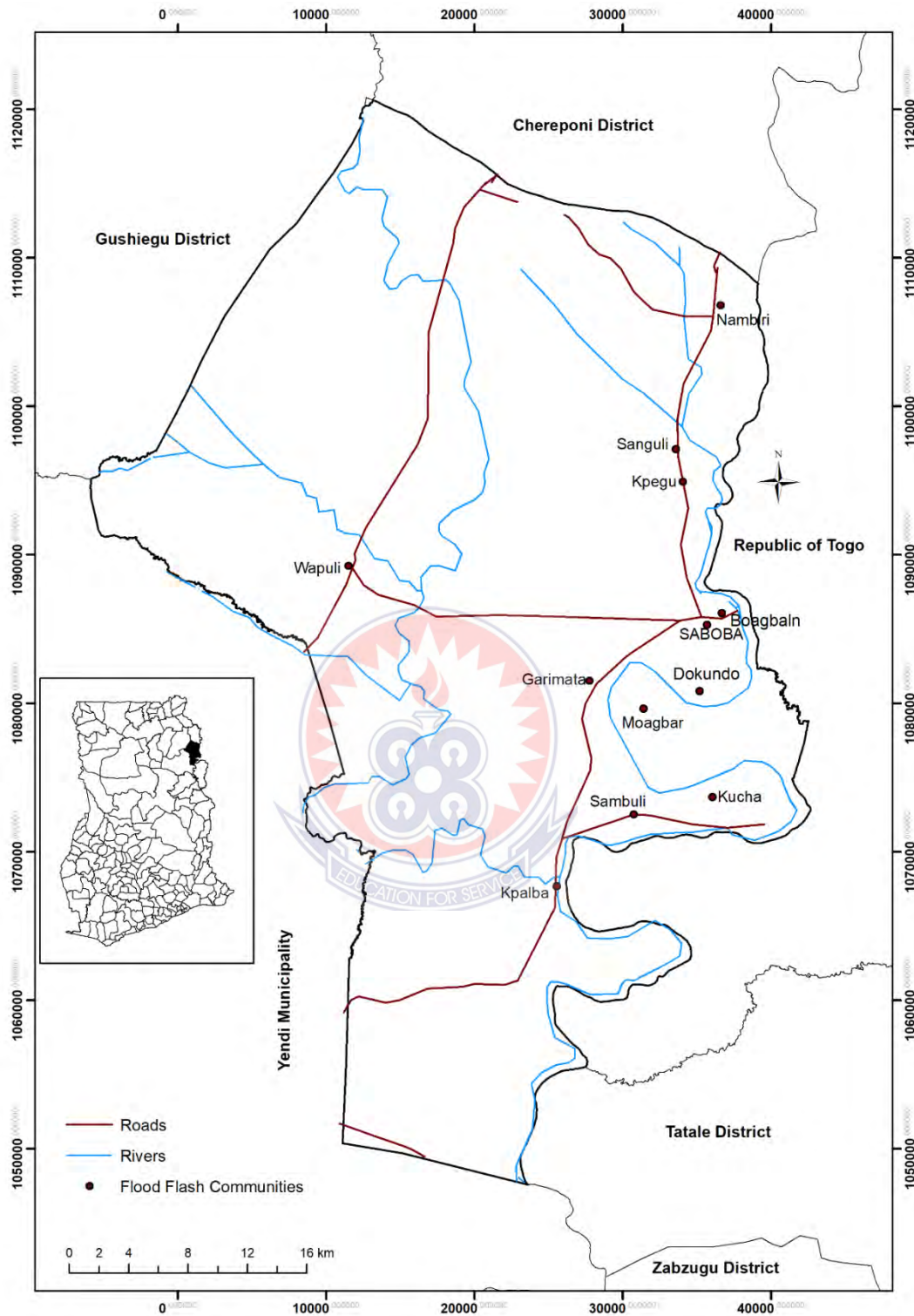


Figure 3.1: Map of Saboba district



Source Field Survey (2022)

3.6 Population

The target population for the study was all households in the Saboba district, who were either affected or not affected by the flooding incidence. According to the district analytical report of the 2010 Population and Housing Census, Saboba has a total of 9,011 households (GSS, 2014). The target of all household was because everyone in the Saboba district was deemed affected or have experienced the annual flood occurrences in one way or the other. For the purposes of data collection, the communities in the district were clustered into three zones. Thus, Kpalba (*Sambuli, Kuntuli, Kuncha, Moagbar*). Sabobae (*Dokondo, kiteek, Buagbaln, Kpegu, Sanguli, Gbangbanpon, Nambiri*) and Wapuli. The accessible population included household heads in the selected communities within each zone, the district NADMO coordinator, the MoFA director, GHS district director, the manager of World Vision Ghana (WVG) in charge of Saboba cluster and the District Coordinating Director (DCD). These participants were considered because they formed part of the major stakeholders of the district in relation to the provision of developments and basic institutional support in the areas of food, shelter, health and education. Besides, they were directly involved in the district's decision making and policy formulation as well as implementation processes.

Household heads were included in the study because they were the breadwinners of the family members and also, extended huge support to the dependent members of the family for their survival and wellbeing. Since the flood incidence directly hits them and household members when it does occur, it suffices to include them to find out the social, cultural and the economic effects of the annual flooding incident and their coping mechanisms.

NADMO was also considered in the study because the department was the custodian of disaster management information in the district and seeks to enhance the capacity of society to prevent and manage disasters and to improve the livelihood of the poor and vulnerable in rural communities through effective disaster management, supply of relief items, social mobilisation and employment generation. They are mandated to manage disasters by coordinating the resources of government institutions and developing the capacity of voluntary community-based organizations to respond effectively to similar emergencies.

The inclusion of MoFA district director was important because the agency is a major stakeholder in the economic activities of the district whose services were crucial to the small scale farmers in terms of agriculture inputs, records on yields and post harvest losses. MoFA was to promote sustainable agriculture and thriving agribusiness through research and technology development, effective extension and other support services to farmers, processors and traders for improved livelihood and as such their activities can be affected by the weather variability. GES was one of the major stakeholders in the district with a vision to create an enabling environment in the educational institutions and management positions that promote effective teaching and learning as well as management efficiency in order to achieve the Service's objectives and goal. When floods occur, this vision is shattered in the sense that effective teaching and learning are disrupted as a result of teachers and learners' inability to attend schools because some paths and communities were cut off by the flood event.

World Vision Ghana in the district was included in the study population because its programme operations directly bordered on the wellbeing and livelihood of children and their parents who happen to be household heads and members. The District Coordinating Director was also captured in the population because the Assembly was the administrative hub of governance in the district and was mandated to protect lives and properties.

3.7 Sample and Sampling Technique

For the qualitative phase, all household heads of the study area's three zones, Saboba, Kpalba, and Wapuli were the target population for the focus group discussion (FGD). The household heads comprising the community chiefs, elders, assembly men and women were among the accessible population for the respondents.

In the qualitative phase of the study, two (2) Focus Group Discussions (FGDs) were constituted in each of the study zones. Thus, male and female groupings. Therefore, six (6) FGDs were drawn to solicit responses from the participants. These participants, were then chosen using a maximum variation sampling technique, which is a nonprobability sampling strategy. This method allows the researcher to select persons who differ on some characteristics or traits in order to broaden the range of viewpoints on the issue under investigation. Maximum variation is used to document one-of-a-kind or diversified variations that can occur when responding to a condition. This sampling technique ensures that participants with varied characteristics were fairly represented in the study (Speziale & Carpenter, 2011).

In addition, four (4) males key informants from the Ghana Education Service Directorate, Ghana Health Service Directorate, District Coordinating Director and NADMO District Director were engaged in a one-on-one interview to validate by

sharing a detailed and lived experiences on the findings from the FGDs. These participants, were purposefully selected based on their lived experiences and knowledge on the issues under investigation (Creswell & Creswell, 2017).

Cohen, Manion and Morrison (2007) supported that purposive sampling technique as a feature of qualitative research is when researchers deliberately choose subjects to be included in a study on the basis of their judgment of the typicality or possession of a particular characteristic of interest. The decision therefore to select those who have relevant knowledge and lived experiences on the topic was made based on the researcher's own judgment.

Also for the quantitative phase, the study sought the views, opinions and lived experiences of the household heads in the district on the effects of annual flooding on the socio-economic lives of the inhabitants. For the quantitative phase of the study, Slovin's formula was used to select a sample size of 400 respondents for the data gathering process in the district. One merit of Slovin's formula is that it allows the researcher to sample the population with a desired degree of accuracy and a fair statistical representation of the study population.

The sample size for the quantitative study was obtained from the district population and housing analytical report (GSS, 2014) which states that there are 9,011 household heads in the district's three electoral areas. These electoral areas were then clustered into Saboba, Kpalba and Wapuli zones for the purpose of this study. Hereafter, Slovin's formula was used to obtain a sample size of 400 for this study:

$n = N / (1 + Ne^2)$. Where;

n = Sample size

N= Total number of population

$e = \text{Margin of error (0.05)}$

Therefore, the population for this data collection was given as: $N = 9,011$ and given that:

$$n = 9,011/1+9,011(0.05 \times 0.05)$$

$$n = 9,011/1+9,011 \times 0.0025$$

$$n = 9,011/9,012 \times 0.0025$$

$$n = 9,011/22.53$$

$$n = 400$$

The basis for the determination of the sample size was corroborated by Krejcie and Morgan (1970) table for sample size selection where a population of about nine thousand (9000), requires a sample size of three hundred and sixty-eight (368) as an ideal statistical representation for the population to be able to generalise the findings or results. Based on a confidence interval of 95% and margin of error of 5% or an alpha level of 0.05.

Therefore, for an informed interpretation and generalization of findings on the socio-economic effects of flooding on the inhabitants of Saboba district a sample size of 400 was statistically satisfactory for the study as suggested by Krejcie and Morgan (1970). Similarly, Kumar (2018) agrees with this position by corroborating that a sample size of 50 is very poor; 100 is poor; 200 is fair, however, 300 is good sample size for a quantitative study.

Multi-stage sampling is carried out in stages using smaller and smaller sampling units at each stage. Hence, the sample for the study was obtained using a multi-stage sampling technique to select the communities, the households and the respondents from Saboba, Kpalba and Wapuli zones, with an equal proportion of 4.44% to

determine the number of household heads for the responses. Thereafter, a simple random sampling was used to obtain the household heads who responded to the questionnaire as shown in Table 3.1.

Table 3.1: Sample Size for the Zones (quantitative phase).

S/N	Zones	Number of house holds	Proportion (4.44%)	Sample size
1	Saboba	3643	4.44× 3643	161.7
2	Wapuli	2816	4.44× 2816	125
3	Kpalba	2552	4.44× 3643	113.3
Total		9011		400

Source: Field Survey (2022)

3.8 Research Instruments

The researcher used four (4) instruments to solicit data from the participants for the study. These instruments were focus group discussions, observation, documentary for the qualitative phase and questionnaires for the quantitative phase.

3.9 Methods of Data Collection

Data was collected using a combination of qualitative and quantitative approaches to provide the needed information to answer the questions posed by the study and also enhanced analytical rigour. Conclusions can thus be transferable and easily generalised to the larger population due to its extensiveness and and depth.

For the qualitative phase of data gathering, the instruments that were used included focus group discussion, field observation and documentary analysis. Whilst community survey or questionnaire was used in collecting the quantitative data of the study.

3.9.1 Focus Group Discussion (FGD)

In order to have a comprehensive representation and understanding of the socio-economic effects of annual flooding on the inhabitants of Saboba, the researcher purposefully selected forty eight (48) household head participants to constitute six (6) FGDs, for the three zones. Each zone had two (2) separated FGDs thus, one female FGD and one male FGD. This sampling technique is useful for issues that participants are familiar with and their views, observations, ideas, opinions, and experience need to be solicited to make an informed judgement.

The selection process was done on purpose because informants were thought to be information-rich individuals who offered the researcher with the knowledge needed to better comprehend the topic under investigation. The FGD technique was used to elicit groups' opinion on issues, situations, events or developments of the socio-economic effects of flooding event on the inhabitants. Kumekpor (2002) supported that focus group discussion takes the form of an exchange of views and opinions through discussions with a group or different groups, which are organised and assumed to be knowledgeable in an issue at stake.

This technique required the researcher to provide information about the issues under discussion as and when necessary to enable members understand and contribute effectively and meaningfully to the topic. The FGD technique used in gathering data from respondents did not only allow participants to share their views and thoughts about the issues of interest under discussion, but also permitted them to comment on others' contributions that made the exercise informative, effective and fruitful.

3.9.2 Observation

In this study, the researcher used observation and took field notes on the behaviour and activities of individuals at the research site. The researcher captured actions at the research location in the field notes in an unstructured or semi-structured manner (using some prior questions that the inquirer wishes to know). The researcher asked general questions of the participants and allowed them to freely express their opinions and views on the research topic (Creswell & Creswell, 2017).

Observation as a means of qualitative data gathering in this study also meant watching participants, listening and recording what was observed rather than asking questions in determining what people actually did and how they actually behaved in their natural contexts (Sutton & Austin, 2015). This observation was done in both controlled and uncontrolled situations. The researcher had in mind the traits or behaviours of interest to observe and recorded as they occurred during the process of observation.

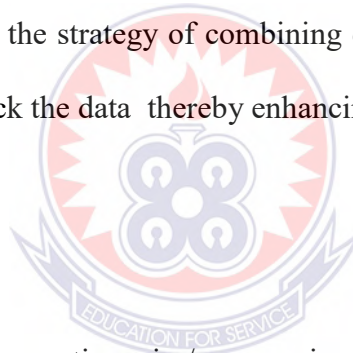
Furthermore, Yin (2015) explains that observations are a form of evidence that do not depend on verbal behaviour, and for that matter the method enables the investigator to observe the phenomenon under study directly. The phenomenon under study; socio-economic effects of flooding was one which lends itself to direct field observation hence, the usefulness of this technique in the qualitative phase of this study.

3.9.3 Documentary analysis

Another key source of data for this study was document analysis. In exploring the socio-economic effects of annual flooding on the people of Saboba district, relevant documents including: Annual reports from the offices of NADMO, MoFA, GHS, GES and photographs were considered to gather a broader and deeper understanding

of the social, economic and the coping strategies of the flooding incidence among the residents.

Furthermore, documentary sources often provide a convincing response because documentary analysis allows the analyst to become intimately familiar with the materials, saves time and supportive in drawing associations among variables. Yin (2015) demonstrates that documentary data collection technique allows an investigator to track both factual and interpretive information regarding the phenomena or situation under investigation. Documents provided reliable and quality information for the study because they revealed the past occurrences by the authors who largely experienced the phenomenon and knew a lot about the subject under discussion. Furthermore, the strategy of combining documentary sources allowed the researcher to double-check the data thereby enhancing triangulation investigation into the phenomena.



3.9.4 Questionnaire

In quantitative research, questionnaire/ survey is one of the most commonly used instruments for data collection. According to Bryman (2004) the attractiveness of the questionnaire arises, in part, from its low cost and speed of administration. Besides, the questionnaire used in this study allowed for the collection of standardised data on the same variables for everyone who was included in the sample.

Open and close ended questionnaire was developed to address the study's objectives, which was to investigate issues relating to household heads' opinions or views, thoughts and their lived experiences on the socio-economic effects and coping mechanisms of annual flooding incidence on the residents of Saboba district.

In this phase of the data collection, the questionnaire was developed to gather the data at the households' level. The questionnaire was put into various sections based on the objectives of the study. The instrument contained a set of questions aimed at obtaining specific information on a variety of themes. It was structured into six (6) sections namely: Section A gathered demographic information of participants. Section B assessed general issues on flood events, while Section C focused on flooding effects on socio-cultural life. Section D delved into economic effects of flooding and lastly, Section E investigated into the coping mechanisms of flood victims.

3.10 Data Analysis Procedure

This session delved into the techniques of data presentation and analysis for a vigorous discussion and findings of the study. Here, data was divided into qualitative and quantitative phases of the study.

3.10.1 Quantitative Data

With the quantitative phase of the data gathering, a questionnaire was administered among the sampled household heads in the three zones of the district. The researcher used Open Digital Kit (ODK), it is an open – source suite of tools or application software used for data gathering using android mobile devices and data submission to an online server.

Questionnaires were used to analyse quantitative data of the study. The data from the questionnaires were coded and loaded into SPSS for Windows after cleaning up the data and correcting the few inaccuracies in filling out of the questionnaires. Analysis was undertaken to generate a descriptive statistical pictures of the data gathered from the field based on themes which emanated from the research questions. Simple percentages and means (central tendencies) were used to analyse the quantitative data.

Thus, quantitative phase of the study was analysed using statistical summaries in the forms of frequency distributions and percentage tables.

The qualitative data from FGDs that were conducted with all categories of respondents were analysed using thematic analysis. Firstly, the recorded views of the respondents were transcribed, coded, analysed and reported manually and supported these with relevant quotations from participants' views. Field observations made and photographic sceneries on the flooding phenomenon were manually analysed and reported to support the description of the events of the study.

In this strategy, the researcher analysed the two data separately and presented them together. So integration in this design involved using the qualitative findings (or results) to inform the design of the quantitative phase of the research.

3.10.2 Qualitative Data Analysis

In line with the research design, data was analysed in two (2) phases with the qualitative data analysis taking the pre-eminence. The process of qualitative data analysis usually commences while the researcher was still in the field in order for the researcher to make major decisions regarding what qualifies as good data. In this present study, qualitative data was coded, transcribed and analysed thematically.

Thematic analysis is a type of qualitative data analysis and is a method for identifying, coding, analysing, and reporting example patterns (themes) within data (Braun & Clarke, 2006). These authors proposed a six (6) staged-model in analysing qualitative data using thematic analysis whilst Creswell and Tashakkori (2007) recommend a model that moves in a spiral form. Therefore, in this study, the researcher used the process of thematic analysis modeled by Braun and Clarke (2006) and they identified six steps in thematic analysis:

1. Familiarisation with the data

The audio recordings of the FGDs was listened to several times to familiarise myself with the data. For easy reference, each interviewee was given a numerical code. The order in which the participants were questioned determined the codes. Male groups were coded (MFGD-R1 to MFGDR-24) while female groups were coded (FFGD-R1 to FFGDR- 24). The audio interview was transcribed verbatim, and hesitations and pauses were recorded (McLellan, Macqueen & Neidig, 2003). This was done to keep the material original and prevented it from being misconstrued or lost. All the six (6) FGD participants were interviewed in the vernacular. These were translated and transcribed verbatim into English. The transcribed data was read through while listening to the audio recordings in order to ensure there were no omissions.

2. Generating Initial Codes

Coding is the process of looking through data for themes, concepts, and categories, then labelling similar chunks of text with a code label so that they may be quickly accessed for future comparison and analysis. According to Braun and Clarke (2006) the coding process entails assigning terms to phrases, quotations, and pieces of textual data, which aids in the sorting, reduction, and distillation of interview information. During the interview, participants used sentences to generate initial codes. The codes made it easier for me to locate data later on in the process. Inductively, a coding frame with codes and sub-codes were created from the interview transcripts.

3. Searching for themes

Braun and Clarke (2006) point out that searching for themes involves sorting the different codes into potential themes, and collating all the relevant coded extracts within the identified themes and this was the beginning of the analyses of the codes.

4. Reviewing themes

This stage involved checking if the themes worked in relation to the coded extracts (phase 1) and the entire data set (phase 2), and generating a thematic ‘map’ of the analysis (Braun & Clarke, 2006). I reviewed the major themes and sub-themes to ensure that the themes that could not be discussed alone were collapsed and added to the ones that were similar. Through this process, the data was made clear and identifiable distinctions were made among themes.

5. Defining and naming themes

This phase of the analysis was to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names of each theme (Braun & Clarke, 2006). I made sure that the names that were given to the sub-themes were catchy and immediately gave the reader a sense of what the theme was all about.

6. Producing the report

According to Braun and Clarke (2021), writing the report is an integral part of the analytic process. At this stage, the researcher has to make sense of the raw data and present it in a way that it will be understood by others. In addition to this, it is important that the analysis gave, to some extent, the concise, coherent logical, non-repetitive and interesting account of the story the data told within and across themes. I wrote the final report after I reviewed themes that made meaningful contributions to answering the research questions. To the best of my ability, I wrote the report devoid of any personal sentiment and observer expectancy effect. I basically depended on the response that participants gave and I discussed the issues as they were.

3.11 Ethical Considerations

Research ethics concern how to create and clarify a research topic, plan a study and acquire access to it, collect data, process and store data, analyse data, and write up research findings in a moral and responsible manner (Saunders, Lewis & Thornhill, 2012) When working with others, whether they are coworkers, respondents, assistants, or persons in positions of authority, ethical considerations are unavoidable (Perecman & Curran, 2006). Ethical concerns are extremely important and should be given careful thought. Researchers must not put participants in situations where they might be harmed as a result of their participation

During the research, a number of ethical issues were addressed, including respondents' acceptance and consent, access to information; as well as assurance of respondents' confidentiality and anonymity. To verify that this research effort was ethical, I first sought permission from the Department of Social Studies Education at the University of Education in Winneba (see appendix). Following that, I acquired verbal authorization from the gatekeepers in the neighbourhood, as well as consent from the parents of school children specifically under the age of 20. This was taken into account because gatekeepers play an important role in ensuring that researchers have access to the desired participants and study settings (McFadyen & Rankin, 2016).

In addition a copy of the letter for data gathering was given to institutions and organisations or communities identified to participate in the study, informing them of the study and seeking their consent to visit their premises for the interview and discussions. I introduced myself and the purpose of study to prospective participants. This helped to avoid intrusion on any premises.

In this study, the investigator further notified all participants of the research objectives and any features of the research or intervention that could fairly be expected to influence one's willingness to engage whenever practicable. The researcher also discussed any other parts of the study that the participants had questions about in the process of this study.

The study also considered issues of participants' confidentiality and anonymity. None of the information provided by interviewees was to be shared to other people, in accordance with the ethical requirement that information received from or about a participant during study be treated discreetly. When informants volunteer information that could be harmful to them or others, if released, it was used with extreme caution and in a way that did not identify the sources.

Regarding the focus group discussion, it was held once respondents had given their verbal agreement. All of the study's relevant information was provided in the local language. The participants were also guaranteed confidentiality and anonymity. As a result, the participants were guaranteed that their names and comments would not be exposed unless they gave their permission. Furthermore, the interview schedule left out any personal information such as the participant's name and residence. After the interview data was recorded, other types of identities were substituted with pseudonyms (Creswell & Creswell, 2017).

To achieve anonymity of the data that was gathered from respondents in the questionnaire, personal data such as names and addresses of participants who answered the questionnaires were left out in the design of the instruments. In this way, it became impossible to trace any information to a particular participant.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents the data analyses and discussion of the results obtained from data collected. Data was gathered using an exploratory sequential form of mixed methods. Focus group discussions, key informants' interviews and questionnaire data gathering techniques were used in an attempt to answer the research questions of the study. The findings were discussed in the light of existing literature. Qualitative and quantitative findings were triangulated in the discussion in order to demonstrate that the quantitative findings gave an enriching statistical understanding and contribution in the forms of frequencies, percentages and average computations to the findings in the qualitative phase of the study.

The purpose of the study was to explore the socio-economic effects of annual flooding on the inhabitants of Saboba district in Northern Ghana. To achieve this purpose, the following objectives were used to guide the research process and conceptualization of variables and indicators.

1. Examine the causes of flooding in Saboba district.
2. Explore the effects of flooding on the socio-cultural lives of the inhabitants of Saboba district
3. Examine the influence of flooding on agricultural productivity and income of households in Saboba district
4. Explore the coping strategies of flooding on the inhabitants of Saboba district.

4.2 Demographic Characteristics of Participants

The demographic information of the respondent was gathered through the use of the Focus Group Discussions (FGDs), key informants' interviews and questionnaire. Collecting and analysing demographic information helped to better understand the study population and ensured that the findings or results were representative and reflective of the population studied.

The interviews were conducted on one-on-one. The essence of the focus group discussion was to capture valuable insights, understand the views of the participants and these information was necessary to reconcile information obtained from the two data sets in order to shed more light on the individuals' views, opinions and lived experiences in order to build multiple perspectives from the respondents and to present a more robust, a holistic analysis and a deeper and broader understanding of the phenomenon under investigation. The demographic characteristics of the respondents are presented in Table 4.1.

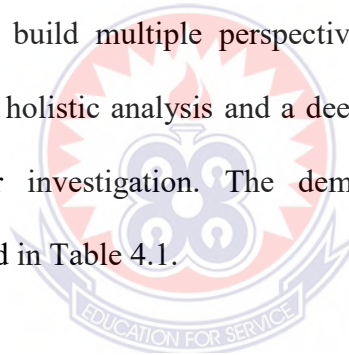


Table 4.1: Demographic Characteristics of Participants

Zone / Electoral Area	Frequency	Percentage (%)
Kpalba	114	28.8
Saboba	135	34.2
Wapuli	146	37.0
Total	395	100
Marital Status		
Married	368	93.2
Not married	11	2.8
Widowed	16	4
Total	395	100
Level of Education		
No formal education	177	44.8
Non-formal education	17	4.3
Primary	42	10.6
JHS	37	9.4
Secondary	35	8.9
Vocational/Technical education	14	3.5
Tertiary	73	18.5
Total	395	100
Sex		
Male	301	76.2
Female	94	23.8
Total	395	
Occupation		
Farming	303	76.7
Teaching	12	3.0
Health Service	10	2.5
Petty Trading	62	15.7
Poultry	8	2.0

Source: Field Survey (2022)

The participants for the study were purposively zoned into the three (3) electoral areas of the Saboba district assembly namely; Kpalba, Saboba and Wapuli. This helped identify potential differences in responses or outcomes based on location. The quantitative phase of the study was designed through the administration of questionnaire to a total of 400 respondents drawn from the communities in the three

electoral areas, thus, Kpalba zone (*Sambuli, Kuntuli, Kuncha, Moagbar*). Saboba zone (*Dokondo, kiteek, Buagbaln, Kpegu, Sanguli, Gbangbanpon, Nambiri*) and Wapuli zone. So as to gather the needed data to ensure validity and also for the purposes of triangulation of data for an in-depth understanding of the flooding phenomena in the Saboba district.

Overall, 395 respondents were reached out to with the questionnaires. Where, 114 participants representing 28.8% then 135 participants constituting 34.2% and 146 indicating 37% of the total number of participants were interviewed from Kpalba, Saboba and Wapuli zones respectively, as shown in Table 4.1.

The quantitative phase of the results showed that 93.2% of the participants were married, while only 2.8% were not married and 4% were widowed. The quantitative data implied that most of the participants were married and lived with their spouses or partners in the communities. The participants' marital status information clarified the responsibilities couples played as household heads in the family and their impact on the organisation, support, and difficulties of family life during flooding situations in the community.

4.2.1 Educational level of participants

Educational level of respondents was another demographic characteristic that was recorded in this research study. This provides insights into how participants' educational level may influence responses or outcomes of the study. The study survey revealed in Table 4.1 that the majority of the participants representing 44.8% had no formal education, whereas 18.5% had attained tertiary level of education. However, only 4.3% of them had non-formal education, whilst 10.6% had completed primary school education. The data also indicated that 9.4% of the participants had JHS

education, while 8.9% were secondary school leavers and only 3.5% of them had completed vocational and technical education. This information was crucial to the study because it affected how well-prepared a person was for life's opportunities and how likely they were to find employment that would allow them to support themselves. The educational level of the study participants also influenced the residents' knowledge about readiness for, and resilience to flooding incidence.

4.2.2 Sex of participants

Data gathered on participants' sex shows that a total of 301 representing 76.2% of the participants were males, while only 94 of the respondents constituting 23.8% were females. The majority of household heads were males, according to the results, which may be related to the inhabitants' patrilineal practice of the family system. The selective sampling method used for household heads in the communities may possibly be the cause of the gender gap in participants' number. As a result, the household heads were defined as someone who the other household members acknowledged as being in charge of them or as someone who is in charge of taking the primary responsibilities and key decisions of the upkeep of the household members.

The distribution frequency Table 4.1 supported that the majority of the participants representing 76.7% were into farming as their main occupation in the study district. The data elicited that 15.7% of the total participants were engaged in business or petty trading in the study setting. Whilst a representation of 3% of the participants were into the teaching service. Then only 2.5% were into health service and 2% of the participants were into poultry keeping as sources of their livelihood.

In Table 4.2 the data shows that 37.8% constituting the majority of the farmers were resident in Kpalba zone, whereas 35.3% of the respondents were settled in the Wapuli zone whilst, only 26.9% of the total participants were residents in the Saboba zone. These occupational distributions suggests that the majority of the population in the Kpalba electoral area in the district are composed primarily of peasant farmers, followed by the Wapuli and Saboba zones or electoral areas respectively.

Table 4.2: Occupation of the Participants

Zonal / Electoral Area		Kpalba		Saboba		Wapuli	
		F	(%)	F	(%)	F	(%)
Occupation	Farming	104	37.8	74	26.9	97	35.3
	Teaching	8	15.7	29	56.9	14	27.5
	Health worker	1	5.0	10	50.0	9	45.0
	Petty Trading	0	0.0%	10	33.3	20	66.7
	Constructional work	0	0.0%	13	81.3	3	18.8

Source: Field survey (2022)

Out of the total population who are teachers, 56.9% are found in the Saboba zone. Whereas only 27.5% and 15.7% of the participants in Wapuli and Kpalba zones respectively were into teaching service. However, the data further revealed that 50% of the total participants' in Saboba zone were into health service while 45% and only 5% of the participants were in the Wapuli and Kpalba zones respectively. In contrast, 66.7% of the participants in Wapuli zone were into petty trading, while Saboba had only 33.3% of the participants as petty traders. However, the data showed that participants into constructional work constituted 81.3% for Saboba zone and 18.8% for Wapuli zone.

It was revealed in Table 4.3 that the majority of the small holder farmers constituting a 22.4% cultivated maize, while 17.5% cultivated soya beans, whereas 14.3% cultivated rice. In addition, 12% of the participants' farmed groundnuts, then 10.8% cultivated yam. Besides, 5.5% were into guinea corn farming, while 8.1% cultivated pepper and 7.5% farmed okro. Other crops that were cultivated in the area were sesame 1.3% millet 0.6% and cotton 0.1%. Table 4.3 indicates that almost all participants were engaged in cultivating a crop for survival.

Table 4.3: Main Crops Cultivated in the Saboba District

Main Crops Cultivated	Frequency	Percentage (%)
Maize	243	22.4
Guinea corn	60	5.5
Millet	6	0.6
Rice	155	14.3
Soya beans	190	17.5
Yam	117	10.8
Groundnuts	130	12.0
Sesame	14	1.3
Cotton	1	0.1
Okro	81	7.5
Pepper	88	8.1

Source: Field Survey (2022)

The study results depict that a greater percentage of participants constituting 76.7% were peasant farmers in the Saboba district, it was therefore necessary to estimate the land sizes that individuals used in farming to be able to assess the extent of damage to their agricultural yields or income. Besides, by knowing the size of the farm and the areas that were susceptible to flooding, farmers could take measures to mitigate the risk, such as building raised beds and using flood-resistant crops such as rice. In the event of a flood emergency, respondents needed to know the farm size and location of

farmland in floodable areas to prioritise rapid response efforts. Overall, knowing the farm land sizes in floodable areas was crucial for managing risk, planning land use, and responding to emergencies in a way that protects both people and properties.

Table 4.4: Participants' Farm Land Sizes in Acres

Farm size (Acres)	Kpalba		Saboba		Wapuli		Average land size
	F	(%)	F	(%)	F	(%)	
1-5	78	31.1	102	40.6	71	28.3	
6-10	24	46.2	6	11.5	22	42.3	
11-15	1	25.0	0	0.0	3	75.0	
16-20	1	16.7	0	0.0	5	83.3	
Average	5		3		5		4.34

Source: Field Survey (2022)

Table 4.4 showed that, on an average, a farmer cultivates on 4.34 acres of land in the district. This information was useful to district authorities for future flooding disasters and helped minimize the impact on farmers and their livelihoods. It also ensured that resources were allocated more fairly to reduce inequality during flooding situations. For instance, Kpalba zone alone had 46.2% of the participants owing between 6 - 10 acres of farm lands, then 31.1% cultivated on a land size between 1 - 5 acres, whilst 25% of the participants used between 11 - 15 acres of farm land and only 16.7% utilised between 16 - 20 acres of land.

Where as, in Saboba zone, 40.6% of the participants owed farm lands between 1 - 5 acres, while 11.5% of them farmed between 6 - 10 acres of land. Meanwhile, in Wapuli zone it was indicated that 83.3% of the participants had between 16 - 20 acres of farm land, whereas 75% of the participants used between 11 - 15 acres of the land and 42.3% farmed on a land size between 6 -10 acres and only 28.3% farmed between 1 - 5 acres of land. These data demonstrate that farmers in Wapuli zone or

electoral area used more farm land sizes than Kpalba zone, though Kpalba had a majority of 37.8% of its residents who were into farming activities.

These findings suggested that the Kpalba and Wapuli electoral areas or zones had a higher residential numbers of peasant farmers than the Saboba zone. This result might be so because Saboba electoral area, happens to be the administrative hub of the district and is overwhelmed with public sector workers and other forms of earnings without necessarily engaged into farming. Besides, NGOs, basic and secondary institutions are seen concentrated in Saboba town which rather required a more formal or skilled labour force to engage.

The findings showed that the Saboba zone contained the largest market centre in the enclave, which encouraged a larger portion of the inhabitants to engage in businesses other than farming. The recent increase in population and urbanisation of the Saboba zone may have led to a need for more building spaces, which in turn decreased the demand for farmland and agricultural interest among young people or the residents.

4.2.3 Household size of participants

Overall, 47.9% of the majority of the participants had a household size between 6 -10 members. Participants who had a household size of less than 5 members represented 43.8% while a minority of only 8.3% had a household size between 11-15 members. Participants' household sizes that were less than five (5) members were described as non-family household which constituted 23.6% of the participants. Whereas, participants' household sizes which had members from six (6) and above were categorised as a family size and was represented by 76.4% of the participants. The results revealed that on the average a household size was 6.65 in the district. The size of a household has an impact on the risk and severity of flooding and as such it was

necessary to compute it for the study. For instance, the usage of water, need for space and food at home during flooding situations is worth noting to a household head and government agencies in times of flooding disasters.

4.2.4 Number of dependents

The number of dependents on a household in a flood-prone community can have a significant impact on household heads. For instance, if a household head has a large number of dependents, the financial burden of dealing with the effects of flooding can be significant. They may need to provide shelter, food, and other essentials for their dependents, while dealing with the costs of repairing their homes and replacing damaged belongings. Besides, flooding can disrupt economic activities and may result in a loss of income, making it more difficult for household heads to provide for their dependents.

Overall, 76.4% of the total participants had a family size dependents more than 5 members in a household, while a minority of the participants representing 23.6% constituted a non-family household with the number of dependents less than (five) 5 members. The findings indicated that the average number of dependents for a household head participant was 3.81. The number of dependents in a household had an impact on the risk and severity of flooding in the area of vulnerability to the impact of flooding. Because floods can lead to displacement, loss of property and injury or death. Therefore, households with huge dependents may need to take extra precautions when it comes to planning for evacuation in the event of flooding.

4.2.5 Participants' alternative source of income

The availability of alternative sources of income has a significant impact on the ability of individuals and communities to respond to and recover from floods. Developing and promoting alternative income sources can help build resilience and reduce the social, cultural, and psychological shocks of flooding incidence on the inhabitants.

Table 4.5 data showed that 121 of the respondents constituting 30.6% of them were engaged in livestock and or poultry rearing, while 102 of them representing 25.8% of the participants did not have any alternative sources of income and 64 representing 16.2% of them were into petty trading. However, 49 of them constituting 12.4% were engaged in farming as their alternative source of income. Also, 51 participants denoting 12.9% were into fishing as their alternative source of income. Then only 3 respondents representing 0.8% and 2 constituting 0.5% were into health and teaching services respectively indicating their alternative sources of income. This question was asked to confirm if residents were engaged in more than one occupation so as to be able to determine their level of resilience to the severity of flooding in the district. The result indicated that participants were engaged in one or the other occupations to make a living and bounced back to life after flooding, on the contrary, 25.8% of the respondents stated that they did not have any alternative source of income to stay resilient to the annual flooding in the district.

Table 4.5: Household Size, Number of Dependents, Alternative Sources of Income and Length of Stay

		Frequency	Percentage (%)	Average (Total)
Household Size	Non-Family Household (less than 5)	93	23.6	
	Family size (More than five)	302	76.4	
	Total	395	100	6.65
Number of Dependents	0-2	154	38.9	
	3-5	137	34.7	
	6-8	74	18.7	
	9 and above	30	7.6	
	Total	395	100	3.81
Alternative Source of Income	Livestock/Poultry rearing	121	30.6	
	No Alternative Source	102	25.8	
	petty trading	64	16.2	
	Farming	49	12.4	
	Health Service	3	.8	
	Teaching	2	.5	
Length of Stay in community	1-10	7	1.7	
	11- 20	23	5.8	
	21- 30	66	16.7	
	31 - 40	107	27	
	41- 50	112	28.4	
	51 and above	80	20.3	
		Total	395	100

Source: Field Survey (2022)

For an in-depth understanding of causes and the effects of the flooding incidence on the residents of the study area, the research sought to estimate the length of stay of the participants to be able to explore their lived experiences and opinions of the floods situation. The results suggested that the length of one's stay in Saboba had an impact on their understanding of flooding in the community. This was because people who have lived in Saboba for a longer period were likely to have experienced several flood

events. The study data showed that on the average a respondent had lived in the community for 41-years. This result summed up that most of these participants were inhabitants of the area and were information rich participants in the flooding phenomenon. The average age lived in a flood-prone community, also had an impact on the risk and severity of flooding. For instance, residents who have stayed longer became familiar with safe evacuation plans and were relatively resilient.

The results from the FGDs suggested that the majority of the participants representing a total of 54% had lived in the community for more than 20 years while a minority of them constituting 46% lived in the community for less than 20 years. Whereas the quantitative findings revealed that only 7.6% of the participants had lived in their communities for 20 years or less whilst an overall total of 92.4% of the participants confirmed that they had stayed in their communities for 21 years or more. Merging both the qualitative and quantitative data, it was conclusive that all participants had lived in their communities averagely for a reasonable number of years, and had personally experienced floods throughout time, and were therefore considered to have a thorough knowledge and awareness of the local flooding dynamics. As a result, the deeper the information and the flooding experiences accumulated, the greater the overall grasp of the causes of flooding in the Saboba district.

4.3 Analysis of Main Findings and Discussion

This session delved into the interpretation of findings of the data gathered from the field. The discussions connected the outcomes, evidence and the understanding about the findings vis-à-vis how the results of the data were related to the literature reviewed and made suggestions in support or in contrary to the findings of the study.

The qualitative and quantitative data were merged in the discussion of the results of the study.

4.4 Causes of Flooding in the Saboba District

4.4.1 Physical factors

The opinions and ideas of the participants were connected to a few physical factors that caused floods in the study location. These physical factors were believed to have little to no human effect and to be more of a natural phenomenon. These included physical features like the terrain of the region, rainfall patterns, precipitation, mountains, hills, valleys, and other natural occurrences (Musyoki et al., 2016).

The topography of Saboba district is characterised by gently rolling hills, valleys, and flat plains. The area is dominated by a series of low-lying hills that run in a north-south direction, with elevations ranging from about 150 to 350 meters above sea level (GSS, 2014). The causes of flooding in Saboba district, were multifaceted. Table 4.6 agrees that 58.5% of the study participants confirmed that Saboba district is in a low and undulating land surface which prone it to flash flooding. Similarly, Douglas (2017) espoused that flooding happens when heavy rains overrun drains and canals that are unable to remove all the water that enters them. Musyoki et al., (2016) corroborated that flooding incidence occurred when an inundation of normally dry areas are caused by rising water in an existing waterway such as river, stream or drainage ditch.

4.4.2 On-set and cessation of the rainy season

The flooding character of the study communities has been greatly altered by the on-set and cessation of the annual rains. Hence, in some cases, the area becomes saturated when the rains arrive relatively early and are heavy within a short period of

time. Another time, the rains delay and comes but heavily within a short period of time within the year and the lands are saturated, putting the nearby settlements in danger of floods. Variability in the on-set and cessation of the rainy season poses significant socio-economic and developmental challenges by threatening food security and poverty among the populace as confirmed (Amekudzi et al., 2015). These results dovetailed into the findings from the study interviews.

According to a female participant:

“Flodding in our community was due to both prolonged and torrential rains within a short time” (FFGD-R18).

A male participant added that:

“The heavy downpours of rains that occur in July and August are also the reason for the flooding” (MRH-1). “Flooding occurs in our area when the Kpalba and Wapuli bridges are submerged due to the heavy rains at the peak of the season” (MFGD-R9).

These responses indicated that, the flooding of the river Oti and its tributaries which enveloped the Saboba district, was attributed to the unpredictable rainy patterns in the Saboba district. As shown in Table 4.6 the majority of the inhabitants representing 87.3% said that Saboba district was susceptible to flooding due to the Oti River's overflow, while 58.5% participants agreed that the communities' physical landscape contributed to the annual flooding.

The survey result revealed that the beginning of the rainy season increased the risk of flooding, particularly in areas with poor drainage or low-lying topography. Heavy rainfall quickly overwhelmed the drainage systems, leading to flash floods. The end of the rainy season also impacted flooding, particularly in areas where water bodies had been filled to capacity. Heavy rains near the end of the season caused rivers,

lakes, and other water bodies to overflow their banks, leading to flooding in adjacent communities in the district.

This finding was supported in Table 4.6 where the majority of the participants representing 96.7% cited heavy rainfalls within a short period of time as a significant risk factor for flooding incidence in the district. Similarly, Musyoki et al., (2016) corroborated that flood incidences occurred when excessive water flows over normally dry lands as a result of persistent rainfall over several days, which results in higher water content in rivers and on the dry land surface.

4.4.3 Type of soil in Saboba District

Different types of soil have varying levels of porosity, permeability, and water-holding capacity, which can affect how easily water can be absorbed or drained. The result suggested that Saboba district was composed of soils that have poor drainage or high levels of impermeability, such as clay soils which made the study area more prone to flooding, especially during heavy rainfall.

A participant noted:

“Our land is extremely clayey and as such absorbs too much water at the slightest drop of rains and even at a short time interval” (MFGD-R9).

According to Table 4.7 a total of 382 participants showed that 96.7% of the participants strongly agreed that the research area's frequent severe rainstorms were to blame for the area's flooding incidents. According to this data, 231 respondents constituting 58.5% shared the opinion that some of the contributing causes to the flooding incidents in the Saboba district were the land forms and soil types of the villages across the district.

4.4.4 Human or structural planning factors

In addition to the natural factors that accounted for flooding in the Saboba district, man's structural planning was identified as a significant factor attributable to annual flooding in the area. Some human activities, such as the ineptitude of leaders, the construction of buildings and roads in flood-prone areas, increased the risk of flooding. For instance, due to improper waste disposal, including the dumping of refuse in gutters and drains, contributed to blockages that exacerbate flooding and also population increase as argued by (Arora, 2019) that the growing global population appears to play a role in flooding disasters. Due to human population growth and pressure on agricultural land utilization.

4.4.5 Unregulated settlements and urbanization

Poor physical planning with the spread of uncontrolled urbanisation and increasing rainfall intensity increased drainage overflow volumes, resulting in more frequent and severe flooding in the study area. The results showed that unregulated settlements and urbanization in the Saboba electoral areas were indeed a cause of flooding. As more land was developed for housing and commercial use, natural drainage patterns were disrupted. People built homes or other structures in areas that were vulnerable to flooding, coupled with inadequate drainage systems exacerbate the problem of flash floods in several communities within the district.

A male participant said that:

“We are settled closed to the river Oti banks” (MFGD-R8).

While a female participants shared that:

“It is the way we build in towns and villages. Unregulated expansion into flood zones. There are no plans to guide the occupants in constructing and by so doing most of the buildings are situated on the water ways” (FFGD-R2).

Similarly, a participant shared his experience thus:

“Hmm! I believe it is due to the lack of culverts and gutters in our area to allow the free flow of running surface water (MFGD-R24).”

The study's findings supported the idea that Saboba district's susceptibility to floods was significantly influenced by human behaviour or structural designs. Communities in the district experienced flooding as a result of structural planning factors such as uncontrolled settlements and population patterns, poor roads construction, insufficient drains or gutters, culverts, and deforestation in the communities.

Hooli (2016) argued that changes in socio-environmental dynamics brought on by urbanisation, poor spatial planning, and population increase have disrupted some river systems and, when combined with excessive seasonal rains, have exacerbated flood disasters in a number of communities across the globe. These discoveries have proved that the physical conditions, human structural planning mentality, or a combination of the two as indicated in table 4.6, were some causes of the district's susceptibility to annual flooding incidence.

The participants noted that there was poor engineering and weak policy or unregulated settlement plans in the district and that there was the need for the construction of drains, culverts and bridges that could forestall proper drainage system. Besides, their perception about the flooding situation was linked to the central governments indifferent in transforming the communities with proper and modern engineering flood resilient technology systems.

4.4.6 Poor Farming Practices and Deforestation

Another view or opinion about the flooding situation in the district was alluded to the poor and traditional mode of farming practices among the small scale farm holders in the study setting. Some of these farming practices included the cultivation of crops along the river banks soil, deforestation and indiscriminate burning and felling of trees have contributed immensely to erosion in the communities and as a result eased flooding in the flood prone communities. Deforestation was emphasised as one of the localised human causes of flood incidence because deforestation results in increased run-off and often a decrease in channel capacity due to increased sedimentation rates. These results were in conformity to Arora (2021) who espoused that poor agricultural practises such as bush burning, animal overgrazing, continuous cropping, and tiling of lands along river banks for farming exposed the landscape to erosion, making the environment vulnerable to flooding.

These assertions were affirmed by the participants who said that:

“It's because we, the farmers, farm along the river banks the vegetation is loosed and exposes the soil to erosion thereby destroying the natural river embankment that would have prevented the overflow of excess water from the main river basin” (MFGD-R20). Similarly, another participant articulated that:

“Inappropriate agricultural practices that cause erosion and forest removal for fuel, wood, and wood products, as well as settlement growth, all contribute to the flood tragedy” (MFGD-R14).

These findings implied that deforestation and soil erosion have led to a loss of vegetation cover, which contributes to soil erosion and reduces the ability of the soil to retain water. This makes the communities in the district more susceptible to flooding.

4.4.7 Poor drainage/ choked drains and roadwork

Poor drainage and lack of drains both refer to issues related to the drainage of water in town and communities. Both situations can lead to issues of waterlogging, soil erosion, and reduced agricultural yields, but they differ slightly in terms of their causes and effects.

Poor drainage is a situation where there are drains in place, but they are not functioning properly or are insufficient to handle the volumes of water that need to be drained. Such as congested or blocked drains, damaged drainage systems, or inadequate maintenance of the drainage infrastructure. The result of poor drainage is that water may accumulate on the surface, leading to waterlogging, soil erosion, and other problems that can impact agricultural production. Poor drainage can also lead to water-borne diseases and insect infestations.

On the other hand, lack of drains explains a situation where there are no drainage systems in place to handle excess water. For example, lack of infrastructure, inadequate planning or inadequate funding. The result of a lack of drains is that excess water may accumulate on the surface, leading to waterlogging and soil erosion.

According to some key informants, some structural or infrastructural factors emerged to have contributed to the flooding situation in the district and that:

“The nature of our gutters, they are not that wide and most of the people don’t drain the gutters and they choke them with solid waste and when it rains the water ways turn to be blocked and doesn’t move freely” (MRDC-1).

“The road networks are not proper in these areas and in rainy season the water doesn’t get free passage and flashes out as a flood” (MRE-1).

Overall, 94.9% of the participants affirmed that the absence of bridges on the major routes, coupled with the very low-lying nature of the land in the district was an

additional factor accounting for the susceptibility of the study setting to flooding incidence as shown in Table 4.6.

Table 4.6: Susceptibility to Flooding

Factors of Floods		Frequency	Percentage (%)
Natural Factors			
Rainfall	Heavy rainfall	382	96.7
Land Type	The nature of the land	231	58.5
Structural/Infrastructural Factors			
	Over flow of rivers/dams	345	87.3
Lack of drains	No drainage	235	59.5
Poor Drainage Systems	Choked drains	295	74.7
Bridge Default	Absence of bridges	375	94.9
Total		395	100

Source: Field Survey (2022)

4.4.3 Participants' experience and perception of flooding in the community

The experience and perception of flooding in a community can vary depending on factors such as the severity and frequency of floods, the community's vulnerability and preparedness, and the level of impact on people's livelihoods and daily activities. Some community members may have experienced severe flooding that has caused significant damage to their homes or businesses, while others may have experienced only minor flooding because it did not have a significant impact on them.

The perception of flooding can also be influenced by individual and cultural factors, such as beliefs about the causes of floods and the role of government in mitigating their impact. Community members who have experienced severe flooding may perceive it as a significant threat to their livelihoods and wellbeing, and may feel anxious and vulnerable during flooding. They may also be more likely to take

proactive measures to prepare for future floods, such as investing in flood insurance or taking steps to protect their homes or businesses. Overall, understanding the experiences and perceptions of community members was critical in developing effective strategies to mitigate the impact of flooding in the study setting.

According to the survey result, it suggested that some locals constituting 94.9% believed that the lack of bridges in the towns was to blame for the flooding episodes. While 74.7% agreed that this was true since the neighbourhoods' built-in drains were frequently blocked and did not allow for the easy passage of torrential downpours of rain. Whilst 59.5% of participants said that some of the areas' lacked of drains was to blame for the floods as collaborated by the qualitative results.

The following were among the extracts from the participants:

“I've lived in this neighbourhood since I was born” (MFGD-R20).
“Yes, we have had flooding every year since I got married and moved to join my husband here” (FFGD-R13).

In the view of a male teacher participant, he said:

“Since I was posted by the Ghana Education Service, I have lived in this community” (MFGD-24).

These responses have been corroborated in Table 4.1 which expressed that a total of 92.5% of the participants responded that they had lived in the communities on an average of 41 years. This information implied that the majority of flooding-related problems, including their causes and consequences on the communities, were not news to the inhabitants. Over time, they have seen and experienced floods and have developed self-reliance techniques to cope with the inconveniences. Participants were questioned about their perceptions of flooding and whether they had ever experienced it in the community. Some participants stated that they have observed and experienced floods when their farms, market, and school routes were totally drowned

or blocked off during the flooding season, making it difficult or impossible for them to move around to access basic social facilities.

Some of the participants shared in the following extracts:

“Yes, there had been flooding incidence. I believed that since I was in class five, we have seen lots of water in our village virtually every year. For example, our seniors were unable to cross the Kpalba Bridge to Saboba to take their final BECE two years ago” (MFGD-R23).

“Usually during rainy season we are not able to cross over to Wapuli town to attend school because the floods cut off our roads”. (FFGD-R7)

“Of course, floods appear to come each year, and we are unable to attend the directorate meetings or to submit reports and obtain teaching and learning resources for the school when they occur” (MFGD-R24).

The survey results in Table 4.6 suggested that a majority of 96.7% perceived heavy rainfalls within a short period of time as a significant risk factor for flooding incidence, whereas 87.3% of the respondents agreed that Saboba district, was susceptible to flooding due to the Oti River's annual overflow, whilst a 58.5% participants cited that the communities' physical landscape or soil type was attributable to the flooding. The results implied that the beginning of the rainy season increased the risk of flooding, particularly in areas with poor drainage or low-lying topography. Heavy rainfall quickly overwhelmed the drainage systems, leading to flash floods.

These findings point out to support MacMahon et al., (2015) who indicated that flood occurrences isolate towns, cut critical roads and highways off, and significantly affects lives, agriculture and properties of the residents. Figure 4.1 shows a pictorial view of the researcher's field observation sceneries of the flooding situation and experiences at different times and places in the district. The sceneries in Figure 4.1

suggested that the flooding incident did not only affect the life space of the residents but also the movements and grazing fields of the animals.

Figure 4.1: Participants' Experience and Views of Flooding situation



Source: Field Survey (2022)

4.4.3.1 Participants' measure of flooding

The participants were further questioned about how they measured flooding in the community in order to elicit their knowledge, opinions and experiences of flooding situations in the communities they lived and to be able to identify conditions that made the area liable to the incidence of flooding. The responses provided by the participants revealed that flooding varied depending on their location, experiences, and world view.

4.4.3.2 Flooding of farm fields, anthills or shrubs and bridges in the communities

According to the research findings, some participants only measured the flood when their farmland was totally submerged by the flood water. A participants agreed with this claim, as shown in the excerpt below:

A participant said:

“Flooding is when all of our cereals field and rice farms are submerged by rain water and leave us helpless” (MFGD-R4).

Overall, total of 151 responses representing 38.2 % of the participants agreed that when the depth of water in their homes or on the crop fields was above one foot high usually in the peak of the rainy season then that was termed as flooding in the community. Similarly, 150 participants expressing 38% revealed that the measure of flooding in the community was when a prolonged flooding caused more damage to homes and infrastructure and increased the risk of waterborne diseases as shown in Table 4.3.

While some respondents also viewed the measure of flooding in the district whenever their farm fields' were submerged in the water in their community. Other participants measured flooding only when they observed absolute submergence of anthills, shrubs and plants on farm fields, which were mostly around two metres high above the ground. This implies that the measure of flooding was highly subjective. Because for some of the residents until one was hit by the floods directly, the measure of flood could be considered quite differently.

One participant's description of this narration was as follows:

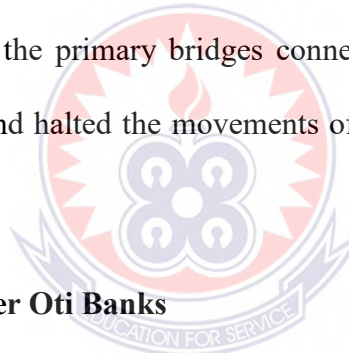
"All of the anthills and shrubs in our crop fields are completely submerged in water during the peak of our rainy season" (FFGD-R3).

This viewpoint contends that due to the length of stay in the community the participants' used local knowledge and conventions to measure flooding event.

Over here participants made a direct reference to the Kpalba and Wapuli bridges being submerged as a gauge or measure of flooding in the district. Below was an extract from a participant:

“We find it difficult to quantify the flood, however the Kpalba bridge (4.8m high), which is the highest bridge among the Saboba-Chereponi, Saboba-Wapuli, and Saboba-Yendi roads bridges, is flooded during the peak of the rainy season, we say the district is flooded”. (MFGD-R8).

Table 4.7 corroborated that 89 participants representing 22.5% of the participants agreed that the community experienced flooding whenever the Kpalba and Wapuli bridges, which acted as the primary bridges connecting the district to other nearby districts, were flooded and halted the movements of vehicles and people for a period of weeks or months.



4.4.3.3 Overflow of River Oti Banks

The results also showed that respondents observed flooding in the Saboba district due to heavy rainfall. Saboba district is located in a region that receives heavy rainfall during the rainy season, which was typically from July to September. These heavy rains within a short time, often led to flash floods that quickly overwhelmed the community's drainage systems. Also, anytime there was a spill at the Bagre Dam, the volume of water in the river Oti basin was significantly affected, which in turn led to an overflow in the district.

A participant said:

“In the district, flooding was observed “when the river Oti overflows some of its banks, causing problems for our farms along the river's banks and halting transportation in the district” (MFGD-R10).

Figure 4.1 demonstrated how some other participants understood and defined flooding in the district as occurring anytime the banks of the river Oti overflowed in the due to localised severe rains.

"Flooding occurred when the mossi land people... or how do we call their country (Burkina Faso) people open their dam (Bagre) and the excess water comes to flood our homes and farmlands" (MFGD-R2).

The impression suggests that flooding in the district was gauged by the Bagre dam spill over from Burkina Faso, a neighbouring country.

When asked how respondents or locals defined flooding, the response contained the phrase "the moment farmlands or fields in a neighbourhood were completely submerged." However, others measured the event through the frequency of flooding.

Table 4.7: Measure, Frequency and Duration of Flood in Saboba Communities

		Frequency	Percentage (%)
Measure of Flooding	When the depth of water in the home/crop field is above one foot high	151	38.2
	When the flood water stays in homes and, or on farms for number of days	150	38.0
	When ground table water rises	5	1.3
	When the Kpalba or Wapuli bridge is submerged	89	22.5
Frequency of Occurrence	Once in a year	321	81.3
	Twice in a year	2	.5
	Several times in a year	66	16.7
	Whenever it rains heavily	6	1.5
Flood Duration	4weeks or less	80	20.3
	5 to 8 weeks	281	71.1
	9 to 12 weeks	34	8.6
Total		395	100

Source: Field Survey (2022)

4.4.3.4 Flood duration and frequency in the community

The effects of the duration of flood on a community can vary depending on several factors, such as, the severity of the flood, the resilience of the community, and the availability of resources and support. In general, the longer a flood lasts, the more significant its impact on the community. Some of the effects associated with longer duration of flooding include: Damage to homes, businesses, infrastructure as well have psychological and financial impacts on the residents.

A question about flood duration before receding was posed to elicit one's understanding and knowledge on the effects of the temporary or long stay of flood water on the farm fields, home compounds, and on the roads in order to estimate the amount of damage or effects that came along with either the short or long periods of flooding on the residents. As a result, participants disclosed varied time periods which were estimated in weeks and months in different communities.

“In my community at certain years the flood lasts for just three weeks or a month (4weeks) before receding” (MFGD-R11).

–Depending on the various years, sometimes 4week or more. For example, this year the flood came in August receded a little and came back in September and receded in October” (MRE-1).

Findings from the study's quantitative data confirmed that 80 participants representing 20.3% as indicated in the frequency distribution table 4.7 were those who supported that the flooding persisted for four weeks or longer before subsiding.

Participants, including a female respondent, 63 - years - old, who had spent around 32 years of her length of stay in the study community, expressed that:

“Floods can persist up to 6 weeks at certain times” (FFGD-R2).

Then another participant corroborated that:

“Yes, so when it comes to flooding it is naturally controlled and as we all know the climate keeps on changing but on the average it take 6 weeks or more” (MRH-1).

The survey showed that, the majority of the participants constituting 71.1% predicted that the floods lasted between 5 and 8 weeks before receding in their localities and thereafter allowed inhabitants' daily routines to resume normalcy.

A 58-year-old male participant who was a farmer and a businessman and had spent his entire life in the village provided further participants' opinions on the length of the flooding. He remarked that:

“If there is a major flood, it can last up to two and a half months (10 weeks) (MFGD-R18).

Other participants had these views they shared:

–In our homes the floods recede within 24 hours but on our roads at times it takes between 2 months (8 weeks). (MRDC-1). –It depends on nature(...) but just 2 or 1 and half months (6 or 8 weeks) time the water will recede” (MRN-1).

Overall, 34 respondents indicating 8.6% of the participants said the floods persisted for 9 to 12 weeks before they subsided to allow locals to go about their everyday lives. Some of the participants' comments hinted that it was difficult to determine precisely how long the floods lasted before subsiding, despite their length of stay in the community. Nonetheless, the impression formed throughout the interviews was that each time flooding did occur, it receded more quickly in residences than it did on farm fields or along the main routes connecting the district. According to these comments, some individuals may have experienced floods in their neighbourhood for a longer period of time than others, depending on their location and the type of landscape they have chosen to live in.

4.4.3.5 Frequency of flooding in the community

The frequency of flooding in a community can have a wide range of effects, from immediate property damage to long-term impacts on the health and well-being of residents. It is essential to develop mitigation and preparedness plans to minimize these impacts and support the community's resilience. When participants were asked how often floods occurred in their communities, a total of 321 participants denoting 81.3% responded that it happened once a year. Whereas only 6 participants representing 1.5% said flooding happened anytime it rained heavily in the community, only 2 participants representing 0.5% said it happened twice a year. While 66 participants representing 16.7% mentioned that flooding happened frequently. Osei et al., (2021) noted that in recent times climate change can partially be attributed to the severity of recent floods across the globe. They have argued that climate change has resulted in an erratic rainfall pattern, which leads to abrupt torrential rains that the ground cannot absorb, resulting in frequent flooding.

4.5 Flooding Effects on the Socio-Cultural lives of the Residence in the Communities

Flooding in Saboba district has various effects on the socio-cultural life of the community's inhabitants. Both qualitative and quantitative results found that the three study zones in the district experienced negative effects from the flooding incidence in the areas of children's education, cost of living, household expenditures on routine building maintenance or repairs, work organisation, the displacement of people, disruption of social structures, separation of families and friends, thus it leads to social tension or conflict and psychological distress as people compete for resources to rebuild their lives.

4.5.1 Family life and organisation

According to the study's findings, flooding had a negative impact on family organisation and lives in areas like when lineage members gathered to perform social and cultural rituals like naming new babies, conducting burial or final funeral rites for family members who had passed away, festivals or cultural heritage . As seen in Table 4.8, the majority of the research participants, 83%, agreed that floods had a socio-cultural impact on the residents' cherished cultural activities.

A female participant shared her impression in this extract:

“The flood water disrupts our communal durbars, which are used to celebrate special milestones like the family outdoor of a new born infant and thereby denying us the support from love ones who would have come to celebrate and rejoice with our families. (FFGD-R19).

For once, it was only during these durbars that families and community members reconnected and sometimes resolved family brawls to strengthen family bonds, and also prayed together and wished each other blessings in the years to come, these socio-cultural practices of the communities were revered and upheld as a part of cultural value. Figure 4.1 depicts the challenges and troubles that the residents faced in terms of farming, transportation, and the likes in times of the annual flooding.

The results from the data indicated that 295 participants that constituted 74.6% of the total participants agreed that the burial and funeral rites of their deceased loved ones were unnecessarily delayed during times of flooding, unleashing extra costs on the bereaved family members. Additionally, it was revealed during an interview with the FGD that social and cultural life patterns were disrupted in numerous ways, as demonstrated in a comment like:

"Eij! The floods have nothing good to offer us. Flooding incidence has impoverished and damaged us in all aspects of our lives and daily

activities; for example, we are cut off from our family ties and other relations during flooding event” (MFGD-R14).

However, another respondent retorted

“Hmm, in my family, I’ve many siblings and some are settled across the river in times of flooding the needed love, care and attention we sometimes get from our parents and other relations are denied due to flooding” (FFGD-R2).

These results implied that flooding had a detrimental impact on the community's sense of social and cultural identity which were consistent with (Vásquez, 2015).

4.5.1 Desecration of graves and community shrines

The results from the study found that the floods frequently vandalised their shrines, swept away their fetish, and shattered or destroyed the graveyards of their departed and buried relatives. It was further indicated that the majority of the villages' residents were traditional people who believed that their ancestors acted as a liaison between the living and the deceased. They respected their forebears because they prayed to the Almighty Being and Ancestors on their behalf. As a result, the villages were spiritually cut off from their religious centres throughout the flooding season. This revealed that due to the flooding, the locals were cut off from their ancestors and shrines, which served as a source of inspiration and blessings for their families and the local area as a whole.

A participant expressed that:

“We as a community were disconnected in terms of our cultural, spiritual and historic obligations, such as offering sacrifices to the earth gods (shrine) in exchange for wealth and good health” (MFGD-R4).

This viewpoint confirmed the fact that floods not only physically separated community members but also interrupted their spiritual lives, which impacted negatively on their well-being as a people. These results supported the claim that the

occurrence of flooding restricted people's rights to necessities of life like food, shelter, clothes, and family ties due to environmental damages and displacement of families and friends (Golo & Eshun, 2018; Vásquez, 2015).

4.5.2 Communal annual festivals

The study findings showed that communities were unable to perform their customary yearly bumper harvest festivals. This was so because each time the flooding occurred it reduced the yields of the households farm products. The yam and guinea corn celebrations, for example, were gradually becoming extinct within the communities partially, due to the yearly flooding condition which did not support the farm yields.

A male participant bemoaned that:

—In fact, our regular events, such as the guinea corn and yam festivals, which were generally held in the tenth and eleventh months of the year (October and November), were hugely disrupted since the year's high flood season extends to those months and subsequently destroy the farm crops. (MFGD-R19).

According to 284 participants representing 71.8% of the responses, flooding incidence hindered communal labour support for the farmers. This was due to the season's frequent sporadic heavy downpours that did not allow labour work. Besides, the roads leading to the farmlands were flooded, making it difficult for people to move around.

These findings agree that flooding occurrence had an impact on local farming organisations. The flooding caused the crops to wither on the field as a result of too much rain water being leading to poor harvest and inadequate financial resources as confirmed by Saqib et al., (2016) that flooding often times, threatens farmers and their agricultural productivity. Hence the inability of residents to hold annual rituals or festivals to demonstrate their identity and cultural values.

Situating these results into the ecological resilient theory on the socio-cultural lives of the residents. It suggests that flooding had significant impacts on the socio-cultural lives of residents, particularly in terms of livelihoods, housing, health, and social cohesion. According to the results, flooding disrupted inhabitants' homes and other buildings and displaced residents. It also desecrated the graves and the community shrines thereby disrupting community life. Additionally, flooding was noted to have increased the risk of waterborne diseases and other health issues, particularly in areas where sanitation and hygiene were relatively poor.

However, the ecological resilience theory suggests that socio-cultural systems that were more diverse, connected, and adaptive were more resilient to the impacts of flooding. From the results, communities that had access to a range of livelihood options, such as farming, fishing, and public services were more resilient to the loss of income from flooding than communities or households that relied solely on one sector. Similarly, communities that had strong social networks or strong family bonding and institutional support systems were better able to cope with the stress and displacement or dislocation caused by the flooding incident. This implied that by improving the ecological resilience of socio-cultural systems, it may be possible to mitigate the negative impacts of flooding and support more sustainable and resilient communities.

4.5.3 Flooding and inaccessibility in the community

Most community members used footpaths and roads as their primary mode of transportation while travelling to places like schools, hospitals, markets, places of worship and farms. The results of the data revealed that during the flooding season, once the roads were cut off, residents' movements were impacted, which significantly

hampered their social and cultural activities in the area. Hence, some participants stated:

“Our neighbourhood who live on the other side of the river are cut off from us. Our children and adults are unable to travel to schools, hospitals, shopping or market centers, churches, or mosques (MFGD-R4).

Another participant corroborated that:

“The floods often times caused extensive damage to our roads leading to farms, neighbouring towns, Schools, health centers and market areas, resulting in an extra cost of our living conditions” (FFGD-R2).

The District Coordinator, a key informant, noted:

“Floods do have serious impact on our service delivery and functions because assembly deals with developmental projects and it would be very difficult for you to implement projects while your roads are not accessible. So during this period most of the communities are cut off so we can't access them to ascertain progress reports and as a result delay the completion of projects and also, increases cost in executing projects”. (MRDC-1).

Correspondingly, the Deputy Director of Education in charge of supervision explained that:

“I must say that the flooding situation in the District has a very terrible effects on education access, participation, quality of teaching etc. Because during that time we have communities beyond the river, ahm! I think we've about five schools across there and apart from that we've Kpalba and Wapuli circuits when the floods come, I bet you these areas teachers are not able to go and so once teachers are not able to cross over to some of these areas clearly teaching and learning are not going on effectively” (MRE-1).

These results showed that whenever the flood in the district was in the spotlight, teaching and learning had always been negatively impacted. Communities that were termed "overseas" schools, such as Kpalba, Demon, Namongbani, and Kucha, hardly have teachers, students, or officers to visit their local schools to monitor and ensure quality teaching and learning delivery.

The study's findings implied that during the floods, the majority of the communities were cut off and were difficult for the District Assembly's planning, works, and development officers to reach in order to monitor, supervise, and get updates on the progress of the construction of schools, water systems, and health projects in the electoral areas.

Also, it was discovered that the agricultural extension staff were unable to connect with the small farm owners during the flood season to begin advocating for the management of diseases and pests on farm fields. These results also indicated that their clients appeared to lose faith, trust, and confidence in their extension services as a result of the separation between the agriculture extension and veterinary officers. This was because the farmers believed that their low yields were the result of them not receiving the necessary information and input at the appropriate time from the agricultural extension officers.

The research findings revealed that most of the important roads connecting Saboba district to other locations were feeder roads, which were rough, characterised by potholes, and occasionally by "manholes". The floodwaters shut off Yendi, Tatale, Chereponi, and Gushiegu from the District, which halted daily operations. Also, the metallic bridges at Kpalba and Wapuli frequently were submerged, closing off areas, forcing passengers to take a risky route across these flood-covered stretches in locally built canoes whose safety cannot be guaranteed. The study's findings indicated that the canoes that were used to transport goods and people during flooding season did not have life jackets, may have been some times overloaded, and may have charged exorbitant rates because they were aware that commuters had no other option. The lack of bridges to facilitate transportation during flooding situations had a detrimental

economic impact on the Saboba district's poor and vulnerable residents, as lorry charges increased during this time and occasionally rendered vehicles unusable due to breakdowns brought on by the numerous potholes on the main highways.

Pregolato et al. (2017) espoused that the transportation sector of an economy was troublesome when weather-related disruptions like flooding occurred. So there was a considerable deal of traffic congestion in all forms of transportation such as by land which causes substantial delays and inconveniences for travellers and had a detrimental influence on their ability to work and earn money in a variety of occupations.

On the contrary, the study's findings showed that some participants had easy access to water for domestic use, while others claimed that flooding water enriched residents who farmed during the dry season. In addition, some fishermen and women, as well as those who owned the canoes that were used to transport people and goods, reported an increase in income during the flooding season. Banerjee (2010) confirmed that floods give water for crop development, recharging refilled soil fertility, and encouraged fish production for the residents.

Additionally, it has been shown in the literature that frequent floods deposited minerals, nutrients, and alluvium materials that nourished the land for agricultural production and fish farming purposes and that floods are essential for replenishing soil for agricultural production and fisheries for people's long-term survival (Macklin & Lewin, 2015; Husain, 2021).

The study findings regarding the impact of flooding on road accessibility to medical facilities in the three district electoral areas suggested that the situation was quite challenging and that health-related illnesses and diseases such as anaemia, malaria,

snake bite, and blood transfusion often accompanied flood-related situations. As a result of the increased numbers of patients and the hospital's capacity to keep its employees motivated during flooding season over time, hence the flood incident dramatically increased the expense of operating at the sub-district and district hospital levels. Overall, 79% of participants agreed as shown in Table 4.8 that flood causes drowning, snake bites, malaria, anaemia and loss of life and each time it occurred in the district. Bell et al., (2018) espoused that extreme weather conditions resulting into flooding have been observed to have a negative impact on human health, injury and death.

A key informant from the District Health Service noted:

“The negative impact of flooding on health delivery in Saboba can't be overemphasised. For instance, we conducted an analysis of anaemia surveillance data on children under five years. One of the findings was that during the peak of the floods we have high incidence of anaemia cases and not just anaemia but we also, recorded high incidence of blood transfusion cases.

I've also realised that when it comes to the Saboba sub districts, the two sub districts that are mostly affected by anaemia cases as a result of the flooding at Kpalba sub district and Saboba sub district. The Kpalba sub district is mostly affected because during flooding the inhabitants there can't easily cross over to easily access health facility in Saboba or Wapuli electoral areas. (MRH-1).

As a result, the majority of Community-based Health Planning and Services (CHPS-compound) were impacted by flooding because they were typically managed by a single officer, making it more challenging to transport supplies and staff to care for clients. In fact, this caused Saboba district hospital to be overloaded with illness cases to manage during the flooding season.

4.5.4 Flooding on residents' accommodation, water and toilet facilities

The study was also set to explore how socially the flooding phenomenon influenced residents' buildings for housing, access to portable water and sanitary facilities due to their role in the socio-cultural organisation of the people.

According to the data gathered, some of the individuals have resided in locally made gravel or mud and clay structures. Several of the residences were constructed with the aid of local labour and expertise. To ensure that the structures could withstand floods, the residents had to perform routine upkeep on them. The participants' expressions revealed that some of the buildings collapsed during extreme flooding situations because they were unable to withstand the inundation.

A participant expressed as follows:

—We the residents of this village, have organised communal labour to construct "atakpami homes" (structures made of gravel, mud and clay soil) in which we dwell. Our roof is made primarily of thatch grasses” (FFGD-R3).

Another participant offered the following response:

“As for me and my family, we grew up in my father's home (family home), and I have since remained there because I am my father's firstborn, and we have a tradition that I must stay in the family home to keep it and preserve the family name of my father. Though it is a home built of gravel and mud. I'll stay there till my grandchildren grow up to see it” (MFGD-R2).

In furtherance, a participant said:

—Aah! For us here since the days of our ancestors we have cherished living in the round rooms with thatch roof since it is economical and cool to sleep in” (MFGD-R10)

A female group participant expressed that:

“Many of us came here after we married our spouses in this community, and as a result, I met my husband, who lives in a round hat room with his siblings who also reside in different round hat rooms within the same compound. We the ladies, and our children, work to

preserve the homes by renovating them every year with cow dung and gravel, and occasionally with some little cement” (FFGD-R14).

Table 4.8 results revealed that a total of 240 participants representing 60.8% agreed that floods had a detrimental impact on home structures by necessitating greater maintenance costs.

Other participants stated that:

“I was living in a distant village but since I got married and moved into my husband’s home, we live in a block house” (FFGD-R8).

“For some time now, many young men and women in this neighbourhood who are fortunate to work for the government have changed from traditional to modern architectural styles. Many teachers and nurses in the community have recently purchased land, and practically everyone is building a block house to dwell in nowadays so you would have observed that the atakpami and round rooms are now reducing in our community.” (MFGD-R9).

Contrarily, it was revealed in the interviews that some of the residents resided in structures made of cement and concrete blocks. This implied that although everyone involved lived in the same communities, some were comparatively more resilient to flooding condition than others in terms of living arrangements. While the atakpami dwellings largely collapsed, the block homes appeared to withstand the flood season.

Water is a very important resource for deciding the health and happiness of humans. Socially, a society's health state reflects how much it is growing and developing. In this context, the researcher set out to learn how people in the Saboba district obtained water in order to sustain their social lives.

When asked where they obtained their domestic water, several residents said that they used natural wells, man-made dams or rivers, boreholes, and standpipes. This showed that people who got their water from rivers or dams shared it with animals who also drank from them. The effects of the water sources on household usage has an impact

on people's health. The results indicated that 73.9% of the participants agreed that there was lack of clean water during flooding for household purposes.

One of the participants narrated that:

“The bore hole you observed as you entered our community, which is far away from my house, is our main source of water in this community. Unfortunately, this borehole cannot supply all of us who live here all year, therefore our women and children must walk approximately three (3) kilometers to wells located outside of our village to obtain water for our needs” (MFGD-R10).

Another participant said:

“As for our water we share same with our animals from the river, we here mostly draw our water from the river Oti” (FFGD-R19)

A participant upon a sigh said:

—We have standpipes in the homes, we can't rely on the community water supply because they always give us excuses that some parts of the pumping machine are spoilt or there is no electricity or enough sun shine because of the rains to power the treatment plant etc. Therefore, at times we have pipe water, another time we go to draw water from the boreholes and the wells” (FFGD-R5).

Participants gave these narrations:

“Our women walk to the boreholes or the dam to obtain water” (MFGD-R9).

“We the women in the house, have to get up early in the morning to go to the borehole to pump for water. Sometimes the water takes a long time to come out, so we have to go to natural wells to obtain some water for our need —FFGD-18).

Another participant buttressed that:

“Unfortunately, because pipe water is too expensive for us to pay for and use in our homes, many of us prefer to obtain our water by walking to the dam, wells, or the main river” (FFGD-11).

This result implied that overall, 73.9% of the participants agreed as shown in Table 4.8 findings that the residents lacked access to safe consumable water. This suggests that the locals were left to struggle socially with illnesses brought on by contaminated water intake. On the contrary, some participants indicated that the flood season made

it quite simple for many families in the communities to harvest rainwater for domestic use.

Further inquiry into the communities' access to toilets revealed that:

—In terms of toilets, a few houses have been able to dig holes and construct toilets out of cement and blocks (KVIP), but many of us will prefer to relieve ourselves in the bush early in the morning or late at night” (MFGD-R13). “We don't have a toilet in our house; therefore, we have to go on the free rang” (MFGD-R23).

Another participant responded that:

—In our communities here, some residents prefer to go to the public toilet and some too have dug their own toilets close to the compounds and yet some go far into the bush —(MFGD-R8)

From the interview data, a female participant appreciated that:

“Since World Vision assisted us in the construction of household toilets (KVIP), many of us have one or two in our homes to use” (FFGD-R8).

A male participant corroborated that:

“Many of us now have KVIP in our houses as a result of the world vision Ghana and the youth parliament advocacy groups' STOP open defecation campaign message given to us here”. (MFGD-R24)

A participant said:

We don't have toilets in our individual homes. Some people frequently visit the teachers' apartments and the school toilets and others go to the bush. (FFGD-R18).

According to the responses, some households had toilets in their homes, whereas others used public toilets and many others went on open defecation. The results suggested that generally, the residents had poor hygienic conditions and as such, flooding season triggers the spread of water-borne illnesses among the residents.

Table 4.8: Socio-cultural Effects of Flooding in Saboba

		Frequency	Percentage (%)
Social Effects	Destruction of Homes and Buildings	240	60.8
	Articles of clothing, bags and shoes	323	81.8
	Flood causes drowning, intensify snake bites and loss of life	312	79.0
	Poor access to medical deliverables and treatment	219	55.4
	Psychological distress	294	74.4
	Unhygienic environment and outbreak of disease	328	83.0
	Lack of clean water	292	73.9
Cultural Effect	Poor Family Organisation	318	80
	Unavailability of communal Labour	284	71.8
	Undue delay of burial and final funeral rites	295	74.6
	curtailed visitations on religious gathering/ shrines	230	58
	Interrupt the Performance of annual festivals	256	64.8

Source: Field Survey (2022)

4.5.5 Social effects of flooding on the inhabitants of the district

Flooding have had significant social effects on the inhabitants of the district. The results from the data outlined that flooding in the district's electoral areas have forced people to evacuate their homes, leading to temporary or permanent displacement. While others have loss personal belongings, separation from family and friends. The flooding occurrence has caused health related problems due to contaminated water sources leading to increased risk of waterborne diseases, exposure to mold and other toxins. Antwi et al., (2015) corroborated that flooding incidence has negatively impacted on residents' socio-economic life patterns in the areas of smallholder farming practices, household food security, family displacement, and the spread of communicable diseases and thereby put citizens' livelihoods at risk in their communities.

The findings from the study, indicated that flooding have resulted in significant economic losses for the inhabitants of Saboba district. For example, it damaged crops, destroyed livestock, and damaged infrastructure such as roads and bridges. A majority of 77.5% of the study participants claimed that the flooding occurrence seriously harmed and destroyed their agricultural planning and farming activities as shown in Table 4.8. The flooding consequences had led to loss of income, increased food insecurity, and reduced access to essential services. Besides, the findings suggested that flooding had psychological effects on the inhabitants of the district, since it caused stress, anxiety, and depression, especially for those who have experienced multiple floods or have lost loved ones or property due to severe flooding.

Table 4.8 depicts that the majority of participants, 328 representing 83% agreed that their communities had experienced flooding, while 74.4% of them acknowledged that psychological distress was an unfavourable social condition that was associated with flooding incidence in the study area. Then 55.4% of the survey respondents claimed that the flooding had a negative impact on their access to medical treatments and deliverables. Besides, 81.8% of the respondents indicated that items of clothing, bags, and shoes were loss due to the floods thereby deepening the social impact of flooding in the communities. This study's findings corroborated Saqib et al., (2016) who found that floods pose serious threats and harm to household members, residents' agricultural crops, fisheries, forestry, livestock that perish or contract infectious diseases and occasionally displaces people and animals.

4.5.6 Flooding effect on community infrastructure

The nature of the damages or effects of the annual flooding on the community infrastructure was another factor that came up in the analysis of the socio-cultural

repercussions of flooding incidence on the residents of Saboba district. The findings indicated that flooding in Saboba district had effects on community infrastructure, including roads, bridges, buildings, and water supply systems. Table 4.9 indicated that 176 participants constituting 44.6% respondents agreed that the district's principal roadways were severely damaged during flooding season. Whilst a total number of 249 participants representing 63% and 77 of them denoting 19.5% of the respondents respectively agreed that the main bridges in the district were harmed severely bringing the movements of goods and services to a halt. Also, it was determined that the drainage was badly damaged, and this was supported by 35.4% study participants. These findings were similar to the damaged evidence of flooding incidence in Northern and Southern European regions which have resulted in increasing economic losses and the destruction of road infrastructures (Blöschl et al., 2019).

Table 4.9: Flooding Effect on Community Infrastructure

Flooding Effect on Infrastructure	Not Severe		Moderately severe		Not sure		Severe		Very severe	
	F	%	F	%	F	%	F	%	F	%
Roads	21	5.3	16	4.1	1	0.3	181	45.8	176	44.6
Bridges	33	8.4	35	8.9	-	-	249	63.0	77	19.5
Drainage	107	27.1	113	28.6	16	4.1	140	35.4	19	4.8
Water system	159	40.3	68	17.2	63	15.9	101	25.6	4	1.0

Source: Field Survey (2022)

Associating these findings into the ecological resilience theory that underpins this study the results revealed that flooding had significant impacts on physical infrastructure. For example, flooding damaged roads, bridges, and buildings that led to transportation disruptions, property damage, and potential safety hazards. Participants confirmed that floods damaged water and sewage systems, leading to water contamination and health risks among community dwellers.

However, the ecological resilience theory suggests that communities with adaptive infrastructural engineering design and maintenance practices could be more resilient to the impacts of flooding on infrastructure. For example, infrastructure that incorporates natural features, such as wetlands and floodplains, can provide protection against flooding and help to mitigate its impacts on other infrastructure. Similarly, infrastructure that are designed to withstand flooding, such as flood-resistant buildings and raised roads or bridges can reduce the damage and disruptions caused by flooding in flood prone communities. Again, by improving the ecological resilience of communities through adaptive infrastructure design and maintenance practices and preparedness measures, it may be possible to mitigate the negative impacts of flooding on physical infrastructure and support more sustainable and resilient communities.

4.6 Effects of flooding on Agricultural Productivity and Income

Agricultural productivity is the primary source of income for the local communities in the Saboba district. The results of the study showed that floods reduced yields or complete loss of crops of the household residents. This has a significant impact on the income of smallholder farmers and the availability of food in the affected communities. Besides, flooding caused soil erosion, which reduced the fertility of the soil and made it more difficult for crops to grow in the next farming season. According to both the qualitative and quantitative results, flooding had significant negative forms of effects on agricultural production in the residents' communities, including losses due to the inundation of crops under water, development of rots, water logging and mold growth on crops. These effects consequently, had severe economic consequences for farmers and the consumers alike.

The data demonstrated that flooding had a significant impact on agricultural production because when crops are submerged in water, they can suffer from a lack of oxygen, which leads to root damage or death of the plants. However, the amount of damages that occurred depended on the duration of the flooding and the type of crop being grown.

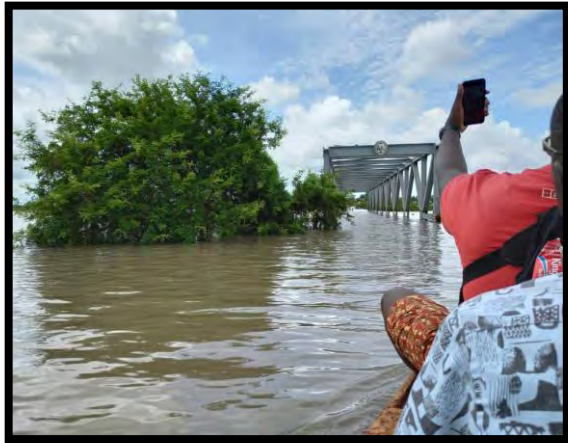
Moreover, instances where the crops or plants were unable to absorb the nutrients they needed from the soil due to waterlogging, it caused nutrient deficiencies and stunted growth which contributes to low crop yields or yield losses to the farmers. In addition, rotting occurred when crops are exposed to excessive moisture for extended periods, leading to the growth of bacteria and fungi that caused decay and deterioration. As a result, there were several types of rots that occurred in the field crops due to flooding. Thus, root rot occurs when the roots of the plant were submerged in water, which limits oxygen availability and caused the roots to rot. Stem rot occurs when the stem of the plant was damaged by flooding or becomes infected with fungi, leading to the decay of the stem and the death of the plant. Fruit rot occurs when fruits are exposed to moisture for extended periods, leading to the growth of bacteria and fungi that caused decay and spoilage.

Flooding in Saboba district led to the spread of plant diseases that caused rots in crops, fruits and root plants. When plants were exposed to excess moisture, they became more susceptible to diseases such as downy mildew, gray mold, and wilt, which caused rotting and deterioration of the fruits, roots and crops on the fields. This resulted in reduced yields and food shortages, which impacted food, fruits and root plant availability, prices and income.

Flooding in the Saboba district was observed to have triggered the formation of mold due to the inability of the farmers to dry their crops. Mold is a type of fungus that grows in warm and humid conditions, and it thrives in moist environments. When crops are exposed to floodwater, they become more susceptible to mold growth due to the high humidity and moisture content. The growth of mold on crops had several negative effects on agricultural production among the communities. The formation of the mold reduced the quality and value of crops. Crops that were contaminated with mold became unsuitable for sale or consumption, which led to significant economic losses for farmers agricultural production and income. For example, it caused damages to equipment and storage facilities, leading to additional costs for small holder farmers. It also impacted the supply chain by causing delays or disruptions in the transport and distribution of crops, leading to shortages and price increases for consumers.

Figure 4.2 provides a visual representation of how floods affected the roadways and agricultural farmland that supported the locals' agricultural production and income.

Figure 4.2: Sceneries of flooding on the bridges, roads, farm fields and transportation



Kpalba Bridge Submerged



Major Road Submerged



Major Road Cut-Off



Transportation Difficulty



Yam Farm Field Submerged



Maize Farm Field Submerged

Poor Farm yields

Results from the data further explained, that flooding situation in the communities had interruption on the timing and planning for farming, marketing and farm produce. The long stay of the flood water on the crop fields eventually destroyed them leaving the smallholder farmers with low or nothing to harvest from the field. According to Table 4.10, it was shown that a majority of 92.7% of the participants stated that the severity of the flooding incidence was due to the farm's poor crop yields.

Besides, the majority of participants representing 68.9% thought that the flooding incident had a significant impact on the land's preparation for farming. The inability of the labour force to plant, weed, or harvest the farm fields at the proper time or season was recognised as another linked condition that was badly disturbed by the flooding occurrence in the study area, as reported by 46.8% of the total participants in Table 4.10.

A key informant explained that:

–Flooding has great impact on our agriculture as we all know agriculture is the backbone of every economy and even when you come to the northern region agriculture plays a very vital role...ee! Most of our people in Saboba district are farmers and thus what they depend on for their livelihood. With this flood most of our farmers have their farms close to the river boundaries so any time there is flood most of them have their crops and other yields destroyed. So, it also goes down to affect the yields they expected since it has been washed away by the floods”. (MRDC-1).

Another participant noted that:

“Flooding had a significant effect on our crops or grains. The flood destroyed an entire maize, groundnut, or rice farm, as well as okro and pepper farms. Meanwhile, on a good weather season, some of these fields can produce hundreds of bags of rice or maize for our consumption and sell out excess as a source of income” (MFGD-R24).

However, other participants said:

“Our people who farm rice, maize, vegetables, etc. along the river banks get fertile soil to farm after the flooding receded” (MFGD-R19).

–The flooding seasons, on the other hand, allowed canoe paddlers to make a large profit from commuters who must cross rivers and streams to access other amenities within and outside of the District” (FFGD-R18).

According to these statements, depending on where one lived and how long they stayed there, flooding situations in the Saboba district had both positive and harmful effects on the local population.

On the contrary, a participant expressed that

“Over time, I've seen that the flooded situation elicits mixed emotions. Though farmers have been badly impacted by the flooding due to low yields, our fisher folk neighbours have benefited monetarily and nutritionally as a result of the flooding. It is a season that allows fisherman to catch a large number of fish, which they feed on and may sell for a large sum of money” (MFGD-R20)

The flooding situation did not appear to have only impacted the locals and their crops. Yet, domestic and commercially raised livestock and poultry had to deal with the unfavourable flooding phenomenon in their neighbourhoods. Flooding caused diseases and infections to spread among the animals in the vicinity of grazing fields, which ultimately led to the death of some ruminants and poultry and thereby impoverishing the residents.

One of the participants indicated that:

“Our cattle, goats, and sheep have all experienced losses as a result of the flooding. The cattle remained in the water, and after a few weeks, you will discover foot rot on them, which will cause many of them to perish. In flood season, many domestic fowls or birds go astray and are lost or killed” (MFGD-R9).

4.6.1 Inaccessibility to farms and markets

According to the findings, flooding made it impossible for locals to carry their livestock and products from farms to their homes or to local markets, where they might be sold to supplement their income. Also, it caused the market-ready grains to spoil because locals were unable to carry them by canoe. This, in turn, affects the community's food security and the ability of households to raise income to meet their basic needs.

A participant stated that:

“Our market men and women were completely cut off from the market network systems during the peak of the flood season. As a result of this circumstance, household income dwindled and food insecurity was alarmed”. (MFGD-R18).

Another participant buttressed that:

During flooding our major roads are cut off by the floods and our economic ventures come to a halt. Trading and market activities have been severely hampered. As a result, when our farm products are damaged and market mechanisms fail, our source of income is also impacted, making life intolerable for us. (FFGD-R24).

Table 4.10: Flooding Effect on Farming Activities and Production

Flooding on Farm Activities	Not severe		Moderately severe		Not sure		Severe		Very severe	
	F	%	F	%	F	%	F	%	F	%
Land preparation	39	9.9	22	5.6	62	15.7	197	49.9	75	19.0
Time of planting	98	24.8	55	13.9	94	23.8	131	33.2	17	4.3
Labour availability	109	27.6	62	15.7	39	9.9	166	42.0	19	4.8
Household food	44	11.1	44	11.1	1	0.3	271	68.6	35	8.9
Production inputs	24	6.1	22	5.6	-	-	260	65.8	89	22.5

Source: Field Survey (2022)

Relating these results of the study to the theory of ecological resilience on agricultural productivity and income, it suggests that ecosystems have the ability to resist and recover from disturbances such as flooding. However, the extent of the impact of flooding on agricultural productivity depends on various factors, such as the severity

and duration of the flooding, the type of crops grown, and the management practices used in the agricultural system.

According to the results from the data flooding had both positive and negative effects on agricultural productivity. On the one hand, flooding deposited nutrient-rich sediment on the farm fields that enhanced soil fertility and increased crop productivity in the long run. On the other hand, flooding severely damaged participants' crops, disrupted irrigation systems, and led to soil erosion, which reduced agricultural productivity of the small farm holders.

The ecological resilience theory suggests that agricultural systems that were more diverse and had higher levels of ecosystem services such as soil retention and nutrient cycling were more resilient to flooding. For example, diversified cropping systems that included a mix of crops with varying tolerances to flooding such as rice was more resilient to the impacts of the annual flooding in the study setting.

Flooding can have significant impacts on residents' income, particularly in areas where livelihoods depend largely on agriculture like the Saboba district. For example, flooding damaged crops and livestock, leading to a loss of income of small holder farmers and local businesses. The ecological resilience theory suggested that communities with diverse and adaptive livelihood strategies were more resilient to the impacts of flooding on income. For example, residents with alternative sources of income, such as non-farm jobs, were less affected by the loss of income from flooding in the agricultural sector. Similarly, communities that had diversified their agricultural practices, such as through the use of crop rotations, cultivation of water resistant crops and mixed farming systems were better able to cope with the impacts of flooding on their crops and livestock. Also, residents who had access to financial resources and

support for recovery were better able to recover from the disruption and the shocks of flooding on their livelihoods.

4.6.2 Effect of flooding on households economic activities and income

The results in Table 4.11 depicts that 77.5% of the total number of participants stated that their agricultural foodstuffs were severely damaged or destroyed by the flooding incidence. Overall, 74.5% of the participants indicated that livestock production was equally severely affected by the flooding phenomenon. Whereas 41.5% of the participants believed that the occurrence of the flooding severely affected their trading and business activities. Consequently, due to the influence of the flooding incidence on the major occupations of the inhabitants, it suggested that the destruction of residents' economic activities translated positively to a low income of the participants. These assertion was noted by 89.7% of the total number of participants as shown in Table 4.11. The findings showed that the district's flooding situation had a significant impact on the main economic activities, such as farming, raising livestock, and enterprises that provided employment for the inhabitants.

Table 4.11: *Economic Effect of Flooding on Participants*

Economic Effect of flooding	Not severe		Moderately severe		Not sure		Severe		Very severe	
	F	%	F	%	F	%	F	%	F	%
Foodstuff	44	11.1	44	11.1	1	0.3	271	68.6	35	8.9
Livestock Production	36	9.1	63	15.9	2	0.5	270	68.4	24	6.1
Trading	132	3.4	58	14.7	41	10.4	158	40.0	6	1.5
Income	20	5.1	19	4.8	2	0.5	208	52.7	146	37.0

Source: Field Survey (2022)

4.7 Flooding Information and Coping Mechanisms of Residents

The research sought to identify flooding information alerts and the different coping strategies or mechanisms that residents deployed in their locality in order to remain resilient despite the outlined and alarming effects of floods as noted in the data results gathered.

The study finding however revealed that the inhabitants in the study zones were unwilling to relocate from the flood prone communities in the district because the occupants believed that they occupied ancestral lands on which the earth gods (*nytingbanwaa*) dwelled. Besides, the participants indicated that they were the true owners (*Bitindam*) of the land. The residents further believed that it was the only parcel of land owned by the clans and also because their present location was suggested to be fertile, suitable for farming activities and for livestock grazing purposes.

4.7.1 Flooding alerts or signs to the residents of the district

The study's findings revealed that residents sourced information on flooding warnings from a variety of media, while examining the information alerts of flooding among the participants. Some claimed to have heard about the impending flooding from friends and families who were talking loudly about it. Others claimed to have heard about the alert through radio or television news reports, traditional knowledge and conceptions, changes in the colour of the river water that was flowing through the neighbourhood, unusual bird sounds at the riverbanks, the presence of red ants, tortoises, and reptiles inside and around their homes and immediate surroundings.

A participant noted:

“They sensed flooding through certain changes in their immediate environment based on traditional knowledge and wisdom. For instance, the cry of specific birds on trees near river banks sent us a sign of possible flooding in that year” (MFGD-R14).

Another respondent said:

“The water flowing in river Oti channel takes on a milky colour and becomes clayey in nature with a lot of contaminants on the water surface were enough indicators of impending flooding of the season” (MFGD-R 20).

Overall, 76.7% of the participants corroborated that traditional knowledge or convention among the residents was another source of flood information in the communities as shown in Table 4.10. The finding suggested that the unusual presence of red ants, tortoises and crocodiles in their immediate surroundings was unique and symbolised imminent floods in the coming days in the community

Several participants also mentioned that they learned about the flooding alert from the Ghana Meteorological Agency through local FM station news, national radio, and television.

A respondent said:

“They learned or picked signals about flooding from either national television or local FM radio stations”. (MFGD-R9).

About 56.7% of the participants attested that they got their information alert on flood occurrence via the national Television broadcast (TV). In addition, 73.2% of the participants said that their source of pending flooding in the community was from the national radio news and the local FM radio stations. However, Table 4.12 results showed that a higher percentage of participants 80.7% reported that their friends and family were their primary sources of news about floods in the district.

Table 4.12: Flood Information and Coping Strategies

Sources	Strategies	Frequency	Percentage (%)
Information	Ghana Meteorological Agency	262	66.6
	Television broadcast	224	56.7
	Radio	289	73.2
	Traditional knowledge or Conventions	303	76.7
	Information from relatives/ friends	319	80.7
Support	Government agencies	113	28.6
	Families	331	83.8
	NGOs	78	19.7
	Friends	325	82.3
	Churches	69	17.5
Other	Borrowing of food and money from friends	273	69.1
	Reduction in the number of meals per day	211	53.4

Source: Field Survey (2022)

4.7.2 Coping strategies of flooding in Saboba district

In this study, the coping mechanisms used by the local communities in the Saboba district to maintain their resiliency in the face of flooding were also examined. The coping mechanisms were put into autonomous and institutional assistance forms.

4.7.2.1 Autonomous coping mechanisms

This suggests that people in the area were capable of managing the flood situation without external assistance from governmental bodies and non-governmental organisations (NGOs). Residents devised their own coping and survival mechanisms to deal with the flooding situation. These autonomous coping mechanisms included support or help from friends and families, cutting back on daily household meals, and borrowing items like food, cash, and clothing. According to the findings Table 4.12 indicates that 83.8% of the participants survived by borrowing food and cash from friends and family members who either lived nearby and were not badly affected by the floods or who lived in far neighbouring districts and had good yields to support them.

One of the male participants said:

“Our socio-cultural life style encourages us to rely on one another for support in times of fundamental needs or crises such as hunger and sickness”. (MFGD-R7).

Another participant stated that:

“There was a strong belief among us that "living for others is a rule of nature, and that is why we are born out of families that come together as a community to support one another no matter how difficult it is," as our forefathers and God himself had taught us. As a result, our community life style of belongingness or oneness serves as a source of hope, survival, and our resilience to cope with disasters” (MFGD-R24).

Table 4.12 indicates that 69.1% of the participants agreed that they coped by borrowing food and money from families and friends.

The participants also shared that some families and small farm holder locals dealt with flooding during the flood season by growing early yield and water-resistant crops. Otomofa et al., (2015) supported this finding that farmers in flood-prone areas be given improved types of crops that were extremely resistant to flooding as well as early yielding cereals or grain seeds. He further suggested that farmers should locate higher grounds that were less likely to be flooded to store food to sustain their households in flooding situations.

The study also found that some community members had to leave their houses temporarily for their safety and as a result, stayed with family and friends who were not directly impacted by the flooding disaster until the floods receded. These results were in line with a study on flood-affected households in Sekondi-Takoradi, which revealed that temporary home vacations, property transfers to nearby neighbours, assistance from family and friends, and the construction of flood steps were the most

popular coping mechanisms used by flood prone community residents (Danso & Addo, 2017).

The study also revealed that during the flood season, families and individuals who were negatively impacted by the floods instead moved to towns that were unaffected by the flood to work as farm labourers for those who had good farm yields in order to earn money or food for their livelihood.

A participant expressed a view that:

“When the floodwaters recede, we use the communal labour to assist those who were fortunate enough to have some portions of their farm fields not completely destroyed, supporting them to harvest quickly at a relatively low labour cost, and these collective gains go to benefit other households who had experienced total harvest loss, resulting in food insecurity in the households (FFGD-R2).

Another participant disclosed that:

“We take to trading and fishing, which are other sources of our survival and coping mechanisms during flooding” (MFGD-R20).

Table 10 data confirms that 53.4% participants agreed to this way of survival or coping strategy in the communities.

A participant shared that:

“We also reduced the amount of food and the number of meals per day in the household in order to go through the season” (MFGD-13).

4.7.4 Institutional assistance coping mechanism

Assistance from NGOs and governmental organisations were identified as some of the coping mechanisms of the district’s residents. The results revealed that commuters who crossed over rivers for work during the flooding season used life jackets which were provided by the District Assembly through NADMO office. The organisation launched a community-wide campaign to raise awareness of the flooding phenomena.

Overall, 28.6% of the participants agreed to have coped with the flooding with the support from government agencies such as, NADMO and MoFA.

The District Assembly Coordinator noted:

“What we normally do is to get life jackets to some officers who commute to communities and also the canoe operators to support the traveler on board in the canoe.

“Together with NADMO office we sensitized inhabitants on the need to put up buildings in less flood prone areas the assembly through the support of the MP common funds also supports with the construction of canoes to facilitate the movements of people in the communities” (MRDC-1).

Besides, the District NADMO Coordinator explained that:

“We sometimes give out relief items as and when we have the logistics to support the flood residents to cope with the situation” (MRN-1).

Despite that NADMO was tasked with coordinating the efforts of all parties involved in disaster management and educating the public about disaster prevention, the study found that the organisation lacked long-term public education campaigns on flood mitigation for flood-prone communities in the study area and also faced difficulties with funding, logistics, and equipment.

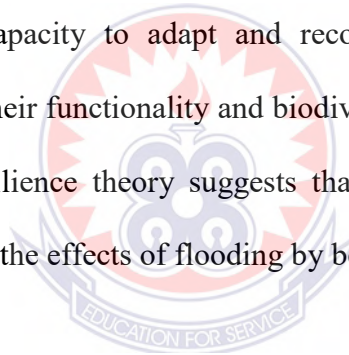
Also, the District Agriculture Officer shared as:

“The office has created awareness among smallholder farmers on the benefits of cultivating early yield crops to support them feed and make income during unfavourable weather seasons” (MRA-1).

The data supported that aid from NGOs and the local council of churches were helpful, and 37.2% of them admitted that it was the intervention or support of both NGOs and the local council of churches that helped them survived the flooding incident over the years in the community either through financial or in-kind support to the floods victims.

Additionally, the results showed that world Vision Ghana had helped the locals built their capacity for community based early warning systems, empowered households through community savings groups, and prepared community disaster preparedness plans. These interventions helped the residents to become resilient to the flood threat. Hyder and Iqbal (2016) supported that flood victims survived with flood events by taking loans from the unofficial sector, or receiving local assistance and government cash grants.

This research results, findings and discussions dovetailed into the ecological resilience theory which is a useful framework for exploring and understanding the effects of flooding on the residents in Saboba district. This theory suggests that ecosystems have the capacity to adapt and recover from disturbances, such as flooding, and maintain their functionality and biodiversity over time. In the context of flooding, ecological resilience theory suggests that ecosystems have the ability to absorb and recover from the effects of flooding by being resilient and not resistant.



CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings based on the objectives that guided the study, the conclusions and the recommendations of the study. This study explores socio-economic effects of annual flooding on the residents in the Saboba district in northern Ghana. The objectives that underpinned the study were to examine the causes of flooding in the Saboba district, explore the effects of flooding on the socio-cultural life of the inhabitants of the Saboba district, examine the influence of flooding on agricultural productivity and income of households in the Saboba district and explore the coping strategies of flooding on the residents in the Saboba district.

5.2 Summary of the Study

The research study adopted ecological resilience theory on flooding as the conceptual framework to guide the study. Ecological resilience theory provides a useful framework for understanding the impact of flooding on ecosystems. The theory suggests that ecosystems have the capacity to adapt and recover from disturbances, such as flooding, and maintain their functionality and biodiversity over time. In summary, ecological resilience theory provides a valuable framework for understanding the impact of flooding on Saboba district to work out to remain resilient and not resistant to floods and guides the development of strategies for managing flood risk while maintaining ecosystem functionality and biodiversity. Besides, empirical literature was reviewed on factors accounting for the causes of flooding events. Social effects of annual flooding. Economic effects of annual flooding on agricultural productivity and on small scale farming as well as on coping strategies of residents to flooding events.

The sampling techniques used for the study were purposive, multi-stage and simple random sampling for the qualitative and the quantitative data respectively. With the qualitative data gathering, six (6) FGDs were drawn from the three zones, thus Saboba, Kpalba and Wupuli. While in the quantitative data a total of three hundred and ninety five (395) respondents were obtained for the study.

5.3 Summary of Key Findings

5.3.1 Causes of Flooding in Saboba District

The study results indicated that a number of perceived elements, categorised as physical, human, or structural planning circumstances, contributed largely to the flooding situations in the district. Regarding the physical aspects, it was determined that the district's terrain, extreme rainfall patterns at the peak of the rainy season, the overflow of River Oti, precipitation, hills, valleys, soil type, and the landscaping of the settlements were vulnerable to flash floods. Whilst the human or structural planning factors included: inadequate drainage and physical infrastructure, unchecked settlement and development, ineptitude of leaders, abandonment of roads construction sites, poor farming methods, deforestation, and the recent increase in population growth in the district have in one way or the other contributed to the occurrence of the annual flooding in the district.

5.3.2 Effect of Flooding on the Socio-cultural Life of the Inhabitants

The findings revealed that flooding in the district has led to the displacement of people. Residents of Saboba district were forced to leave their homes and sought shelter with relatives and friends in other areas that were not hit by the annual floods. This migration led to a breakdown of social structures as families and friends were separated, and communities' routines or activities were significantly interrupted. For

example, funeral rites, the yam and guinea corn festivals were interrupted and these were major cultural events that took place in the communities to rebond family ties. Also, the local shrines were desecrated by the flooding occurrence which disrupted the community members' communion with their objects of worship.

Another effect of flooding was the spread of waterborne diseases, amidst snake bite. The occurrence of the floods contaminated the main water sources of the local inhabitants, leading to an increase in cases of typhoid, cholera, dysentery, and other diseases. This puts a strain on the healthcare system and led to the loss of lives. The study's results suggested that overall 79% of the participants agreed that the frequency of flooding had a negative impact on drowning, snake bites, and human life losses among the residents across the district.

Additionally, flooding disrupted educational system in the study zones by temporarily closing down schools or making it difficult for students and teachers to commute to school. This can have long-term impacts on the community by limiting educational opportunities and reducing human capital in the district's progress and development.

5.3.3 Flooding on agricultural productivity and income of households

The results in Table 4.1 demonstrated that 77% of the total participants in the Saboba district were primarily agrarian, hence agriculture was the main source of income for many household residents. Annual flooding in the Saboba district or communities' had numerous effects on the local population including agricultural losses or farm disruptions.

One of the most significant impacts of annual flooding in the study area was the destruction of crops, which led to food shortages and economic losses for small holder farmers in the district. When flooding occurred, it significantly disrupted the planting

times and also affected the availability of labour force and as a result it destroyed crops, making it difficult for farmers to have good yields to feed their families and earn a meaningful living. Table 4.3 revealed that the majority of the district's inhabitants were small-scale farmers who grew mainly maize, guinea corn, millet, rice, soya beans, yam, groundnuts, okro, and pepper. The findings exposed that the annual flooding caused the locals to suffer significant losses in agricultural output and income. The majority of participants constituting 92.7% agreed that the poor crop yield was due to the flooding's interference with planting, weeding, and harvesting times.

Furthermore, the flooding occurrence damaged homes, roads, bridges, and other infrastructure in the Saboba district. This was quite costly to repair and disrupted the normal functioning of the community daily activities. Approximately, 44.6% of the total respondents concurred that the district's key highways or main roads were disrupted and 63% of them agreed that bridges had suffered severe damages, which had halted the flow of goods, services and the movements of the residents in and out of the communities to make ends meet.

5.3.4 Coping Strategies of Flooding in the Saboba District

The study results revealed that the length of one's stay in Saboba district had an impact on their understanding of flooding in the district. This was because people who have lived in Saboba district for a longer period were likely to have experienced several flood incidence and witnessed their effects on the district. This implied that people who have lived in Saboba district for a longer time were more likely to have developed a deeper understanding of the community's flood risk, the area's most prone to flooding, and the measures to take to mitigate the effects of flooding

incidence. They may have also developed coping mechanisms and strategies to deal with the effects of flooding.

The study showed that the majority of households' coping mechanism was autonomous because they stayed resilient through their own initiatives or self-help within and outside of the community. Others, on the other hand, relied on institutional coping mechanism or strategy. Over here the flood victims survived by the support and assistance from government organisations like the National Disaster Management Organization (NADMO), the intervention of World Vision or NGOs and philanthropies. Besides, the residents stayed informed about the flood situation in their area, and followed any updates or instructions from emergency officials, local radio announcements and as well through the local knowledge conventions and information from friends or relatives.

5.4 Conclusion

The study has revealed that flooding was generally caused either by physical or human factors. As a result, several effects were experienced due to the annual flooding situation in the Saboba district.

According to the responses gathered from the various institutions and community household heads, floods were becoming more frequent and more severe, resulting in the destructions of the residents' socio-cultural lives. The results indicated an increased risk of death and injury, homelessness, destruction of physical infrastructure, the spread of diseases, population dislocation, and environmental destruction. The findings showed that floods have hampered residents' family ties by their inability to carry out funeral rites and other community rituals to stay connected and prosperous.

Another significant impact of the annual flooding incident in the district was the decline in agricultural productivity and income of the small farm holders or residents. Due to the unpredictability of the weather pattern, the farmers were faced with challenges regarding availability of labour, time for planting or harvesting. The results demonstrated that flooding had a significant impact on agricultural production and that resulted in losses due to inundation of crops under water, the formation of mold due to the inability of the farmers to dry their crops which subsequently led to the spread of plant diseases that caused rots in crops. Besides, the destruction of social infrastructures like the schools, CHPS compounds, major roads and bridges that connect the Saboba district to its neighboring districts was worrying.

In relation to the coping mechanisms of the flood victims, the findings showed that most of the victims survived the floods autonomously. Though there were instances whereby institutional support was given to the floods victims to cope with the situation, but at the same time it was noted by the participants that the District Assembly and its agencies like NADMO were poorly equipped to mitigate the challenges of floods on the residents and people were not well informed about these threats of flood in the area. It was also found out that respondents had very limited livelihood options in the communities, hence a clarion call on the central government and its agencies to redirect attention to flood events in the Saboba district.

5.5 Recommendations

It is appropriate to highlight some policy consideration which, if implemented could serve an important role in flood risk management and mitigation in the Saboba district.

1. There is the need for relevant stakeholders or duty bearers such as, the Environment Protection Agency, Town and Country-planning Department, MoFA, NADMO, assembly men and women and the traditional rulers in the district to engage with the residents in the communities to gather insights into the causes of flooding. This initiative and education, will lay bare environmental factors, including land use and urban development, deforestation and farming as well as climate change that have contributed to unpredictable and erratic rainfall patterns leading to annual flooding on the district.
2. The need for the local authorities and organizations to work and develop educational programmes and awareness campaigns that will incorporate local cultural values and practices of the inhabitants. The education creation will help the residents in the district to understand the link between flooding and their socio-cultural lives, and thereby promote preparedness and resilience to mitigate the negative effects of flooding on the socio-cultural institutions
3. The inhabitants have to understand their local context, including traditional agricultural practices and cultural factors that may influence the relationship between flooding and agricultural productivity and income. Small farm holders should collaborate with experts in agriculture, hydrology, and local government agencies to gain a perspective on early yield seedlings, flood resistant crops and other alternative sources of livelihood and income.
4. The central government through the district assembly should harness its national programmes such as one village one dam construction to trap the excess water from River Oti and its tributaries and use it for irrigation to enhance food security in the Saboba district.

5. The central government through its agencies such as the Saboba district assembly should engage and empower the communities or household members by involving them in the planning and decision-making processes. There should be a deliberate policy by the Town and Country-planning Department and the Environmental Protection Agency (EPA) to compel communities especially in rural areas in the district to build houses using durable and flood resistant materials.

5.6 Suggestions for Further Research

This study explored the socio-economic effects of flooding on the residents of the Saboba district. However, there are several directions one can consider for further research. Here are some suggestions for further research:

1. A study on vulnerability assessment to identify which populations in the Saboba district are most vulnerable to flooding. Understanding residents vulnerability to floods can help in crafting targeted policies and interventions.
2. A study on the link between climate change and flooding in the Saboba district. A study of this sort could explore how changing weather patterns and extreme events are affecting the frequency and severity of flooding, and how this, in turn, impacts the socio-economic conditions of the inhabitants.
3. A study on analysis of existing policies and regulations related to flood management in the Saboba district. Evaluate their effectiveness and suggest improvements that could better protect the socio-economic well-being of the residents.

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APPENDICES

APPENDIX A

Letter of Introduction



UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF SOCIAL SCIENCE EDUCATION
DEPARTMENT OF SOCIAL STUDIES EDUCATION

✉ P. O. Box 25, Winneba, Ghana
☎ +233 (020) 2041096

✉ socialstudies@uew.edu.gh

12th June, 2021

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION: MR JOHN TACHIN LIYAB (202146143)

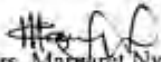
We write to introduce Mr. John Tachin Liyab to your outfit to assist him conduct his research. Mr. John Tachin Liyab is pursuing a Master of Philosophy (M. Phil) in Social Studies Education in the Department of Social Studies Education of the University of Education, Winneba.

As part of the requirements for the award of M. Phil in Social Studies Education, he is undertaking a research on the topic "Exploring the Socio-economic Effects of Annual Flooding on Saboba Community in Northern Ghana".

We would be very grateful if he could be offered any assistance he may need to enable him achieve the purpose of his study.

Thank you.

Yours faithfully,


Mrs. Margaret Nyala
For: Ag. Head of Department

APPENDIX B

Key Informants Questionnaire

FACULTY OF SOCIAL SCIENCE EDUCATION DEPARTMENT OF SOCIAL STUDIES EDUCATION

EXPLORING SOCIO-ECONOMIC EFFECTS OF ANNUAL FLOODING ON THE SABOBA DISTRICT IN NORTHERN GHANA

This guide is designed to gather information from heads of institutions on the socio-economic effects of flooding in the Saboba District. The data collected is purely meant for academic purposes. The identities of the participant(s) in the discussions will be protected through the use of pseudonyms in the presentation of results.

A. General Information on Participants.

Department/Organisation	
Position/ Officer	
Age	
Educational level	
Marital status	
Household size	
No. of dependents	
How many are of school-age	
Length of stay in the community	

B. Understanding and Causes of flooding in Saboba.

2. How long have you lived in this community or District?
3. Have you experienced flood occurrence during your stay here?
4. What is your understanding of flooding in Saboba District?
5. What is the measure of flooding in Saboba?
6. How long do the floods last?
7. In your opinion what do suggest that makes Saboba susceptible to the flooding incidence?
8. What do say is not done right about the repeated floods?
9. Why do you think there is repeated flood in Saboba?

C. The effects of flooding on the socio-cultural life of the inhabitants of Saboba.

10. How does the flooding impact on:
 - a. Family life- education of children,
 - b. Cost of living,
 - c. Expenditure at home,
 - d. Organization of work,
 - e. Farming (Planning and Output),
 - f. Community life (Festivals, Durbars and meetings)?

11. How does the flooding affect socio-cultural life of the inhabitants in Saboba e.g.?
- Funeral or burial rites,
 - Festivities- payment of marriage dowry, ceremonies,
 - Access to schools, hospitals, shrines, churches, mosques etc.
 - What are your household living conditions in terms of structure type/type of building, access to water, toilet; electricity, etc.?

D. The effects of flooding on agricultural productivity and income of households in Saboba.

12. Can you tell me the effects of the flood event on agriculture productivity? E.g.
- Damage to crops (cereals and grains)
 - Livestock (animals and birds)
 - Availability of labour force,
 - Market systems
 - Agricultural inputs
13. How does flooding affect households' income? E.g.
- Transportation,
 - Cost of accommodation repairs
 - Petty trading
 - Quantity of cereals and grains, tubers of yams etc.

E. the Coping Strategies of flood victims in Saboba

14. What are the flood signals you receive?
15. If it is the case that the flooding event has some undesirable conditions on the residents, why have they not relocated?
16. During flooding what do you do differently for your survival or what steps do you take to go about things in the community? E.g.
- Socio-cultural life organization
 - Agricultural activities
 - Income generation

Thank you.

APPENDIX C

Household Questionnaire

UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF SOCIAL SCIENCE EDUCATION
DEPARTMENT OF SOCIAL STUDIES EDUCATION

QUESTIONNAIRE ON EXPLORING SOCIO-ECONOMIC EFFECTS OF ANNUAL FLOODING ON THE SABOBA DISTRICT IN NORTHERN GHANA

Household Questionnaire

This questionnaire is designed to gather information solely for academic purpose. I assure you that your identity and the information you provide will be treated with utmost confidentiality. Kindly fill in the gaps and tick in the boxes with the most appropriate response(s). Thank you.

A. Demographic Characteristics.

1. In which of these zones is your community located? Saboba [] Wapuli [] Kpalba []
2. Name of your community?
3. Sex? Male [] Female []
4. What is the level of your education? 1. No formal education [] 2. Non – formal education [] 3. Primary [] 4. JHS [] 5. Secondary [] 6. Vocational education [] 7. Technical [] 8. Tertiary []
5. What is your main occupation? 1. Farming [] 2. Teaching [] 3. Nursing [] 4. Petty trading []
5. Constructional works [] 6. Driving (motor king, tractor, motor bike, passenger vehicle) []
6. What is your secondary occupation/ alternative source of livelihood? 1. Farming [] 2. Teaching [] 3. Nursing [] 4. Petty trading [] 5. Constructional works [] 6. Fishing [] 7. Poultry keeping []
7. What is your marital status? 1. Married [] 2. Not married [] 3. Widow [] 4. Widower []
5. Divorced/Separated []
8. What is the occupation of your spouse? 1. Farming [] 2. Teaching [] 3. Nursing [] 4. Petty trading [] 5. Constructional works [] 6. Driving (motor king, tractor, motor bike, passenger vehicle) []
9. Number of children?
10. What is your household size?
11. What is the number of dependents?
12. How many of your dependents are of school going age?
13. How many of these dependents are actually in school?

14. What is your average income from your sources of income [in GHC]? [*Please fill for the ones that apply to you*]

SN	Source of income	Daily income GHC	Weekly income GHC	Monthly income GHC
1	Farming			
2	Teaching			
3	Nursing			
4	Petty trading			
5	Constructional works			
6	Driving			
7	Fishing			
8	Livestock rearing			
9	Poultry keeping			

B. General issues on flood events.

15. How many years have you lived in this community?
16. Have you experienced floods during your stay in this community? 1. Yes [] 2. No []
17. How many times have you experienced flooding in this community for the periods you have stayed here? 1. Not at all [] 2. Once [] 3. Several times [] 4. Every year []
18. How do you measure flooding in Saboba? (*Tick only one option most applicable in your zone*)
1. When the depth of water in the home/ crop field is above one foot high []
 2. When the flood water stays in homes and, or on farms for number of days []
 3. When ground table water rises []
 4. When the Kpalba or Wapuli bridge is submerged []
 5. Others (specify)
19. How often does the flood occur?
1. Once in a year [] 2. Twice in a year [] 3. Several times in a year [] 4. Whenever it rains heavily []
20. How long do the floods last when it occurs [*provide your response in weeks*]?
..... (Weeks)
21. What do you suggest are the natural cause(s) of flooding in Saboba? (Tick the most applicable in your community)
1. Change in weather patterns []
 2. Heavy rainfall []
 3. The nature of the land []
 4. Over flow of rivers/dams []
 5. Other (specify).....
22. What do you suggest are the human contributory cause (s) of flooding in Saboba? (Tick the most applicable in your community)
1. Poor drainage []
 2. No drainage []
 3. Choked drains []
 4. Absence of bridges []

C. Flooding effects on Socio-cultural life:

23. Has your household or community lost any property to floods?
 1. Yes [] 2. No []
24. Kindly indicate the item(s) damaged or destroyed? (*Tick as many as applicable*)
1. Interior room properties and electric appliances []
 2. Articles of clothing, bags and shoes []
 3. School books []
 4. Foodstuff and cooking utensils []
 5. Buildings (houses, school blocks, health post, church buildings, Mosques, Shrines/fetish room, market stores grain banks, hen coops) []
 6. Livestock / Poultry []
 7. None []
 8. Others (specify)
25. Indicate the level of severity how s these socio-cultural life practices were interrupted or affected during floods?

This statement relates to the level of flood severity damages or effects on the socio-cultural life practices in the community. please indicate level of severity using the given scale by ticking the most appropriate cell against each statement that most accurately describes your position, opinion or situation (tick one box only): 1 =Not sure 2. Least severe 3 = moderately severe 4 = Severe 5 = Very severe

Indicate how severe were these socio-cultural life practices interrupted or affected during floods					
SN	Form of socio-cultural life practices	1	2	3	4
1	Family organization				
2	Communal labour				
3	Burial and final funeral rites of beloved ones				
4	Routine visitations to our shrine				
5	Performance of annual festivals (e.g. yam or guinea corn festivals)				

26. How will you describe the nature of the damages or effects of the floods on the community infrastructures?

This statement relates to the level of flood severity damages or effects on the community infrastructures. please indicate level of severity using the given scale by ticking the most appropriate cell against each statement that most accurately describes your position, opinion or situation (tick one box only): 1 = Not sure 2 =Least severe 3 = moderately severe 4 = Severe 5 = Very severe

Level of damages or effects of floods on the infrastructure in the community					
SN	Type of infrastructure(s)	1	2	3	4
1	Roads				
2	Bridges				
3	Drainage				
4	Water system				
5	Homes				
6	Institutions (Schools, health centres, Churches/ Mosques/Shrines etc.)				
7	Telecommunication systems (Radio and Television stations, mobile network services)				

26. What material is your house made of?

1. Blocks [] 2. Bricks [] 3. Mud [] 4. Wood []

27. What factors make it difficult for you to relocate during flood occurrences in your community? (*Tick as many as applicable*)

1. Affordability of cost of living here []
 2. Proximity to farm and vegetation for animals []
 3. This is the only parcel of land for my family []
 4. Our earth gods or shrines dwell here []
 5. Others specify.....

D. Economic effects of flooding:

28. How many farms do you have?

29. What crops do you produce? (*Tick as many as applicable*) 1. Maize [] 2. Guinea corn/sorghum [] 3. Millet [] 4. Rice [] 5. Soya beans [] 6. Cassava [] 7. Yam [] 8. Groundnuts [] 9. Sesame [] 10. Cotton [] 11. Okro [] 12. Pepper []

30. What are the sizes of the farms?Acres

Crop	Farm Size (Acres)
Maize/Corn	
Guinea corn / Sorghum	
Millet	
Cotton	
Rice	
Soya beans	
Cassava	
Yam	
Groundnuts	
Sesame	
Okro / Pepper	

31. What was your yield or output for the previous season? [In KG/ cocoa bag]

Crop	Yield in KG
Maize/Corn	
Guinea corn / Sorghum	
Millet	
Cotton	
Rice	
Soya beans	
Cassava	
Yam	
Groundnuts	
Sesame	
Okro / Pepper	

32. How many kilos of the yield/ harvest was consumed?

Crop	Amount consumed [KG/Bags]
Maize/Corn	
Guinea corn / Sorghum	
Millet	
Cotton	
Rice	
Soya beans	
Cassava	
Yam	
Groundnuts	
Sesame	
Okro / Pepper	

33. What quantity of crop yield was stored?

Crop	Stored in KG
Maize/Corn	
Guinea corn / Sorghum	
Millet	
Cotton	
Rice	
Soya beans	
Cassava	
Yam	
Groundnuts	
Sesame	
Okro / Pepper	

34. What quantity of crop harvested was sold?

Crop	Quantity sold in KG
Maize/Corn	
Guinea corn / Sorghum	
Millet	
Cotton	
Rice	
Soya beans	
Cassava	
Yam	
Groundnuts	
Sesame	
Okro / Pepper	

35. What is the main source of livelihood of the people in your community?

1. Crop Production []
2. Petty trading []
3. Livestock production []
4. Pito brewing []
5. Fishing []
6. Charcoal Burning []
7. Manufacturing (weaving – cane craft, basketry, mat, pottery, Shea butter) []
8. Driving (motor king, tractor, motor bike, passenger vehicle) []

9. Others (specify)

36. How will you describe the severity of damages or effects of the flooding on these sources of income/alternative livelihoods of community members?

This statement relates to the level of flood severity damages or effects on the sources of income/alternative livelihoods of community members. please indicate level of severity using the given scale by ticking the most appropriate cell against each statement that most accurately describes your position, opinion or situation (tick one box only): 1 = Not sure 2= Least severe 3 = moderately severe 3 = Severe 5 = Very severe

Indicate how severe were these sources of income interrupted or affected during floods					
SN	Sources of income/ alternative livelihood	1	2	3	4
1	Crop Production				
2	Livestock production				
3	Trading				
4	Charcoal Burning				
5	Pito [beer] brewing				
6	Manufacturing (weaving – cane craft, basketry, mat, pottery, Shea butter)				
7	Driving (motor king, tractor, motor bike, passenger vehicle)				

37. Those periods that you did not have enough food and money what did you do in order to ensure there was food for your household?

1. Reduced the number of meals per day []
2. Borrowed from friends and relations []
3. Reduced Household food consumption []
4. Borrowed money []
5. Sold family labour []
6. Burned charcoal for sale []
7. Others (Specify)

38. How severe was your agricultural productivity affected or damaged by the flood incident? *This statement relates to the level of flood severity damages or effects on the agricultural productivity in the community. please indicate level of severity using the given scale by ticking the most appropriate cell against each statement that most accurately describes your position, opinion or situation (tick one box only): 1 = Least severe 2 = moderately severe 3 = Severe 4 = Very severe*

Indicate how severe agricultural productivity was interrupted or affected during floods					
SN	Agricultural productivity	1	2	3	4
1	Land preparation				
2	Time of planting				
3	Labour availability				
4	Poor yield				
5	Income				

E. Health related issues

39. What are the common sources of domestic water in your community? (*Tick as many as applicable*)

1. Pipe born water [] 2. Bore hole [] 3. Rain harvest [] 4. Pond [] 5. River []
 6. Dam []
40. What is the main source of water for your household?
 1. Pipe born water [] 2. Bore hole [] 3. Rain harvest [] 4. Pond [] 5. River [] 6. Dam []
41. How do you access toilet in your community? 1. Pit latrine/KVIP [] 2. Public Toilet []
 3. Water closet [] 4. Open defecation/ free range []
42. At the peak of the flooding which of these is a threat to your quality of live? (*Tick as many as applicable*)
 1. Drowning of people [] 2. Snake bite and loss of life [] 3. Lack of clean water []
 4. Delays in medical deliverables and treatment [] 5. Psychological distress []
 6. Unhygienic environment [] 7. Outbreak of disease []

F. Copying strategies/ mechanisms

43. Before floods occur do you get information or warning? 1. Yes [] 2. No []
44. What are your sources of flooding information?
 1. Radio []
 2. Television broadcast []
 3. Traditional knowledge or Conventions []
 4. Information from relatives []
 5. Others (specify).....
45. Which institution/ organization provides the flooding information?
 1. Ghana Meteorological Agency [] 2. Family and friends []
 3. Weather forecaster []
46. How do you survive when floods occur? (*Tick as many as applicable*)
 1. Support from families [] 2. Borrowing of food and money from friends []
 3. Reduction in the number of meals per day [] 4. Support from government []
 5. Others (specify).....
47. Do you think these floods can be prevented?
 1. Yes [] 2. No []
48. If yes how can that be done?
 1. Proper building permits should be sought from the town planning committee []
 2. Construction of bridges drains and walls to help channel the floodwaters. []
 3. Proper disposal of waste products in the communities []
 4. Choked drains should be desilted regularly []
 5. Retention ponds should be constructed to hold extra water during times of flooding []
 6. Others, (specify)
49. How severe is the effects of flooding on these household life activities?
This statement relates to the level of flood severity damages or effects on the households activities. please indicate level of severity using the given scale by ticking the most appropriate cell against each statement that most accurately describes your position, opinion or situation (tick one box only): 1 = Least severe 2 = moderately severe 3 = Severe 4 = Very severe

Forms of effects of flooding on household life activities					
SN	Forms of households life activities	1	2	3	4
1	Production [Farming activity]				
2	Household food and feeding				

3	House or living space				
4	Health				
5	Education				

50. In your opinion what do you suggest to be short term strategy to mitigate the annual flood occurrence in the community?
1. Stay with friends' and relatives who are not affected by the flood event []
 2. Build walls or steps to block the floodwaters []
 3. Construct temporary wooden bridges to get access to foodstuff stored in the farms []
 4. Fill sacks with sand stones to check erosion []
 5. Clear choked gutters []
 6. Ensure that children and the elderly are safe by leaving the house to a higher ground. []
 7. Others specify
51. In your opinion what do you think could be done as a long term strategy to mitigate the annual flood occurrence in the community?
1. Construction of roads, gutters and river embankment. []
 2. Ensure proper permits for building houses. []
 3. Establish designated place for the dumping of waste []
 4. Early planting of crops []
 5. Relocate victims []
 6. Construction of dams to collect excess overflows []
52. What are the main coping strategies if any, that people of the community employ during floods?
1. Stay with friends' and relatives []
 2. Build walls or steps to block the floodwaters []
 3. Construct temporary bridges to get access to foodstuff stored in the farms []
 4. Fill sacks with sand stones to check erosion []
 5. Clear choked gutters []
 6. Ensure that children and elderly are safe by leaving the house to a higher ground. []
 7. Others specify.....
53. Which person, agency or organization assist during the floods?
1. NADMO [] 2. NGOs [] 3. Families and friends [] 3. Churches []
 4. MoFA []
 2. Others specify.....
- 54 What kind of help or support is given to you in times of floods?
1. Foodstuff []
 2. Clothing []
 3. Building materials (roofing sheets, cement, roofing nails) []
 4. Money []
 5. Others specify

Thank you.

Presentation of FGD data transcription and coding

The study area was put into three (3) zones namely; Saboba, Wapuli and Kpalba for the Focus Group Discussion (FGD). In each zone a community was purposively selected to represent several communities which constituted a zone. In each zone the FGD was separated into a male and a female group and each group constituted eight (8) respondents, which gave a total number of forty eight (48) participants in the FGD.

Each respondent in the FGD was coded. For the male groups the researcher assigned MFGD-R1 to MFGD-R24 to mean Male (FGD-R1): Respondent 1 to the 24th respondent in the 3 males groups for Saboba, Wapuli and Kpalba respectively. Whereas FFGD-R1 to FFGD-R24, represents Female (FGD-R1): Respondent 1 to the 24th respondent serially for Saboba, Wapuli and Kpalba respectively for the zones in the study.

The data was further translated from the local language (Likpakpaaln) into English language and presented into major or main themes, sub-themes, category of codes and examples of response patterns.

CODE BOOK

Main theme	Sub theme	Category of codes	Example(s) of response pattern
Flooding in Saboba	Understanding and experience of floods	Duration of stay	<i>"I've lived in this neighbourhood since I was born"</i> MFGD-R20 <i>"Since I was posted by the Ghana Education Service, I have been in this location"</i> MFGD-24 <i>"I moved into this community after marrying my husband"</i> FFGD-R19.
		Experience of flooding	<i>Yes, we have had flooding every year since I got married here</i> FFGD-R13 <i>Yes, since I was in class five our seniors were unable to cross the bridge to Saboba to sit BECE</i> MFGD-R23 <i>Usually during rainy season we are not able to cross over to Wapuli Township to attend school because of the floods</i> FFGD-R7
			<i>Yes, almost every year since I've lived here</i> MFGD-R19
		Understanding flooding	<i>"is when all of our cereal and rice farms are submerged by rain water"</i> MFGD-R4 <i>"Flooding occurs when the Burkina Faso people open their dam and the water comes to flood our homes and farmland"</i> MFGD-R2 <i>"Flooding" occurs when "all of the anthills and shrubs in our crop fields are completely immersed in water during the peak of our rainy season"</i> FFGD-R3. <i>"Flooding occurs in our area when</i>

			<p><i>the rains submerge the Kpalba and Wapuli bridges" MFGD-R9.</i></p> <p><i>when the river Oti exceeds some of its banks, causing problems for our farms along the river's banks and halting transportation MFGD-R10</i></p>
		Measure of flooding	<p><i>...it can be estimated that when Kpalba bridge (4.8m high), which is the highest bridge in the district is completely inundated during the peak of the flood season MFGD-R8.</i></p> <p><i>We measure the annual flood when our husbands' rice fields are flooded with water, and it looks like a cotton plantation that hasn't been harvested from afar. FFGD-R5</i></p> <p><i>"When the termite hills around here which are as high as two and a half submerged" MFGD-R9.</i></p> <p><i>When the potholes on our major highways become so full of water that no vehicle can drive through the depth of it" FFGD-R18.</i></p> <p><i>The flood is measured when all of our yam mounds are submerged by the water MFGD-R10</i></p>
		Flood duration	<p><i>If it is a major flood, it can last up to two and a half months MFGD-R18</i></p> <p><i>Floods can persist up to six weeks at times FFGD-R2</i></p> <p><i>The flood might last for up to a month MFGD-R11</i></p> <p><i>At certain years just three weeks MFGD-R8</i></p>
	Susceptibility of Saboba to floods	Physical factors	<p><i>We live in a low land area MFGD-R20.</i></p> <p><i>Our land is extremely clayey and as such absorbs too much water at the slightest drop of rains MFGD-R9.</i></p> <p><i>A respondent said: due to both prolonged and torrential rains within a short time FFGD-R18.</i></p> <p><i>It is an "act of God" MFGD-R15</i></p>
		Human factors	<p><i>We are settled closed to the river Oti banks MFGD-R8.</i></p> <p><i>It is because of the opening of the Bagre dam from the Mossi peoples'</i></p>

			<p><i>land (Burkina Faso) MFGD-R13.</i></p> <p><i>It's because Ghana's government has failed to build our roads and bridges MFGD-R20.</i></p> <p><i>I believe it is due to the lack of culverts and gutters in our area MFGD-R24</i></p> <p><i>It's because we, the farmers, farm along the river banks MFGD-R20.</i></p> <p><i>Also, it is the way we build in towns and villages. Unregulated expansion into flood zones FFGD-R2.</i></p> <p><i>Inappropriate agricultural practises, all contribute to the flood tragedy MFGD-R14.</i></p>
<p>The effects of flooding on the socio-cultural life of people</p>	<p>Socio-cultural values</p>	<p>Family life and organization</p>	<p><i>We are cut off from our families and other relatives during flooding events MFGD-R14.</i></p> <p><i>Our neighbourhood who live on the other side of the river are cut off from us. Our children and adults are unable to travel to schools, hospitals, shopping or market centers, churches, or mosques MFGD-R4.</i></p> <p><i>The floods caused extensive damage to our roads leading to farms, neighbouring towns, and market areas, resulting in a rise in the cost of living for us FFGD-R2.</i></p> <p><i>Besides, our capacity to pay traditional marriage dowries in order to owe additional wives is weakened since poor yields are recorded as a result of the floods MFGD-R8</i></p>
		<p>Poor communal and spiritual bond</p>	<p><i>We as a community is disconnected in terms of our cultural, spiritual and historic obligations, such as offering sacrifices to the earth gods (shrine) in exchange for wealth and good health MFGD-R4</i></p> <p><i>The floods disrupt our communal durbars, which are used to celebrate special milestones like the family outdooring of a new born infant FFGD-R19.</i></p> <p><i>In addition, our communities are</i></p>

			<p>unable to execute burial or funeral rites as required by our traditions when the flood occurs FFGD-R14.</p> <p>our annual historical events, such as the guinea corn and yam festivals are generally disrupted MFGD-R19</p>
Household living conditions.	Structure or building type.	Mud and gravel home (Atakpami building)	<p>FFGD-R3 said: <i>We the residents of this village, have organised communal labour to construct "atakpami homes" (structures made of gravel and clay soil) in which to dwell.</i></p> <p>MFGD-R2 indicated that: <i>...though ours is a home built of gravel and mud.</i></p> <p>MFGD-R10 said: <i>...the days of our ancestors we have cherished living in the round rooms with thatch roofing since it is economical and cool to sleep in.</i></p> <p>FFGD-R14 said: <i>...I met my husband, who lives in a round hat room with his siblings who also reside in different round hat rooms within the same compound.</i></p> <p><i>Many of us in our community live in "atakpami" buildings with aluminum zink roofing. There are of course many more people who dwell in the mud round rooms</i> MFGD-R24</p>
		Block house	<p>MFGD-R9 said <i>many teachers and nurses in the community have recently purchased land, and everyone is building a block house to dwell.</i></p> <p>FFGD-R8 said: <i>since I got married and moved into my husband's home we live in a block house.</i></p>
	Access to water	Pipe borne water	<p><i>...at times we have pipe water</i> FFGD-R5</p>
		River	<p><i>as for our water we share same with our animals from the river</i> FFGD-R19</p> <p><i>We here mostly draw our water from the river Oti</i> MFGD-R14.</p> <p><i>We also walk to the river occasionally to obtain water.</i> FFGD-15</p>

		Bore hole	<p>MFGD-R9 indicated that <i>bore hole was a source of water for them.</i></p> <p>MFGD-R10 said: <i>Our women walk to the boreholes to obtain water.</i></p> <p><i>Another participant said:</i> <i>We the women in the house, have to get up early in the morning to go to the borehole to pump for water...</i></p> <p>FFGD-18</p>
		Natural wells	<p>MFGD-R10 said that <i>natural wells were sources of water for them.</i></p> <p><i>...another time we go to draw water from the wells</i> FFGD-R11.</p> <p><i>The wells are our primary source of water.</i> FFGD-15</p>
	Toilet	Latrine pit (KVIP) and Open defecation (Bush)	<p>(MFGD-R13) said: <i>In terms of toilets, a few houses have been able to dig holes and construct toilets out of cement and blocks (KVIP), but many of us will prefer to relieve ourselves in the bush early in the morning or late at night.</i></p> <p>MFGD-R23 Indicated that, <i>“We don't have a toilet in our house, therefore we have to go on the free range”.</i></p> <p>MFGD-R8 said <i>in our communities here some residents prefer to go to the public toilet and some too have dug their own toilets close to the compounds and yet some go far into the bush.</i></p> <p><i>Since World Vision has been assisting us in the construction of household toilets (KVIP), many of us have one or two in our homes</i> FFGD-R24</p>
	Electricity	Volta River Authority (VRA)	<p><i>yes as for electricity we have but ...</i> FFGD-18</p> <p><i>there is electricity in all homes in our community</i> MFGD-R8</p> <p><i>A participant said: Sad that we don't have electricity here, yet we see the poles pass by us</i> MFGD-R10</p>

<p>Flooding on agricultural productivity and income of households</p>	<p>Agricultural productivity and income</p>	<p>Timing, planting and income</p>	<p><i>flooding has caused a significant interruption in our planning for farming and marketing activities</i> MFGD-24 <i>... I've seen that the flooded situation elicits mixed emotions. Though farmers have been badly impacted by the flooding due to low yields, our fisher folk neighbours have benefited monetarily and nutritionally as a result of the catastrophe.</i> MFGD-R20.</p> <p><i>our people who farm rice, maize, vegetables, etc. along the river banks get fertile soil to farm after the flooding</i> MFGD-R19</p> <p><i>The flooding season, on the other hand, allows canoe paddlers to make a large profit from commuters who must cross rivers and streams to access other amenities within and outside of the district.</i> FFGD-R18. <i>The flood might destroy an entire maize, groundnut, or rice farm, as well as okro and pepper farms.</i> MFGD-R24.</p> <p><i>Our cattle, goats, and sheep have all experienced losses as a result of the water. Many domestic fowls or birds go astray and are lost or killed</i> MFGD-R9.</p> <p><i>the uncertainty of the weather at that time affects the organisation of the communal labour force since it becomes stressful, expensive, and unreliable for us farmers.</i> FFGD-R2 <i>Our market men and women were completely cut off from the market network systems during the peak of the flood season. Household income is dwindled and food insecurity is increased.</i> MFGD-R18</p> <p><i>Agricultural inputs are unavailable to us, the farmers, during flood. due to road inaccessibility and the unpredictability of the weather patterns,</i> MFGD-R9 <i>...during flooding our major roads</i></p>
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			<i>are cut off by floods, our economic ventures come to a halt. Trading and market activity have been severely hampered</i> FFGD-R24
Coping Strategies of flood victims	Flooding alerts or signs	Traditional knowledge	<p><i>They sensed flooding through certain changes in their immediate environment based on traditional knowledge and wisdom. For instance the cry of specific birds on trees near the river</i> MFGD-R14.</p> <p><i>The unusual presence of red ants, tortoises and crocodiles in their immediate surroundings was unique</i> FFGD-R2.</p> <p><i>The river water takes on a milky colour and becomes clayey in nature, which are signals or enough indicators of impending floods in the area.</i> MFGD-R 20.</p> <p><i>An increase in the volume of water flowing through the main river that engulfs us and with the presence of a lot of contaminants on the water surface.</i> MFGD-R24</p>
		National TV and local FM	<i>picked signals about flooding from either national or local television or radio stations respectively</i> MFGD-R9
	Coping with floods	Survival strategies	<p><i>Our socio-cultural life style encourages us to rely on one another for support in times of fundamental needs or crises.</i> MFGD-R7</p> <p><i>... our community life style of belongingness or oneness serves as a source of hope, survival, and coping with famine and disasters</i> MFGD-R24</p> <p><i>we use the communal labour force to assist those who were fortunate enough to have some portions of their farm fields not completely destroyed, supporting them to harvest quickly at a relatively low labour cost</i> FFGD-R2</p> <p><i>Our alternative source of money creation and livelihood is animal rearing</i> MFGD-R14</p>

			<p><i>We take to trading and fishing, which are other sources of our survival during flooding</i> MFGD-R20</p> <p><i>During floods, we ask for and receive assistance from our families, friends, and other relatives who live outside of our neighbourhood</i> FFGD-R18.</p> <p><i>parents let their children to work elsewhere and return their earnings home</i> FFGD-R11</p> <p><i>We also reduced the amount of the food and the number of menus served each day</i> MFGD-13</p>
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