

**ENSIGN GLOBAL COLLEGE
KPONG, EASTERN REGION, GHANA**

DEPARTMENT OF COMMUNITY HEALTH

**THE EFFECTS OF FLUVIAL FLOODING ON LIVELIHOOD
VULNERABILITY IN CENTRAL TONGU AND ADA EAST DISTRICTS
OF GHANA**

BY

AKUA ASUAMAH-TAWIAH

SEPTEMBER 2024

ENSIGN GLOBAL COLLEGE

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**A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY
HEALTH, FACULTY OF PUBLIC HEALTH, ENSIGN GLOBAL COLLEGE IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER OF
PUBLIC HEALTH DEGREE**

SEPTEMBER 2024

DECLARATION

I, Akua Asuamah-Tawiah, hereby certify that except for references to other people’s work, which I have duly cited, this project submitted to the Department of Community Health, Ensign Global College, Kpong is the result of my own investigation, and has not been presented for any other degree elsewhere.

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DEDICATION

I dedicate this work to my beloved mum and dad, Madam Cecilia Asantewaa and Hon. Jones Samuel Tawiah for their constant love, support, and financial assistance. And to all the victims of the 2023 Akosombo and Kpong Dams Spillage.

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DEFINITION OF TERMS

Direct Damage	Immediate physical damage caused by direct contact with floodwaters, such as destruction of buildings or crops.
Fluvial Flooding	Flooding caused by river overflow due to excessive rainfall or dam spillage, leading to inundation of surrounding areas.
GhanaWeb	A popular news and information portal focused on Ghana
Indirect Damage	Secondary effects of flooding that occur outside the immediate flooded area, such as economic losses due to disrupted transportation or trade.
Intangible Damages	Non-physical impacts of flooding, such as psychological stress, disruption of social networks, or loss of cultural heritage.
Key Informant	Individuals with specialized knowledge or experience relevant to the study, often interviewed to provide insights into specific issues.
Livelihood Activities	Economic activities or sources of income that individuals or households engage in to sustain their living, such as farming, fishing, or trading.
Livelihood Vulnerability	The susceptibility of households or communities to disruptions in their means of livelihood, particularly due to natural disasters like floods.
NADMO	National Disaster Management Organization, responsible for coordinating disaster response and relief efforts in Ghana.
SHEP Coordinators	School Health Education Programme Coordinators, responsible for promoting health and hygiene in schools.
Tangible Damages	Physical and measurable losses caused by flooding, such as property damage, loss of crops, or infrastructure destruction.

LIST OF ABBREVIATIONS

ADS	Akosombo Dam Spillage
APP	Application
BBC	British Broadcasting Corporation
CBO	Community-Based Organization
CHAG	Christian Health Association of Ghana
CHPS	Community Health Planning and Services
DCE	District Chief Executive
DHD	District Health Directorate
GBC	Ghana Broadcasting Corporation
GDO	Gender Desk Officers
GDP	Gross Domestic Product
GHS	Ghana Health Service
GIS	Geographic Information System
GNAT	Ghana National Association of Teachers
GPS	Global Positioning System
HIV	Human Immune Virus
IRB	Institutional Review Board
LMICs	Low-and-Middle Income Countries
MDG	Millennium Development Goals
MMDA	Metropolitan, Municipal, and District Assemblies
MoFA	Ministry of Food and Agriculture

MS	Microsoft
MS Excel	Microsoft Excel software used for data storage and management
MT	Metric Tons
NADMO	National Disaster Management Organisation
NCCE	National Commission for Civic Education
NGO	Non-Governmental Organisation
PLHIV	People Living with Human Immune Virus
SHEP	School Health Education Programme
STATA	A statistical software used for data analysis
UNDP	United Nations Development Programme
URL	Uniform Resource Locator
USAID	United States Agency for International Development
VRA	Volta River Authority
WASH	Water Sanitation and Hygiene
WHO	World Health Organization

ABSTRACT

Background: Flooding commonly refers to the overflow of water that submerge onto dry land. This can occur due to heavy rainfall, storm surges, rapid melting of snow or ice, or the overflow of rivers, lakes, or other water bodies. Dam-mediated flooding can occur due to various factors related to the operation, design, or failure of a dam. In the last three decades, floods have drawn much attention in both developed and developing countries as a critical development challenge. In September 2023, the Akosombo Dam was spilled due to changes in rainfall patterns which led to flooding downstream communities along the lower Volta Basin. The study aimed to explore the effects of flooding on livelihood vulnerability in the Central Tongu and Ada East Districts of Ghana.

Methodology: This study employed a qualitative design and used a non-probability purposive sampling technique to recruit 33 key informants. The study utilized published newspapers and key informants' interviews as main data sources. To analyze data, thematic analysis was adopted, and ATLAS.ti was used in coding whereas the emergency relief items checklist was analyzed using descriptive statistics with STATA version 18.

Results: The controlled spillage caused significant damage in Central Tongu and Ada East districts, affecting both tangible and intangible assets directly and indirectly. Roads, bridges, and water supply systems were completely destroyed, while schools, markets, and electricity systems suffered partial damage. Some toilet facilities, refuse dumps, cemeteries, and mortuaries were submerged. Schools were repurposed as temporary shelters, disrupting education. The use of polluted water led to skin infections, with reports of diarrhea and malnutrition among children. Overcrowding in shelters increased the risk of communicable diseases, particularly affecting children and girls. Farmlands, food crops, and livestock were impacted, causing temporary food

shortages and higher food prices, while economic activities like fishing and oyster mining were halted. Although emergency relief items were donated, they were insufficient, and their distribution was influenced by political factors.

Conclusion: The Akosombo Dam Spillage severely affected the livelihoods and general well-being of the people living in the Central Tongu and Ada East Districts. This study underscored the need for comprehensive disaster preparedness and resilience strategies that address the many challenges posed by floods.

Keywords: Flood, Fluvial flooding, Akosombo Dam Spillage, Volta River Authority, Newspapers.

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CHAPTER 1

1.0 INTRODUCTION

1.1 Background

Flooding commonly refers to the overflow of water that submerge onto dry land. This can occur due to heavy rainfall, storm surges, rapid melting of snow or ice, or the overflow of rivers, lakes, or other water bodies. Natural disasters like hurricanes, tsunamis, or heavy monsoon rains can also result in widespread flooding, causing damage to infrastructure, homes, and agriculture (Amoako 2016). Fluvial flooding specifically refers to flooding that is caused by the overflow of rivers or streams. This type of flooding occurs when the volume of water in a river exceeds its capacity, leading to water spilling over onto adjacent areas, such as floodplains. Fluvial flooding can be triggered by various factors, including heavy and prolonged rainfall rapid snowmelt, or a combination of these events (WHO, 2017). Fluvial flood regimes are increasingly influenced by dam infrastructure. Although certain dams are specifically designed to reduce flood risk, the consequences of dam failure can result in severe impacts on the livelihoods of downstream communities (Dotse-Gborgbortsi *et al.*, 2022).

In the last three decades, floods have drawn much attention in both the advanced and low and middle-income countries as a critical development challenge. Assets, safety, and social amenities suffer during floods (Amoako, 2016). For instance, excessive rainfall in the highlands of Ethiopia and Somalia between October and November caused the Shebelle River to overflow its banks in central Somalia and submerged the surrounding area, including the town of Beledweyne (Ahmed, 2020). Flooding in the town forcefully displaced an estimated 250, 000 people from their homes (Earth Observatory, 2023). Flood-related natural disasters result in higher fatalities and economic losses compared to many other similar disasters (Amoateng *et al.*, 2018).

Urbanization has been ticked as the prime propeller of these natural disasters due to rapid population growth, poor planning, increased slums, and other human activities in the cities (Amoako, 2016). Ghana is one of the most vulnerable African countries to floods, which pose a serious economic retrogression and threat to prosperity (World Bank, 2019). Different kinds and intensities of floods do occur, and there has been a rise in occurrence in recent times in some cities like Accra, Kumasi, Tamale, and Secondi-Takoradi (Amoateng *et al.*, 2018).

As a result of climatic changes, Ghana has experienced increasing levels of rainfall, leading to a rise in the water levels of the country's main dam beyond its maximum operational capacity. To keep the water levels at the Akosombo Dam steady, the Volta River Authority (VRA) decided to start a controlled spilling exercise (VRA, 2023). As a method of mitigating disasters, the spilling experiment started on September 15, 2023, albeit slowly at first, with little effect on the people downstream. On October 10, 2023, however, as the reservoir's inflow approached the dam's full capacity, six spilling gates were opened to boost the flow. Around 8,000 people were displaced because of this spill, with Mepe suffering the greatest damage, from eight settlements downstream along the Volta River, according to Graphic Online. Districts in North, Central, and South Tongu in the Volta Region, as well as the Asuogyaman District in the Eastern Region, are among the impacted communities (Etefe, 2023).

Given this, the current study aims to explore the multifaceted effects of fluvial flooding on livelihood vulnerability, recognizing the intricate interplay between environmental factors, socio-economic conditions, and community resilience.

1.2 Problem Statement

Globally, between 1980 and 2013, floods were the most frequent natural disasters and affected an estimated 2.8 billion people (Dotse-Gborgbortsi *et al.*, 2022). Most of these floods are attributed

to variations in climate. An Indian study indicates that significant climate changes may lead to variations in both the intensity and frequency of rainfall, alongside an increase in average global temperatures. Consequently, heightened rainfall intensity and frequency are expected to result in increased surface runoff and peak discharge, thereby contributing to a higher incidence of flood events (Ramachandran *et al.*, 2019). However, between 2015 and 2016, Ghana experienced extreme power outages which were attributed to low water levels in the country's hydroelectric dam; the Akosombo Dam. Heavy rainfall particularly in 2023 resulted in the historic opening of all spill gates of the Akosombo and Kpong Dams since their inception. The spillage was carried out to safeguard the operational integrity of both dams, particularly the Akosombo Dam. The National Disaster Management Organization (NADMO) estimated that eight districts had been affected since the start of the floodwaters on Wednesday, October 11, according to BBC News, during the Akosombo Dam spill, which caused widespread flooding. Many homes were fully flooded, and authorities are still evaluating the entire extent of the damage. One of the areas visited, Mepe, had about 25% of its residents significantly impacted by the flooding. The inundation of critical infrastructure, such as restrooms, cemeteries, and trash dumps, raised serious fears about the possibility of an outbreak of waterborne diseases. In addition, vital utilities including electricity and water were interfered with and rendered unavailable in the impacted areas (Aaase Radio, 2023).

Many studies focus on the immediate impacts of dam-mediated flooding quantitatively (Li *et al.*, 2021; Dotse-Gborgbortsi *et al.*, 2022), but there is a need for more research that examines qualitatively the long-term consequences and effects of dam-mediated flooding on livelihood vulnerability. This includes investigating the processes involved in spilling the dam, understanding how each community experienced the flood, the speed, and coverage of the media houses in

reporting the news to the public for emergency aid, and the sustained effects on communities' livelihoods. As climate change intensifies, the frequency and severity of fluvial flooding events are expected to escalate, exacerbating the challenges faced by vulnerable populations such as displacement and migration issues. Understanding the nuanced dynamics of the intentional Akosombo dam spillage through the combined efforts of the government and the media is crucial for developing effective mitigation and adaptation strategies, ultimately fostering sustainable and resilient communities (Munyai, Musyoki and Nethengwe, 2019).

1.3 The Rationale of the Study

Understanding the effects of floods on the lives of communities that depend on natural resources is vital for climate change adaptation, as extreme weather events are occurring more frequently and with greater intensity. The results of this study will provide an opportunity for learning from a crisis thus resilience building. Furthermore, the study is expected to help in understanding and addressing the health implications of flooding, enabling better preparedness and response in the healthcare sector. Moreover, researching the effects of flooding on communities will allow for the development of resilience strategies in Ghana. These include the creation of infrastructure that can withstand flooding, early warning systems, and community education on preparedness and response. Fellow researchers who wish to conduct studies around this area could also use the findings of this study as literature.

1.4 Conceptual Framework

This study employed the sustainable livelihoods framework. The purpose of this tool is to raise awareness about livelihoods, especially those of the impoverished. Building on past work of the Institute of Development Studies, it was created over several months by the Sustainable Rural Livelihoods Advisory Committee. It arranges and illustrates the relationships between the

variables that limit or improve living opportunities. It aids in creating development initiatives that are responsive, participative, and people-centered (Serrat, 2017). Figure 1 presents the framework with factors that hinder or increase the livelihood opportunities of the poor and illustrates the relationship between them.

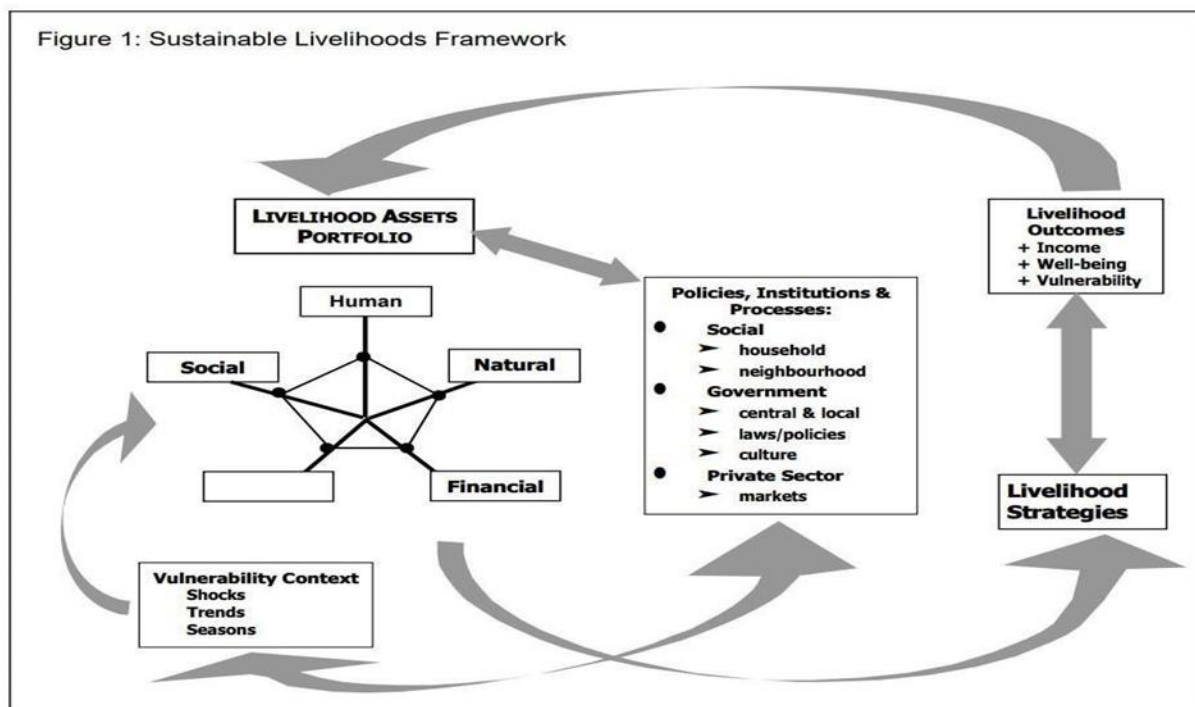


Figure 1 Sustainable Livelihood Framework

The vulnerability context defines the outside world in which people live. Important trends also have a fundamental impact on people's livelihoods and the availability of assets, in addition to shocks and seasonality, over which people have little to no control. The elements that comprise the vulnerability context are significant because they directly affect people's asset position and the opportunities available to them in search of favorable livelihood outcomes. Direct asset destruction is possible in certain situations (such as floods, storms, civil conflicts, etc.). They can also compel people to forsake their homes and sell assets (like land) before their time as a coping mechanism (Paulson, 2018).

Applying the sustainable livelihood framework in this study illustrates the effects of shocks which include floods on natural capital which entails lands, water, and aquatic resources, and how governmental policies can help curb these challenges to affect livelihood outcomes in the future.

1.5 Research Questions

1. How did the various communities experience the flooding?
2. What were the effects of the flood on the residents?
3. What emergency interventions were received?

1.6 General Objective

To explore the effects of the Akosombo Dam Spillage and associated emergency interventions in Central Tongu and Ada East districts.

1.7 Specific Objectives

1. To understand how each community experienced the flood.
2. To investigate the effects of the floods on residents.
3. To identify the emergency interventions received by flood victims.

1.8 Profile of the Study Area

Adidome serves as the capital of the Central Tongu District, which was created in February 2012 by the Legislative Instrument (LI. 2077). Adidome District was the name given to Central Tongu District (previously North Tongu District) when it was first created in 1989. The present Central Tongu and the new North Tongu districts were created by splitting the North Tongu district once more. Ada East District of the Greater Accra Region, the Ho West, Adaklu, North Tongu, South Tongu, and Akatsi South and North districts of the Volta Region share boundaries with the Central

Tonu district. Due to its advantageous location and proximity to both the National seat, Accra, and the Volta regional seat, Ho, agricultural goods, and other economic products generated in the area are better marketed.

Figure 2 shows the map of the study area, Central Tongu district.



Figure 2 The District Map of Central Tongu (Source: Ghana Statistical Service, 2014)

According to the 2010 Population and Housing Census, Central Tongu District has 59,411 residents or 2.8% of the region's total population. 53.2 percent of the population is female, while 46.8 percent is male. Roughly 88% of the population lives in rural areas. The district has an 87.9 sex ratio, thus one male for every 100 females. With 38.7% of the population under 15, the district has a young population with an overall age dependence ratio of 89.8 (Ghana Statistical Service, 2014).



Figure 3 A Picture of the Flood Scene

Figure 3 shows an image of a flood scene at Bakpa in the Central Tongu district. This includes stranded victims in retrieving their belongings from the flood.

The Ada East District was created in 1989 by Legislative Instrument (L.I. 1491). However, the Legislative Instrument was renamed L.I.2130 once the Ada West District was established in 2012 independently of the Assembly. The district covers an area of approximately 289.78 square

kilometers or nearly 8.93% of the Greater Accra Region's total land area. The number of people living in the Ada East District is 71,671, with a slight gender imbalance. According to the 2010 Population and Housing Census, 52.54 percent of the district's total population is female whereas 47.46 percent of the population, is male. Fishing and farming are the main occupations of the residents of the district. Most of the farming activities in the district are done with irrigation, and crops grown there include maize and cassava (Sandqvist, 2019). Figure 4 shows the district map of Ada East District.



Figure 4 District Map of Ada East

1.9 Scope of Study

Using information from key informant interviews and media, this study was limited to the Central Tongu and Ada East Districts.

1.10 Organization of Report

This thesis is made up of six (6) chapters. Chapter One entails the introduction, which dilates on the background of the study, problem statement, rationale, conceptual framework, objectives of the study, research questions, profile of study area, scope of the study, and the organization of thesis chapters. Chapter Two reviews related literature on fluvial flooding and its effect on livelihood vulnerability. Chapter Three explains the methodology employed in this study and the kind of analysis carried out. Chapter Four presents the results of the analysis. Chapter Five presents a discussion of the findings. Finally, Chapter Six presents the conclusion and recommendations of this study.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter highlights key literature covering all aspects of fluvial flooding, dam-mediated flooding, the overview and structure of the Akosombo Dam, the 2023 controlled spillage, the effects of flooding on both immediate and long-term bases, emergency interventions during natural disasters, and the role of the media in reporting flood incidences. The chapter further compares global flood issues to floods in Ghanaian contexts considering the variations in climate change. It ends by emphasizing some research gaps and ways to bridge them in future research works.

2.2 Fluvial Flooding

Flood is one of the world's most dangerous disasters (Vasconcelos *et al.*, 2023). It occurs when an extreme amount of water covers any area, which is mostly a living settlement. Flooding is commonly characterized as the overflow of water beyond its designated channel or course, which can be caused by various factors such as intense rainfall, rising sea levels, storm waves, coastal erosion, melting glaciers, melting snow, and decreased ground penetration (Amoateng *et al.*, 2018).

India is reported to be a highly prone flood area (Sam *et al.*, 2017). The most common and expensive natural disasters in the world are floods (Jean *et al.*, 2023). Fluvial flooding occurs when an influx of water into a river causes the level of water to rise above the bank crest elevation, resulting in the overflow of water from the river channels into the adjacent floodplains (Rahman *et al.*, 2022). However, to move surface runoff from rainfall, modern cities typically rely on drainage systems. Days or even weeks are not uncommon for fluvial flooding, which has a significant impact on floodplains along rivers (Chen *et al.*, 2010).

2.3 Dam-Mediated Flooding

Dams serve a vital function in water resource management by facilitating the provision and regulation of water supplies, hydroelectric power, and flood control. However, their influence on flood dynamics can be complex. While dams are designed to mitigate floods by controlling the release of water, they can also contribute to flood risks under certain conditions. Approximately 10% of large dams outside of China are used partially for flood mitigation, while another 10% are entirely dedicated to this purpose, particularly in the United States (He et al., 2020). Many countries may experience a greater need for flood mitigation in the future due to potential increases in annual rainfall probability by 10% to 20% and relevant floods by over 20% because of climate change (AghaKouchak et al., 2020). A flood event with a current annual probability of 1% (1/100) may experience an increased likelihood, rising to 10% (1/10) in the future due to various factors, such as climate change. The repurposing of existing or newly constructed dams, originally intended for hydropower generation or irrigation, for the additional objective of flood mitigation could offer significant advantages moving forward. The analysis of flood-related incidents involves assessing parameters such as dam height, reservoir storage capacity, and spillway design. Notably, the most severe accidents reported have typically involved embankment dams with a storage capacity exceeding 10 hectometers (hm³). Fatalities from dam failures are mostly attributed to the floods that occur after the dam failure. The effect of climate change has further intensified the challenges associated with dam management. When a flood has an annual probability of 1/100, it is generally realistic to aim for a 30% reduction in its peak. A cheaper option would be to combine a free-flowing, labyrinthine spillway with a gated spillway that can release the yearly flood or up to 20% more. Gates can be opened in significant catchment areas a few hours in advance to generate storage for a portion of the flood peak, and at this point, it is reasonable to

predict the expected peak value of a big flood (Lempérière, 2017).

2.4 Global Trends in Flooding

Flooding is a widespread and severe hazard that significantly disrupts lives and livelihoods globally. The extent of flooding, among other factors, is projected to rise over the next century (IPCC, 2007; Kirezci et al., 2023). Floods frequently cause substantial damage and hardship, particularly in low-income countries, where infrastructure such as drainage systems and flood protection measures are often underdeveloped. While flood risk affects nations across all levels of development, 89% of the global population exposed to flood hazards resides in low- and middle-income countries (LMICs). Both large-scale, infrequent floods and smaller, more frequent events can reverse years of progress in poverty alleviation and development. Utilizing the latest high-resolution Flood Hazard and population maps, alongside poverty estimates from the World Bank's Global Subnational Atlas of Poverty and Global Monitoring Database, it is estimated that 1.47 billion individuals globally are directly exposed to significant flood risks, with nearly 600 million of them living in poverty. Global flood risk exposure is on the rise, with approximately 2.2 billion people, or 29% of the global population, residing in areas vulnerable to flooding during a 1-in-100-year event (Dryden et al., 2021). Such an event, which has a 1% likelihood of occurring annually, presents a 10% probability within a decade and a 50% likelihood throughout an average human lifetime (68 years). Of the global population, around 1.47 billion individuals, or 19%, are at risk of experiencing flood depths exceeding 0.15 meters. Notably, over half of those exposed face the possibility of life-threatening flood levels, with particularly severe risks posed to vulnerable groups such as children and individuals with disabilities. In England and Wales, for instance, river floods have decreased since 1998. However, heavy rainfall and flooding remain recurring issues, as seen with the Akosombo Dam in Ghana, where geographical and

meteorological factors contribute to the area's susceptibility to flooding (Kumar et al., 2019).

2.5 Global Effects of Flooding

Flooding can have disastrous social, economic, and environmental effects on any country (Mensah and Ahadzie, 2020). Surprisingly, the annual cost of flood-related damages worldwide surpasses \$40 billion, with Asia suffering the most losses (Ballester et al., 2023). Millions of people in Africa are impacted by floods, mainly as a result of the continent's undeveloped and inadequate infrastructure, the population's increased susceptibility to flooding due to pervasive poverty, the lack of adequate coordination in flood management initiatives, and low adaptive capacity to flooding (Adelekan, 2020).

Without doubt, flooding in the UK is linked to higher rates of anxiety and depression, two of the most prevalent mental illnesses along with other traumatic life experiences (Agronomy, 1973; Tunstall et al., 2006). A separate study found that adults who live in flooded homes are four times more likely than non-flooded homeowners to feel psychologically uncomfortable (Reacher et al., 2004). Ten months after the flood, it was shown that the autumn 2000 flooding in Lewes was strongly associated with common mental disorders. In addition to loss and damage to properties and possessions, there was also a strong indication that displacement played a significant role in this psychological distress. Additionally, in addition, Tunstall et al. (2006) found that individuals who have experienced flooding have far greater rates of psychological impairment than those who have not experienced flooding but are still at risk. An increase in the prevalence of arthritis and other illnesses that can be made worse by flood-related conditions was found in an English study. Additionally, studies have demonstrated that flood victims with a history of health issues are more likely to experience flood morbidity and that single parents are particularly sensitive to the impacts of flooding since they typically have lower incomes and must care for both their children and the

aftermath of the flood on their own (Tunstall *et al.*, 2006). A Namibian study that employed the HIV and floods paradigm identified significant issues that PLHIV face daily that impact their ability to work, live, and make ends meet. The infrastructure collapse brought on by flooding, insecurity, malnutrition, and diseases that develop during a flood exacerbate the threats that flooding poses to them under normal circumstances: poverty, malnutrition, unsafe water, sanitation, and hygiene; limited access to health facilities; a precarious health status; and stigma. Due to the lack of access to antiretroviral therapy and health services, there is a potential dual risk to their health: a higher chance of infection and illness (Anthonj *et al.*, 2015).

2.6 Economic Impacts of Flooding

Floods expose residents to the challenge of living under a very minimum standard of living. In this case, people go without proper or no housing, clean water, or healthy food affecting socio-economic and political perspectives. This is extreme poverty, the point at which financial assistance is required. But other assets, such social capital, non-cash advantages, elementary education, and primary healthcare access, are equally important for improving human potential (Coleman, 1988). It has been reported that many are involved in primary production like fishing just to make ends meet. But this is lost due to the impacts on aquatic ecosystems and this in the long run affects the productivity of countries which negatively influences GDP and brings about economic instability (Chauhan *et al.*, 2019). The harmful economic impact of flooding poses a significant threat to Ghana's development. Heavy rains and water spillage have led to the destruction of vast farmlands and displaced numerous individuals. (Asare and Tuffour, 2023).

2.7 Flooding in Ghana

Flooding has been a persistent issue in Accra, Ghana's capital, contributing to human vulnerability and occurring frequently since 1930. At least 18 notable flooding events have occurred within the

previous 50 years, resulting in damage and human casualties. Since 1995, the frequency of flooding in Ghana's coastal areas has increased. Flooding typically follows intense or continuous rainfall, leading to high runoff. Contributing factors include climate variability and change, as well as poor physical planning and drainage system flaws. Flooding is the second most common natural disaster in Ghana, following epidemics. From 1900 to 2014, economic losses from flooding amounted to approximately US\$780.5 million.



Figure 5 A flood scene in Ghana

The most devastating flooding event in Ghana's history occurred on June 3, 2015, when heavy thunderstorms and rain hit southern Ghana. The storm was centered over Accra, recording 212.8 mm of rainfall and causing widespread flooding. This incident, coupled with an explosion at a fuel station in Kwame Nkrumah Circle, resulted in over 150 deaths, extensive property damage, and the displacement of hundreds of people.

Further heavy rains and thunderstorms on June 18 and 28, 2018, caused flooding in Ghana's two largest cities, killing 14 people, displacing 34,076, and causing property damage estimated at \$168,289, as reported by the NADMO (Ansah *et al.*, 2020).

In their article, "The three-dimensional causes of flooding in Accra, Ghana," published in the *International Journal of Urban Sustainable Development*, the authors investigate the multifaceted causes of flood hazards to propose an integrated flood management framework. Through a mixed-methods approach, including document analysis, consultations with institutions, and key informant interviews, the research identifies three interrelated thematic areas contributing to flood hazards in Accra. These findings underscore the need for a holistic and integrated flood management strategy that takes into account the city's distinct physical, social, and political contexts (Amoako and Boamah, 2015).

2.8 Overview of the Akosombo Dam

The Akosombo Dam, also known as the Volta Dam, is a hydroelectric facility situated on the Volta River in southeastern Ghana, within the Akosombo Gorge, and is managed by the Volta River Authority (VRA) (Salini Impregilio, 2017). Its construction led to the inundation of parts of the Volta River Basin, forming Lake Volta, the world's largest artificial lake by surface area. Spanning 8,502 square kilometers, Lake Volta covers 3.6% of Ghana's land area. In terms of volume, it contains 148 cubic kilometers of water, making it the world's third-largest artificial lake by volume, surpassed only by Lake Kariba with 185 cubic kilometers (Fobill, 2003). The Akosombo Dam was initially constructed to provide electricity for the aluminum industry and represented the largest single investment in Ghana's economic development at the time (Zackhary, 1997). The dam is essential in supplying electricity to Togo and Benin, though the construction of the Adjarala Dam aims to complement Akosombo and reduce the reliance of Togo and Benin on imported

electricity. Originally generating 912 megawatts (1,223,000 hp), the dam's capacity was increased to 1,020 megawatts (1,370,000 hp) following a retrofit completed in 2006 (Altera P).

2.9 Structure and Design of the Akosombo Dam

In 1915, geologist Albert Kitson first proposed the concept of constructing a dam, though concrete plans were not developed until the 1940s (BBC, 2007). A formal proposal to develop the Volta River Basin emerged in 1949, but due to financial constraints, the American company Volta Aluminium Company (Valco) provided funding to facilitate the dam's construction. President Kwame Nkrumah strongly supported the Volta River hydropower project (VRA, 2007). The dam itself spans 660 meters (2,170 feet) in length and stands 114 meters (374 feet) tall, with a rock-fill embankment structure. It has a base width of 366 meters (1,201 feet) and a structural volume of 7.9 million cubic meters (10.3 million cubic yards). The reservoir formed by the dam holds a capacity of 148 cubic kilometers (120 million acre-feet) and covers a surface area of 8,502 square kilometers (3,283 square miles). The lake stretches 400 kilometers (250 miles) in length, with a maximum water level of 84.73 meters (278.0 feet) and a minimum of 73.15 meters (240.0 feet) (Jackson et al., 2019). Two spillways on the eastern side of the dam are capable of discharging approximately 34,000 cubic meters per second (1.2 million cubic feet per second) of water, each equipped with six steel floodgates, measuring 11.5 meters (38 feet) in width and 13.7 meters (45 feet) in height (Statesman Online, 2007). The dam's power station contains six 170-megawatt (230,000 horsepower) Francis turbines, each fed by a penstock ranging between 112–116 meters (367–381 feet) in length and 7.2 meters (24 feet) in diameter, with a maximum hydraulic head of 68.8 meters (226 feet) (Jackson et al., 2019). The final proposal for the project included the construction of an aluminum smelter in Tema, powered by the Akosombo Dam, along with a network of power lines throughout southern Ghana. The smelter was designed to generate revenue

for local bauxite mining and refining, to enable aluminum production without the need for imported alumina. The success of Ghana's aluminum industry was closely tied to the availability of hydroelectric power from the dam. Kaiser Aluminium, an American corporation, was in charge of the aluminum smelting project, which Valco ran. (VRA, 2007).

2.10 Power Generation

The Akosombo Dam supplies electricity not only to Ghana but also to neighboring West African countries like Togo and Benin (GhanaWeb, 2011). Initially, 20% of the dam's electricity output (which met 70% of Ghana's national demand) was allocated for domestic use, while the remaining 80% was earmarked for Valco. Ghana's government, under contract, funded over 50% of the dam's construction costs but was limited to receiving only 20% of the generated power. Some critics view this arrangement as a form of neocolonialism. In recent years, production from the Valco plant has declined, with most of Akosombo's capacity now used to meet increasing domestic demand (Car *et al.*, 2023).

Initially designed to exceed current demand significantly, the dam's capacity has doubled since its inception due to Ghana's industrial and economic growth (Boateng, 2010). However, this growth has outpaced the Akosombo power plant's capabilities. By 1981, a smaller dam was constructed downstream at Kpong, and ongoing upgrades to Akosombo are essential to maintain hydropower output. Increasing power demands have led to frequent rolling blackouts and major outages (Gyau-Boakye, 2001). Moreover, declining lake levels, sometimes falling below operational requirements, pose further challenges (Boateng, 2010).

At the start of 2007, concerns arose about the dam's electricity supply due to low water levels in the Lake Volta reservoir (MyJoyOnline, 2023). By the latter half of the year, these worries eased as heavy rainfall replenished the Volta River catchment area (Ghanaian Times, 2023). In 2010, the

dam recorded its highest water level ever, reaching 84.45 meters (277 feet), prompting the opening of floodgates and leading to weeks of downstream flooding (Ghanaian Times, 2023). The Akosombo Dam has fostered various industrial and economic activities, including lake transportation, increased fishing, new farming along the shoreline, and tourism (The Original, 2006).

2.11 Impacts of Constructing the Akosombo Dam

The construction of the Akosombo Dam resulted in the flooding of part of the Volta River Basin and its upstream fields, creating Lake Volta, which now covers 3.6% of Ghana's total land area (Gyau-Boakye, 2001). Formed between 1962 and 1966, the reservoir required the relocation of approximately 80,000 people, constituting about 1% of Ghana's population (GhanaWeb, 2007). Two years before the dam's completion, residents of 700 villages were resettled into 52 new villages as part of a program overseen by the VRA (Oyoko, 2007). About 2% of the resettled population were fishermen, and most were subsistence farmers (The Statesman, 2011).

The Eastern Region of Ghana, along with its districts, bore the brunt of the project's impacts (GhanaWeb, 2001). The creation of Lake Volta had profound environmental consequences, including seismic activity leading to coastal erosion, altered hydrology causing microclimatic changes with reduced rainfall and higher temperatures. Downstream agricultural systems suffered from reduced soil fertility due to the absence of periodic floods that had previously enriched the soil. Increased agricultural use of fertilizers further contributed to eutrophication, fostering the growth of invasive weeds that hinder water navigation and serve as habitats for disease vectors like those causing bilharzia, river blindness, and malaria. The resettlement process proved challenging and, in many cases, unsuccessful, leading to the loss of traditional farming practices and increased poverty (The Original, 2012). Migration resulting from the dam's impact also

facilitated the spread of HIV, particularly affecting communities within the Volta Basin, such as the districts of Manya Krobo and Yilo Krobo, where HIV prevalence is disproportionately high (GhanaWeb, 2011).

2.12 Dam Engineering and Design

Design criteria and regulations vary significantly between countries, often rooted in historical data and local traditions. The design of a dam for a specific site could vary considerably depending on the regulatory standards applied in different countries. These standards often necessitate a thorough review considering evolving experiences and newly available solutions (Lempérière, 2017).

2.13 Spilling the Akosombo Dam

Until 2023, the most recent instance of flooding in the downstream communities due to controlled spillage occurred in 2010. On September 15th, 2023, the Volta River Authority (VRA) initiated a controlled release of water from both the Akosombo and Kpong dams, located in the Eastern Region of Ghana. This action resulted in flooding in communities along the lower Volta Basin, causing widespread power disruptions. Numerous residents were severely affected, losing their possessions and means of livelihood. The floods led to the destruction of farmlands, homes, and other properties (Van de Giesen et al., 2001).



Figure 6 Akosombo Dam during the spillage (Source: Citinewsroom)

2.14 Immediate Effects of Flooding in Ghana

Floods are recurring events that have a major influence on food security, production of food, and promotion of out-migration. Social networks, non-agricultural career alternatives, and agricultural income levels are important variables that increase the susceptibility of Ghanaian communities that depend on natural resources. Environmental calamities like floods, overall living standards, and nutritional condition all have an impact on the occurrence of diseases in these areas. Agricultural revenue, non-agricultural career options, and social networks are also vital in treating physical and mental health issues within the community (Armah *et al.*, 2010).

Floods have the greatest potential to harm WASH systems and have the biggest impact on a community when compared to other natural hazards and disasters (Paterson *et al.*, 2018). In the wake of the floods, research carried out in Ghana's Northern Region evaluated the vulnerability and coping mechanisms of two villages that depended heavily on agriculture. The floods caused

the already-existing vulnerabilities to rapidly deteriorate. Many of the inundated areas were unreachable following the floods because important infrastructure, such as roads and bridges, had collapsed. Initial evaluations of the Ministry of Food and Agriculture (MoFA) estimated that 70,500 hectares were impacted, which led to an estimated production loss of 144,000 Metric Tonnes of countless amounts of food crops, such as yam, cassava, ground nuts, sorghum, maize, rice and millet. Not all food commodities were readily available at all markets, due to flooded roads and submerged bridges.

After the early harvest in October 2008, an estimated 50,000 individuals in Northern Ghana were predicted to be at danger of malnutrition and food insecurity for at least 15 months (Basabe and Bedir, 2007). Faecal indicator bacteria (thermotolerant coliforms and *E. coli*) increased significantly during the flood season for groundwater sources, according to a longitudinal study conducted in Ghana on the effects of flooding on microbiological contamination of domestic water sources. However, bacterial pathogens (*Shigella* and *Salmonella*) were not detectable in borehole samples during either season (Dzodzomenyo *et al.*, 2022).

2.15 Community Response and Interventions During Previous Flood Events in Ghana.

According to Armah *et al.* (2010), the following were some of the strategies used by the respondents to deal with previous floods: selling livestock, trading and selling in nearby townships, weeding other people's farms in exchange for food, fishing, selling livestock, prematurely harvesting crops, weaving, and basketry, relying on food from previous crop seasons, and relocating to other towns (geographical diversification). To survive, respondents engaged in two or more of these occupations at the same time (income diversification).

Fifteen percent (15%) of the participants strongly agreed that these measures helped them deal with the flooding. Sixty-eight percent of respondents agreed with this statement, while seven

percent disagreed. Ten percent didn't reply to this question. Sixty percent (60%) of those surveyed said that their traditional knowledge and skills helped them deal with the flooding. The abilities include building thatch homes, swimming, canoeing, climbing, weeding, basketry, artisanal fishing, and weaving. But 40% of those surveyed did not possess these abilities (Armah *et al.*, 2010).

2.16 Media Coverage of Flood Events

In the realm of media advocacy, environmental journalism plays a crucial role in mass media activities. An investigation carried out in Bandung, Indonesia, looked at environmental journalism's advocacy work in the mainstream media on flood reporting. The *Pikiran Rakyat Daily* and *Tribun Jabar* newspapers covered flood issues in Bandung Raya based on the initiatives and references from journalists in the field. The journalistic efforts from each media outlet act as a catalyst; if a reporter identifies an important and compelling question, the media is energized to cover the flood issue. Community concerns begin to surface in public spaces. Without the initiative of journalists, the flood problem fades from public attention (Santana, Zulfebriges and Iskandar, 2019).

2.17 Emergency Interventions During Flood Incidences

It has been determined that social capital is essential for adaptation (Soeters and Zoomers, 2017). Nearly all respondents to Ghanaian research on urban floods reported receiving remittances from family members who did not live in the disaster zone. In addition to this form of assistance, the flood victims received relief supplies from several organizations. There were two types of groups that provided aid to flood victims: internal and external. Various United Nations agencies and bilateral development partners were examples of external organizations. There are local, regional, and national divisions within the internal organizations. The National Disaster Management

Organization (NADMO), religious institutions, and community-based organizations are among the local organizations. Money, food, and clothing were found to be the main forms of support for the flood victims.

2.18 Effectiveness of Emergency Responses

According to a Ghanaian survey on the Weija Dam spill, 3.3% of respondents said they relied on NGOs and NADMO for support, while almost 4% said churches were their primary source of support. The primary organization in Ghana in charge of flood-related matters, NADMO, was instrumental in providing mattresses, blankets, and life jackets to flood victims. However, over 70% of respondents said that NADMO's assistance were insufficient and demanded that more be done to help flood victims (Asare and Tuffour, 2023).

2.19 Challenges and Gaps

Significant research is highlighted by the focus on the causes of floods in the Greater Accra Region and possible remedies utilizing exploratory literature studies (Ahadzie and Proverbs, 2011). Nevertheless, there is a gap in the literature and a need for more research because these studies have not adequately addressed the effects of floods on the residents of the Weija municipality. Furthermore, many these studies used thorough literature reviews to get secondary data sources (Mensah and Ahadzie, 2020). Ansah et al. (2020) looked at the broad causes of flooding in the Weija community, but it didn't address flooding that happens due to purposeful dam spills or how people handle them. On the other hand, a study conducted in Sekondi-Takoradi highlighted how crucial it is to comprehend the coping strategies used by Ghanaian flood victims (Addo and Danso, 2017).

CHAPTER 3

3.0 METHODOLOGY

3.1 Introduction

This section outlines the research methods and procedures employed in this study. It details the design, data collection techniques, sampling methods, and analytical approaches used to address the research objectives. The methodology is structured to ensure the reliability and validity of the findings, providing a comprehensive framework for understanding the research process.

3.2 Study Site and Design

This study employed a descriptive phenomenology using a qualitative study design to explore the effects of fluvial flooding on livelihood vulnerability. This study is part of a broader project on the effect of the ADS on livelihood conducted by Ensign Global College and Engage Now Africa. Through key informant interviews and newspaper analysis the qualitative component highlighted issues on the floods following the Akosombo Dam spillage. This approach clearly defined the research objectives and questions that guide the research by selecting the specific aspects of media content of interest and relating to the effects of dam-mediated flooding on livelihood vulnerability. The approach also helped select the themes and messages relevant to the study. Given the nature of the media analysis, this study was conducted remotely online without a specific physical site. Key informants were purposively selected through newspaper reviews and interviews were conducted in their various offices in both districts in the affected areas we visited. The areas included Adidome, New Bakpa, Awadiokome, Kebegodo, and Kebenu all in the Central Tongu District, and some Islands in the Ada East District including Pediatorkope, Azizanya, and the Clam Shed area at Big Ada. These key informants included stakeholders from VRA, NADMO, NCCE, District Disease Control Officers, District Health Promotion Officers, Staff from the two District

Health Directorates, Social Welfare Staff, SHEP coordinators, Assemblymen, Teachers, and Traditional Rulers from affected areas visited.

3.3 Media Data Source

Data sources used included but were not limited to newspapers from various media houses addressing the September Akosombo Dam spillage and its associated floods. As well as subscribing to the channels of both international and national media houses and newspaper websites like BBC, Al-Jazeera, MyJoy online, Graphic online, and CityNews amongst others to receive updates in the form of emails and mobile notifications as and when relevant content was published concerning the Akosombo Dam spillage. Between the period of January to April, a media search was done on various media websites which led to the gathering of over fifty (50) newspapers published on the to the Akosombo Dam Spillage.

3.4 Inclusion Criteria

Newspaper publications from various national and international media houses addressing the 2023 Akosombo Dam spillage were included leveraging the following webpages: MyJoy Online, Graphic Online, GBC Online, Ghanaian Times, Citi newsroom, Ghanaweb, Peace Online, Adom Online, 3News.com, the Custodian, Peoples dispatch, Al Jazeera, BBC, Pulse Ghana, Onua Online among others. The following search terms were used but not limited to “Mepe Floods”, “Akosombo Dam”, “Akosombo Dam Spillage” “VRA” “Ghana Floods”, “NADMO”, “Relief items”, “Mepe”, “Spillage”. Newspapers were reviewed using a guide and selected newspaper items were stored in a Microsoft Excel template (Figure 7).

	C	D	E	F	G
	TITLE	SOURCE	URL	DATE PUBLISHED	Tangible
2	Akosombo dam spillage averted 'catastrophic' consequences – Energy Minister	citnewsroom	http://tinyurl.com/yeyfudne	8th November 2023	"displacing thousands of residents and destroying several prop
4	VRA ends spilling of Akosombo dam	citnewsroom	https://citnewsroom.com/2023/10/vra-ends-spilling	31st October 2023	
5	controlled spillage of water from Akosombo and Kpong Dams	www.vra.com	https://www.vra.com/media/2023/Controlled-Spillag	12th September 2023	
6	ECG urges affected customers to rectify wiring issues	asaesa radio 99.5	http://tinyurl.com/mnyxmaxv	6th February 2024	
7	Floods recede more than 3 feets at Mepe-NADMO	myjoyonline	http://tinyurl.com/4haik6z	26th October 2023	"destroying properties running into millions of ceedis and burying
8	All you need to know about Ghana's Akosombo Dam spillage	Peoples dispatch	http://tinyurl.com/2j2ntr2d	1st November 2023	
9	Life on water in now- flooded Mepe after Akosombo Dam spillage	myjoyonline	http://tinyurl.com/27yw35rs	25th October 2023	submerged by water
10	Akosombo dam spillage	www.unicef.org	https://www.unicef.org/ghana/blog/akosombo-dam-	17th November	
11	Akosombo dam spillage -open letter to the speaker of Parliament	Modern Ghana	http://tinyurl.com/uxvs8z4s	4th November	
12	Flood victims blame government for overflowing dam destruction	www.climate change news	http://tinyurl.com/5b6zj4z3	19th November	
13	Flood in Mepe not under control- Ablakwa reacts	Graphic Online	http://tinyurl.com/5b6zj4z3	23rd October	Homes flattened, crops were wiped out, schooling was put on
14	Mepe grapples with flooding after Akosombo Dam spillage	GBGghanaonline.com	http://tinyurl.com/mskpszur	15th October	
15	Lydia Forson, Naa Ashorkor & others support flood victims at Mepe	GBGghanaonline.com	http://tinyurl.com/bde27he3	23rd October	
16	Volta FA donates 300 bags of sachet water to Mepe residents	GBGghanaonline.com	http://tinyurl.com/3ufx3mkr	19th October	
17	Nobody asked us to evacuate- Mepe Dev't Association Jabs Freda Prempeh	GBGghanaonline.com	http://tinyurl.com/3ufx3mkr	24th October	
18	Ghana Floods:My entire farm is under the water and so is my farm	BBC news	http://tinyurl.com/3ufx3mkr	18th october	
19	Hundreds of residents in Mepe facing severe crisis after Akosombo dam spillage	citnewsroom	http://tinyurl.com/3tmspp22	12th October 2023	
20	JJ Rawlings foundation donates to Mepe flood victims	Modern Ghana	http://tinyurl.com/tr3k3rx	6th November	
21	Akosombo Dam spillage-flood mapping	hotosm.org	https://tasks.hotosm.org/projects/15705		Nov-23
22	VRA offers support to communities affected by ongoing spillage exercise	www.vra.com	http://tinyurl.com/2s426j8v		
23	Presbyterian Church supports Mepe flood victims with relief items	Ghana web	http://tinyurl.com/ym6ijhde	22nd November	
24	Gov't budgets Ghc 220 million to support affected communities	Modern Ghana	http://tinyurl.com/ym6ijhde	15th November	
25	Mepe , Battor and many North Tongu towns in distress	adomonline	http://tinyurl.com/37fsyfu5	11th October	
26	Health crisis emerges in flood- ravaged Mepe	3news.com	http://tinyurl.com/2nhwtxvy	21st October	
27	Watch a tour of Mepe after severe Akosombo, Kpong dams spillage	ghanaweb.com	http://tinyurl.com/4d48a7t4	20th October	
28	Gov't rolls out rescue plan for flood victims in Mepe and other affected areas	thecustodian	http://tinyurl.com/3948a7t4	16th October	
29	17 year old boy chooses mother's safety over school	Ghana web	http://tinyurl.com/54tb8v3b	19th October 2023	
30	Navy rescues 8000 flood victims	peacefmonline.com	http://tinyurl.com/js4736vz	20th October	
31	The US and UNICEF provide \$500,000 in school supplies for impacted communities	gh.usembassy.gov	http://tinyurl.com/4bx5acbv	18th January 2024	

Figure 7 A Picture of Media Data sources in Excel

3.5 Exclusion Criteria

Scientific publications, television, and radio broadcasts on the Akosombo Dam spillage were not included. Newspaper publications that were not related to the spillage and flooding were excluded or did not meet the review criteria were also excluded. Media content published on dam-mediated flooding before the September 2023 spillage was also not selected.

3.6 Study Population

The target population for this study comprised key stakeholders who were identified during our newspaper review and were directly involved in the Akosombo Dam Spillage. These key informants are defined as those who experienced flooding, property damage, or displacement directly attributable to the dam spillage event in their respective roles and offices as well as media content inclusive of all individuals living in Central Tongu and Ada East districts and were affected

by the spillage.

3.7 Key Informant Interview Sampling

The study employed a non-probability purposive sampling technique to select key informants who were identified during newspaper reviews and from word of mouth by other stakeholders who were directly involved in the spillage and its related flood. This technique enabled the selection of key informants who were experienced in their various fields providing an in-depth analysis of the language used, framing techniques, and the overall narrative surrounding floods. Considering this, newspaper items were selected using a written guide based on their relevance to themes to ensure the research was focused and targeted. This technique was chosen to gain a contextual understanding of media coverage within the specific geographic area during that time frame. This helped in capturing the nuances of town differences, cultural contexts, or evolving media narratives during specific flood events.

3.8 Data Collection Instruments

A structured questionnaire, key informant interview guide, and an emergency relief items checklist were developed as the primary data collection instrument with the various stakeholders. The questionnaire was designed to capture comprehensive information on livelihood activities, the extent of flood impact, coping strategies employed by households, and indicators of livelihood vulnerability. The instruments were adapted from validated UNICEF flood assessment tools previously utilized in similar studies investigating the impact of natural disasters on livelihoods. The adaptation process involved a thorough review by subject matter experts, including public health professionals, data analysts, and researchers with expertise in livelihood vulnerability assessment, to ensure the relevance and cultural appropriateness of the instrument for the study context.

3.9 Data Collection Procedure

A team of well-trained research assistants, fluent in English and the local languages (Ewe and Damgbe), were responsible for data collection. Face-to-face interviews were conducted with designated key informants. The interviews were primarily conducted in English, Ewe, and Damgbe to facilitate comprehension and enhance the quality of responses. Responses were recorded directly onto the questionnaire by the research assistants during the interview process. A few recorded interviews were also transcribed and reread for analysis.

A Comprehensive media search was done using search terms such as flood, Akosombo Dam spillage, fluvial flooding, Mepe floods, Effects of Dam spillage, and Emergency relief Items received by victims while taking notice of the dates those searches were done to retrieve relevant media publications.

3.10 Pretesting

To find out the appropriateness of the interview guide to ensure that the necessary corrections and modifications are made to the questions, a few interviews were held on the first day among similar key informants in the Central Tongu district. Certain key concerns and inaccuracies were identified concerning the content, clarity, structure, and general commands associated with the Kobo Collect APP. These hitches were modified and corrected for further interviews.

3.11 Data Handling

This information was retrieved from the websites of media houses and was categorized and saved in MS Excel with four columns including the title of the content, the source, the date it was published, and the URL. This data was then stored on a password-secured computer. The primary data was exported from the Kobo Collect app and exported into STATA (*StataCorp.2007 Stata Statistical Software. Release 18*. StataCorp LP, College Station,TX,USA) for analysis. Recorded

Interviews were also transcribed and uploaded on a password-secured ATLAS.ti

3.12 Data Analysis

To analyze the media content, thematic analysis was adopted. The newspaper contents, reports from the VRA and other recorded key informant interviews were uploaded on ATLAS.ti. The content was read and re-read to improve familiarity (Riger & Sigurvinsdottir, 2016). Afterwards, codes were generated, and various themes were created considering the study objectives. Key informants' interviews were transcribed and uploaded on ATLAS.ti. Questionnaires were extracted from Kobo Collect in an Excel template and imported to Stata version 18. Floods encompass consequences with multiple types of damage such as mortalities, environmental losses, and economic losses. A table was used to represent the different types of consequences, and the damages were divided into tangible and intangible damages, depending on whether the losses can be assessed in monetary value. Another classification was made between direct damage caused by physical contact with floodwaters, and indirect damage that occurred outside the flooded area (Jonkman and Vrijling, 2008). The effects were also classified into immediate and long-term. This process involved grouping data into themes and sub-themes and regularly cross-referenced to ensure accuracy and reliability (Sundler *et al.*, 2019).

3.13 Outcome

This study generated empirical evidence on the effects of the 2023 Akosombo dam spillage on livelihood vulnerability among affected households in Central Tongu and Ada East districts. These findings will contribute to a better understanding of the specific factors that exacerbate or mitigate livelihood vulnerability in the context of fluvial flooding events and provide insights into the coping strategies employed by households and their effectiveness in reducing vulnerability. The results of this study may inform the development of targeted interventions aimed at enhancing the

resilience of flood-affected communities and mitigating the detrimental effects of future flood-related disasters on livelihoods. Additionally, the findings may contribute to the formulation of evidence-based policies and disaster preparedness strategies at the local and national levels.

3.14 Ethical Considerations

Ethical consideration was obtained from the Institutional Review Board of Ensign Global College with ethics approval ID *ENSIGN/IRB/EL/SN-265/02*.

3.15 Confidentiality and Data Security

Stringent measures were implemented to safeguard the privacy and confidentiality of study participants. All questionnaires were anonymized, with no personally identifiable information collected. The completed questionnaires were securely stored electronically on Kobo Collect. Data was maintained on encrypted and password-protected devices accessible only to authorized members of the research team.

3.16 Informed Consent

Written informed consent was obtained from each study stakeholder prior to data collection. The informed consent process involved a detailed explanation of the study objectives, procedures, potential risks and benefits, and the voluntary nature of participation. Stakeholders were assured of their right to withdraw from the study at any point without consequence, and their decision was respected without prejudice.

3.17 Risks and Benefits

The risks associated with participation in this study are minimal, as it primarily involves responding to survey questions. However, some questions may elicit emotional responses or discomfort when recounting experiences related to the flooding event. In such cases, participants were offered the opportunity to pause or discontinue the interview if needed. The potential benefits

of this study include contributing to the understanding of livelihood vulnerability in the context of dam-mediated flooding.

3.18 Limitations of Study

Despite the potential drawbacks of this methodology, the study chose to thoroughly examine the consequences of river flooding using a qualitative approach and purposive sampling. The inclusion of persons with valuable ideas and interaction with flood victims in their everyday activities even though it introduced selection bias by targeting participants based on specified criteria.

The results of the study were based on the available data gathered from newspapers and key informants and not from the individual victims of the flood. This may result in misinformation and inaccuracies. Additionally, only two out of the eight affected districts were included in this study, limiting the generalizability of the results.

3.19 Assumptions

It is assumed that key informants would be able to identify and communicate the effects of the flood considering the infrastructure damaged and the properties destroyed due to their direct engagement with flood victims. It was further expected that there would be some challenges in the distribution of relief items

CHAPTER 4

4.0 RESULTS

4.1 Introduction

This results section provides themes in response to the study objectives. The section is divided into five sub-sections and comprises results from key informant interviews and information from published newspapers. Sixteen (16) main themes were developed after coding which were further sub-classified into four broad themes. The second section presents a major theme (Experiences at the time of the flood), the third (Livelihood Vulnerability), the fourth (Effects of the flooding), and the final section presents information on (Emergency interventions). Table 1 presents the socio-demographic features of key informants.

Table 1 Socio-demographic characteristics of key informants

Variable	Overall		Ada East District		Central Tongu District	
	Frequency (N=33)	Percentage (%)	Frequency (N=12)	Percentage (%)	Frequency (N=21)	Percentage (%)
Type of Key Informants						
NADMO	6	18.18	5	41.67	1	4.76
Ghana Health Service	5	15.15	0	0.00	5	23.81
SHEP Coordinator	1	3.03	0	0.00	1	4.76
Teachers/Headmaster of the School	11	33.33	3	25.00	8	38.10
Social Welfare/Gender Desk Officer	2	6.06	0	0.00	2	9.52
Traditional Leaders (Chiefs, Queen mother)	1	3.03	1	8.33	0	0.00

NCCE	2	6.06	1	8.33	1	4.76
Assemblyman	2	6.06	1	8.33	1	4.76
Others	3	9.09	1	8.33	2	9.52
Gender of Key Informant						
Female	10	30.30	4	33.33	6	28.57
Male	23	69.70	8	66.67	15	71.43
Age Category						
Under 30	3	9.09	1	8.33	2	9.52
30-39	14	42.42	4	33.33	10	47.62
40-49	10	30.30	4	33.33	6	28.57
50 and above	6	18.18	3	25.00	3	14.29

The study comprised of 33 participants from two districts in Ghana: Ada East District (36.36%) and Central Tongu District (63.64%). The key informants represented a diverse range of professional backgrounds crucial to community development and disaster management. The largest group comprised Teachers and Headmasters of Schools, accounting for 33.33% (n=11) of the total sample. This group was more heavily represented in the Central Tongu District (38.10%, n=8) compared to the Ada East District (25.00%, n=3).

The National Disaster Management Organisation (NADMO) representatives formed the second largest group, constituting 18.18% (n=6) of the total sample. Interestingly, there was a marked difference in NADMO representation between the two districts, with Ada East District having a significantly higher proportion (41.67%, n=5) compared to Central Tongu District (4.76%, n=1). Ghana Health Service personnel made up 15.15% (n=5) of the total sample, all of whom were from the Central Tongu District (23.81%, n=5). The Ada East District had no representation from this sector. Other professional categories included Social Welfare/Gender Desk Officers (6.06%,

n=2), National Commission for Civic Education (NCCE) representatives (6.06%, n=2), and Assemblymen (6.06%, n=2). These roles were relatively evenly distributed between the two districts.

The sample also included one School Health Education Programme (SHEP) Coordinator (3.03%) and one Traditional Leader (3.03%), representing the Central Tongu District and Ada East District, respectively. A small proportion of respondents (9.09%, n=3) were categorized as "Others," indicating roles not specifically listed in the main categories. The gender distribution of the key informants showed a predominance of males. Overall, 69.70% (n=23) of the respondents were male, while 30.30% (n=10) were female. This gender imbalance was consistent across both districts, with the Ada East District having 66.67% (n=8) male respondents and the Central Tongu District having 71.43% (n=15) male respondents.

The age distribution of the key informants revealed that the majority fell within the 30-49 age range. The largest age group was 30-39 years, accounting for 42.42% (n=14) of the total sample. This was followed by the 40-49 age group, which comprised 30.30% (n=10) of the respondents. The Central Tongu District had a higher proportion of respondents in the 30-39 age group (47.62%, n=10) compared to the Ada East District (33.33%, n=4). Conversely, the Ada East District had a higher proportion of respondents aged 50 and above (25.00%, n=3) compared to the Central Tongu District (14.29%, n=3). The youngest age category, under 30, was the least represented, accounting for only 9.09% (n=3) of the total sample, with similar proportions in both districts. Table 2 presents newspaper stories in four columns including the Media Outlet, Short title of the paper, the URL, the date it was published, and the study ID.

Table 2 *Descriptions of media stories used in the study*

NEWS OUTLET	SHORT TITLE	DATE PUBLISHED	STUDY ID
BBC News	Ghana Floods: My entire farm is under the water and so is my farm	18th October 2023	File 1
Graphic Online	Flood in Mepe not under control- Ablakwa reacts	23 rd October 2023	File 2
Climate Change News	Flood victims blame government for overflowing dam destruction	19 th November 2023	File 3
GBC News	Mepe grapples with flooding after Akosombo Dam spillage	15 th October 2023	File 4
VRA Website	VRA offers support to communities affected by ongoing spillage exercise	October 2023	File 5
3News	Health crisis emerges in flood- ravaged Mepe	21st October 2023	File 6
Citi News	Hundreds of residents in Mepe facing severe crisis after Akosombo dam spillage	12th October 2023	File 7
Ghana US embassy website	The US and UNICEF provide \$500,000 in school supplies for impacted communities	18th January 2024	File 8

Ghana Web	17-year-old boy chooses mother's safety over school	19th October 2023	File 9
The Custodian	Gov't rolls out rescue plan for flood victims in Mepe and other affected areas	16 th October 2023	File 10
Pulse Ghana	Here are 5 challenges facing communities following Akosombo dam spillage	23rd October 2023	File 11
Citi News	Health officers warn of possible outbreak of waterborne diseases	16th October 2023	File 12
My Liberty News	Some victims of the Akosombo dam spillage still inhabit in classrooms at mepe	24 th December 2023	File 13
Ghanaian Times	Akosombo dam spillage victims cautioned against use of polluted water	18th October 2023	File 14
Soiree News	Flood victims in Mepe, Battor, Aveyime and others dying of hunger	14th October 2023	File 15
All Africa Report	Schools conduct studies under trees as classrooms turn into holding places	25 th October 2023	File 16
Onua Online	VRA tasks zoomlion to fumigate Mepe as flood waters recede	30 th October 2023	File 17
MUG Website	Methodist University donates relief items to flood victims	14th November 2024	File 18
IG News	Deputy NADMO Director says Mepe Situation Still unfolding	19th October 2023	File 19

Peace FM Online	Navy rescues 8000 flood victims	20th October 2023	File 20
GBC News	Lydia Forson, Naa Ashorkor & others support flood victims at Mepe	23rd October 2023	File 21
Peoples Dispatch	All you need to know about Ghana's Akosombo Dam spillage	1st November 2023	File 22
MyJoy Online	Floods recede more than 3 feet at Mepe-NADMO	26th October 2023	File 23
Asaase Radio	ECG urges affected customers to rectify wiring issues	6th February 2024	File 24
Citi News	Akosombo dam spillage averted 'catastrophic' consequences – Energy Minister	8th November 2023	File 25
Modern Ghana	JJ Rawlings foundation donates to Mepe flood victims	6th November 2023	File 26
GBC News	Nobody asked us to evacuate- Mepe Dev't Association Jabs Freda Prempeh	24th October 2023	File 27
Adom Online	Mepe , Battor and many North Tongu towns in distress	11th October 2023	File 28
GBC News	Volta FA donates 300 bags of sachet water to Mepe residents	19th October 2023	File 29
The Herald	Citi FM/Citi TV hands over Resettlement centres	7th February 2024	File 30

Ghana News Agency	Eight Months after Akosombo Dam Spillage	19 th May 2024	File 31
MyJoy Online	Families affected by Akosombo dam spillage begin anew in Aveyime-Battor	10 th December 2023	File 32
Prevention Web	Akosombo dam disaster reveals a history of negligence that continues to this day	21 st November 2023	File 33
Onua Online	Married couples at Agbotikpo cry out	28 th December 2023	File 34
GIP website	Planners, Architects, Engineers suggest raised structures for Mepe and its environs	28 th October 2023	File 35
Ghanaian Times	Ex-President Mahama pushes for bipartisan parliamentary enquiry into Akosombo Dam spillage	12 th February 2024	File 36
MyJoy Online	ECG restores power to majority of communities affected by Akosombo Dam spillage	14 th October 2023	File 37
GBC News	President Akufo-Addo promises relief, tours displaced Communities after Akosombo Dam Spillage	16 th October 2023	File 38

Onua Online	Education in limbo as some Akosombo flood victims still occupy classrooms	16 th June 2024	File 39
VRA website	Mepe Traditional Council welcomes the Executive of VRA to confer on Managing Spillage Flood	January 2024	File 40
The Africa Report	Ghana: Akufo-Addo gaffe as Akosombo dam spill displaces thousands	18 th October 2023	File 41
UNICEF Website	Ghana is currently facing a mini crisis	17 th November 2023	File 42
3News	Replacement of Voter ID cards for flood victims	16 th May 2024	File 43
Ghana News Agency	Some flood victims still inhabit classrooms	24 th December 2023	File 44
VRA Website	VRA Sustainability Report	February 2024	File 45
3News	Akosombo Dam Spillage: Health crisis emerges	21 st October 2023	File 46

4.3 Descriptions of the Experiences at the Time of the Flood

4.3.1 How Each Community Experienced the Flood

4.3.1.1 Central Tongu District

In Central Tongu District, two communities (Bakpa Awadiokome and Kebegodo) and one school (Kebenu Junior High School) were purposively selected.

In Bakpa Awadiokome, respondents described their whole community was flooded including farmlands, livestock, and properties that everyone had to evacuate. Some respondents mentioned how they had to leave the Island at dawn with no hope of how to carry their belongings as shared in the quotes below:

“.....the floods came at dawn while we were sleeping, you know initially, we told them to leave but they were waiting to see if the waters would recede but that never happened. When I stepped out of my room, I could only see water and at that point, every other house around mine was also flooded.”

[KI, Social welfare, Central Tongu]



Figure 8 A picture from the flood scene (Source: GBC News)

On the other hand, residents of Kebegodo described their situation as worse. The whole village was surrounded by water, leaving their houses in the middle, which made it very difficult to leave their homes.

“.....we were surrounded by the water and were left miserable in the middle. No one could visit the farm or even the river to fetch water”

[Family head, Kebegodo]

In Kebenu, the school was flooded completely and therefore students had to go on a break. Students who were from Kebegodo also had to halt their studies as the roads leading to Kebenu were not accessible.

4.3.1.2 Ada East District

Pediatorkope is a big Island comprising several other smaller islands. Some homes and farmlands were flooded. While most of the victims fled to higher ground, some also stayed and hoped for the best. Many properties were destroyed including houses, belongings as well as food crops.

“.....my house is the one just here. The water entered our room, so I woke my children up to start packing. We were only able to gather a few items that we needed the most, the rest were destroyed after we came back”

[Queen mother of Oyster Miners, Pediatorkope]

In Azizanya, an Island close to Pediatorkope, the whole town was flooded and everyone had to evacuate to Big Ada to seek shelter. Mud houses, farmlands, and Oyster mining tools were all swept off by the floods.



Figure 9 Damaged mud house of a victim (Source: Field Visit)

The clam shed area where most people gather to cross the river to the other Islands was flooded. Most houses close to the shore lost their belongings as well as traders who sold various food items along the shore complained about their working materials and tools.

“.....my frying pan and other utensils that I use to fry oysters were carried away at dawn when the flood became severe. Now I don’t have a table to sell my oysters.”

[Trader, Clam Shed Area]

“.....I sell watermelon over here, so I cover my fruits every day with a trampoline when I close and surround them with heavy stones. The floods took all the stones away together with my watermelons. What hurt me the most is that I had just bought the watermelons and was going to sell them the next day”

[Trader, Clam Shed Area]

4.3.2 Reactions to the Flood

Amid the flood, the victims' responses reveal a deep and multifaceted encounter with fear. The overwhelming power of the flood triggered a cascade of emotional and physical reactions, marked by the raw and instinctive nature of their responses. Fear, panic and hopelessness manifested in various forms:

“Jane Doe was at her family cassava farm in south-east Ghana when overflowing water from the nearby Akosombo hydro-electric dam unexpectedly came rushing onto her land. In a panic, she ran home to gather her children and the few belongings they could salvage and fled to higher ground”

[Maxine Batteridge- Moes, Climate Home News]

Jane Doe paces anxiously on a dry patch of land overlooking her collapsed and completely submerged three-bedroom home in the Volta Region.

[Maxine Batteridge-Moes, Climate Home News]

Table 3 General classification of the effects of floods in Central Tongu and Ada East districts

	Tangible	Intangible
Direct	<ul style="list-style-type: none"> • Houses • Schools • Health facilities • Markets • Cemeteries • Refuse dumps • Mortuaries • Bridges • Roads, • Electricity supply system • Water supply system • Contamination of water bodies • Destruction of habitats • Telecommunication • Internet • Food crops • Farmlands • Livestock • Fishing tools • Fish cages • Skin infections • Cholera • Malaria • Malnutrition • High blood pressure 	<ul style="list-style-type: none"> • Disruption of public services • Loss to Government • Local Economic Shock
Indirect	<ul style="list-style-type: none"> • Loss of income • Unemployment • Increased cost of living • Interruption of electricity • Water supply • Telecommunication services • Skin infections • Cholera • Malaria • Malnutrition • High blood pressure 	<ul style="list-style-type: none"> • Fear • Panic • Shock • Hopelessness • Disruption of daily life • Community displacement • Breakdown of social networks • School closures • Loss of educational facilities • Interruption of learning

Table 3 presents damages and effects of the flooding by categorizing them into tangible and intangible, as well as direct and indirect. Tangible vs. Intangible Damages distinguishes whether the damage can be quantified in monetary terms. Tangible damages refer to physical, quantifiable losses, while intangible damages include psychological and social impacts.

Direct vs. Indirect Damages: Direct damages are those that resulted directly from contact with floodwaters, affecting areas and items physically touched by the flood. Indirect damages occurred because of the flood but were not caused by direct contact with water, such as economic impacts and psychological effects.

4.3.4 Properties Destroyed

Many victims reported the destruction of their homes, leaving them with nowhere to return. Houses built over the years were submerged or swept away by floodwaters. Some victims have been forced to live in overcrowded temporary shelters, where conditions are cramped, uncomfortable, and far from their previous living standards. Preliminary assessments by Soiree news outlet suggested that floods affected 75,500 hectares of farmlands, resulting in an estimated loss of 148,000 tonnes of crops, including maize, sorghum, pepper, okro, millet, peanuts, yam, cassava and rice. As beads of tears roll down her face flood victim tells BBC News.

"My entire farm is under the water and so is my house. I was only able to take my clothes. It took me about 14 years to build this house - there is nowhere to go, there is no other land to build on,"

[Resident to Thomas Naali, BBC News]

"This is the first time we are experiencing this here. The water has taken over my house and I couldn't take all my belongings,"

[Flood Victim to The Africa Report]

The floods destroyed farmlands and food crops, which were the primary sources of livelihood for many victims. This not only caused immediate food shortages but also long-term economic hardships.

Farms, houses, and even cemeteries are now submerged in floodwaters. The inundation has disrupted essential services, leading to water and electricity supply cutoffs. As a result, residents find themselves grappling with the multifaceted impact of this flooding.

[Elorm Aryee, GBC]

“I have been affected just yesterday. My whole house has been flooded. Yes, I feel a bit okay now. I have moved to the neighbouring community, Battor. This is my first time.”

[Flood victim to Fred Duhoe, Citi News]

Victims had little to no time to save personal belongings, losing almost everything they owned. The loss of clothes, furniture, and other personal items has left them in a state of deep distress. Another resident *“I was only able to take my clothes; everything else is gone. The water has destroyed my house. It started bit by bit, but it later came with speed. We were not able to get everything out before the water flooded the place.”*

[Flood victim to Fred Duhoe, Citi News]

“Over 400 vegetable farms and were destroyed, about 10 villages got their fish cages destroyed, and some were carried away this has increased economic crises in the communities”

[Assemblyman, Ada East]

A group of Built Environment Practitioners team brought attention to the plight of a fish farmer

who had graduated with a degree in natural resource management from Kwame Nkrumah University of Science and Technology (KNUST). This individual suffered a devastating loss, with over 1,700 fish perishing along with the destruction of his fishpond

(GIP Website, 2023).

4.4 Livelihood Vulnerability

This section discusses the issues related to the impact of the flood on various social amenities, natural resources and personal properties, which have, in turn, reduced the quality of life for the flood victims and increased their vulnerability.

4.4.1 Livelihood

Before the spillage, most men in the Central Tongu and Ada East districts made their living as fishermen, farmers, livestock traders, and oyster miners. However, due to the flood, many of these men have been forced to turn to petty businesses, while others are now jobless or reliant on remittances to survive.

“the oysters in the water have become a problem it wasn’t safe at all for them to dive into them I mean the waters when it comes to fish farming I even have a video I can show to you that over ten different fish farms here in the district were destroyed as a result of the spillage all their fishes were carried away all their cages were destroyed and so it became a problem for them”

[NADMO, Ada East]

On the other hand, many women were involved in petty trading, particularly in the fish and oyster business, while others worked as vegetable farmers. However, with the destruction of farms and the decline in oyster mining, these women are now left without jobs.

“Yes, the women some of them are fishmongers some fry fish this is what they were doing, and

they depend on the men when the men go fishing, they also buy the fish. Some fry it and sell it some also smoke it and sell it so the moment the fishing activities cease then it means that the business of the women has also ceased same applies to the oyster miners”

[NADMO, Ada East]

“The local economy had also taken a significant hit with farming and trading activities at a standstill.”

[Kekeli K. Blamey, Ghana News Agency]

“Currently, more than 500 households are grappling with the inundation as residents desperately attempt to salvage their belongings. The floods have already claimed properties valued at thousands of Ghana Cedis, including numerous buildings”

[MyJoy Online]

“I have three children and I’m the only one who takes care of them”, the victim told Climate Home outside the school shelter. “One of them is Delali who I was helping prepare to go to university. All those preparations were taken away.”

[Flood Victim to Maxine Betteridge-Moes, Climate Home News]

"The bike I use for my okada [motorcycle taxi] business is in the room that collapsed, so it has affected me. No food to eat. My farm has been washed away by the floods. As I'm talking to you, these clothes I have on me now are the only ones I have."

[Flood Victim to Thomas Naali, BBC News]

4.4.2 Water, Sanitation and Hygiene

When key informants were asked about their water systems, most reported that before the flood, victims relied on pipe water systems, wells, rivers, rainwater, and boreholes for their water supply. Despite the contamination, some community members continue to use the river water. During the flood, approximately 41.7% of key informants noted that their community members turned to sachet water in the Ada East District, while 70.6% of victims in the Central Tongu district continued to use river water. Additionally, community members in the Central Tongu and Ada East districts store water in barrels, clay pots, and jerrycans.

It was also reported that the river water became discoloured, tasted salty, smelled foul, and contained particles. Many people reacted after using it since most pump machines were destroyed by the flood and the water available was not treated.

“Water changed to a yellow colour with so much odour and people had itchy skins after bathing with it”

[NADMO, Central Tongu]

“Pump stations were not able to treat the water since debris damaged most of their machines. For more than a month, the water wasn’t treated to be supplied so there was a total cut-off.”

[NCCE, Ada East]

The number of latrines in both districts was just a few with no separate latrines for males and females. Most households had no latrines and flood victims used communal latrines which are not so safe.

“Most Islands didn’t even have latrines because of the tidal waves that always affect them. The floods just made it worse”

[Assemblyman, Central Tongu]

4.4.3 Infrastructure and Community Resources Destroyed

Most newspapers highlighted the widespread destruction of schools, roads, bridges, and electricity and water supply systems. Additionally, there were reports of difficulties in accessing various health facilities and markets. Meanwhile, key informants provided detailed information, as shown in the table below, about the extent of damage to different types of infrastructure. They also identified which infrastructures are of high priority for repair or rehabilitation in both districts.

Table 4 Infrastructure and community resources destroyed

Items Damaged	Not Damaged	Partially Damaged	Completely Damaged	High Repair Priority
Road /Streets			✓	✓
Schools		✓		
Bridges			✓	
Water Supply Networks			✓	✓
Electricity Networks		✓		
Telecommunication and Internet Coverage		✓		
Markets		✓		

Table 4 shows the responses from key informants on the state of various infrastructures in both the Central Tongu and Ada East Districts and their levels of destruction during the 2023 ADS.

According to key informants, most roads and streets, as well as bridges and water supply networks, were completely damaged. In contrast, schools, health facilities, markets, electricity, and telecommunication networks suffered partial damage. Among these amenities, respondents identified roads and water supply networks as the highest priorities for repair and maintenance.



Figure 10 A Picture depicting a flooded area with phone booths

“The Akosombo Dam water spillage occurred from 15 September 2023 to October of the same year, leading to the temporary suspension of power supply to affected areas for safety reasons. While power supply has been gradually restored, some premises remain disconnected until necessary repairs are completed.”

[Joseph Appiah-Dolphyne, Asaase Radio]

“The floods have affected access to communities as roads have been cut off, leaving commuters stranded, with others resorting to the use of boats and canoes which further endanger their lives”

[Fred Duhoe, Citi News]

“Also, one of the biggest mortuaries in Sogakope was taken over by the floods, forcing workers to move all the dead bodies to another location.”

[Evans Annang, Pulse Ghana]

Some flood victims shared their grievances with various media houses as reported below:

“We used to access water from the main river but due to the spillage we can no longer access the water from that side, and we’ve been disconnected from using the electricity we have in our town which is a source of pumping the pipe that we get drinking water from. So, as it stands, we have no drinking water in town.”

[Flood victim to Fred Duhoe, Citi News]

“Since last night, I haven’t taken water. Even the water that we use to cook; those that are on the hill, the water that they will use to prepare food for others they are not able to do that.”

[Flood victim to Fred Duhoe, Citi News]

“Most Health centres in the Islands were closed because were severely affected. We had to create mobile clinics”

[DHD, Central Tongu]

In addition to the other damages and inconveniences, some victims expressed their concerns about the rising transportation costs and high food prices in the market, as highlighted in the quotes below:

“Prices of food items have gone high, a bucket of dough that we used to purchase at Gh¢30 (USD \$1.92) is now Gh¢50 (USD \$3.20) and it comes in a reduced quantity”

[Family Secretary, Kebegodo]

“We don’t have a hospital here at Kebegodo. After the flood, the roads became very bad, so we now pay Gh¢40 (USD \$2.56) to motor riders before attending the clinic at Dove or Adidome”

[Chief, Kebegodo]

“The downstream communities have been experiencing varied forms of ecological, economic, health, and social crises since the construction of the Akosombo and Kpong Dams. We feel that this is too much a price to pay for our sacrifice to power the nation”

[Teacher, Ada East]

4.4.4 Protection and Gender Issues

Regarding gender-specific issues and protection, most respondents noted that family separations had significantly affected children and girls. Concerns were also raised about sexual violence, domestic violence, and exploitation, particularly at safe havens in the Central Tongu District; however, these were mostly unconfirmed reports. Instances of child labour were allegedly recorded in the Central Tongu District, with Adidome identified as a key area. Some form of psychosocial support was provided to flood victims who lost their properties, delivered by mental health officers in the Central Tongu District.

“We were told that some of the men were taking advantage of the adolescent girls at the Safe Havens”

[GDO, Central Tongu]

“Yes, child labour issues are here, but you know Adidome here is the source, so they take the children somewhere else to work.”

[GDO, Central Tongu]

“We can’t sleep with our partners because we share classrooms with children and the aged who are not family members. And this is hugely affecting our matrimonial homes as our partners keep fighting us for not sleeping with them,”

[Victims to Maxwell Otoo, Onua News]

“Nuclear family system seems to have been broken as parents have no affability to train and raise their children the way they want”

[Maxwell Otoo, Onua News]

4.5 Effects of flood on residents in Central Tongu and Ada East Districts

This section provides both news reports and field information detailing the effects of the ADS on residents in both districts. It covers themes such as health impacts, educational prospects, the number of people displaced, the condition of shelters, and the overall effects of the flood on the victims.

4.5.1 Health effects

From the various newspapers, reports of fungal skin infections and diarrhea were emerging, particularly among children. While emergency shelters played a crucial role in providing refuge, they also became potential hotspots for disease spread due to overcrowding. Frontline Health professionals were concerned about the rapid transmission of respiratory tract infections. Additionally, respondents noted an increase in water-borne diseases, with some health centres and CHPS compounds in the affected areas reporting cases of schistosomiasis among adults and diarrhea among children.

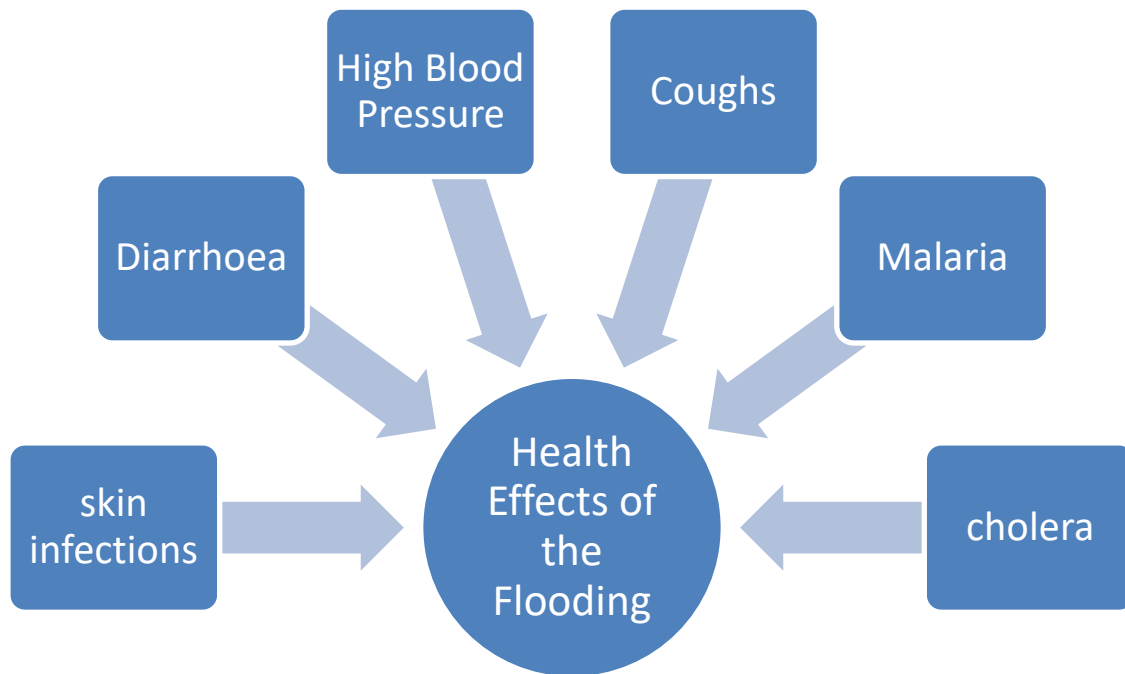


Figure 11 Health effects of the flooding

Key informants also observed that malaria, skin infections, and coughs were common in the affected communities. In the Central Tongu District, cases of malnutrition were recorded during the flood in Kebegodo and Davime, despite consistent growth monitoring efforts and the flooding of toilets, cemeteries, and rubbish dumps has led to a surge in typhoid and cholera cases.

Jane Doe, a displaced resident and mother of three, shares her concerns to 3News:

“All my kids have fallen ill since we got here. They’ve had some skin infections, and one of them even complained that his genital area itches.”

[Victim to Emmanuel Samani,3News]

“The commonest things we have found during the health screening are skin eruptions. We’ve had children come in with fungal infections on their heads and skin. Residents have reported cases of

scabies. Elderly individuals are reporting high blood pressure, with some claiming they've never been diagnosed with this before."

[Community Health Volunteer]

Jane Doe, another displaced resident, laments her discomfort, *"My body has been itching since we got here, and I also have some body pains, so I have come to collect medicine from the doctors."*

[Victim to Emmanuel Samani, 3News]

4.5.2 Effects on Education

The 2023 ADS had a severe impact on education, with many schools flooded and others repurposed as temporary shelters for displaced residents. In the Central Tongu District, community volunteers conducted teaching and learning under trees, as most teachers were unavailable. In contrast, in the Ada East District, respondents reported that schools remained in session in many communities by transferring students to other schools that were not as severely affected by the flood. Pupils were grouped into two classes, lower and upper primary, and taught by volunteers. Unfortunately, junior high school students were left without classes, as no arrangements were made for them. The General Secretary of GNAT informed journalists that over 300 teachers had been displaced, 3,000 students were forced out of classrooms, and 70 schools had been closed due to the floods.

The Comboni Technical Vocational Institute was also among the places affected by the floods, which led to the school being closed as a result.

Yes, i have school to go to but because of this, I can't leave my mum there and go to school. Maybe

one night, we can sleep and that place will be flooded too and nobody will be there to take my mum and that's why we carry this canoe on our shoulder to the water”

[Student Victim to Mawuli Ahorlumegah, GhanaWeb]

“There must be an immediate intervention by the government to get the education of these children going as we wait for the situation to normalize and teaching and learning restored. We must be intentional about this. The teachers must be engaged,”

[GNAT Secretary, Ghanaian Times]



Figure 12 A picture of a schoolgirl learning under a tree

“One of our major problems is our language. A lot of people do not speak the Ewe. Most of the teachers they bring speak Twi but the children too do not understand the Twi. This has worsened the situation of the children. So if we get teachers who can speak both the Twi and Ewe, it will help”

[Teacher, Central Tongu]

“The spillage has also had a profound impact on education in the region. Schools have been forced

to close, leaving pupils and students without access to education. The interruption in learning could have long-term consequences for the affected children, depriving them of their right to education and hindering their future prospects.”

[Stanley Kwabla Arku, Peoples Dispatch]

4.5.3 State of Shelter of Affected Residents

The flood destroyed numerous houses in both districts, as reported by newspapers and key informants. Many families sought shelter in local schools, uncertain about when or how they would be able to return to their land and rebuild. Entire homes were flattened, crops were devastated, and schooling was put on hold. Climate Home News reports that a flood-hit resident sheltering in a cramped classroom with 15 members of her family is left to fend for themselves.

“We’ve moved to the Clam Shed area because our mud house was destroyed by the water. I am now perching at my friend’s house together with my two children. Her Husband has left the house because of that”

[Trader, Clam Shed Area]

4.5.4 Number Displaced

The dam-mediated flooding led to the displacement of thousands of people across both districts. Over 300 individuals from 60 families affected by the spillage of the Akosombo and Kpong dams have resettled in Aveyime-Battor in the Volta region. According to the National Disaster Management Organization (NADMO), more than 26,000 people have been displaced by the floods. Several facilities were converted into emergency shelters to accommodate the families displaced downstream. Onua News reported that the Akosombo dam spillage in October displaced

an estimated 35,857 people in the Volta and other adjoining regions.

“At least 26,000 people have been displaced and currently taking shelter at different safe havens and other designated areas”

[Claude Nyarko Adams, Ghanaian Times]

4.6 Emergency Interventions at the Time of the Flood

This section presents details on the various interventions and emergency relief items received from various bilateral organizations, churches, institutions, individuals, and social groups as reported in the newspapers and further includes information on delays in receiving humanitarian support from the government, NADMO, and VRA. It also presents responses from an emergency relief checklist for key informants which aimed to assess whether relief items were received as reported in the newspapers by the various media houses.

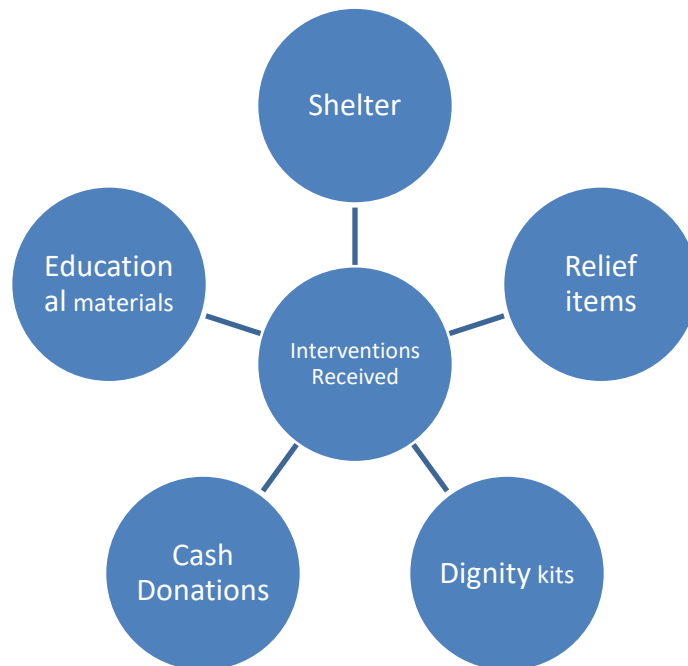


Figure 13 A framework depicting the interventions received

4.6.1 Interventions Received

The Volta River Authority (VRA), in collaboration with the National Disaster Management Organization (NADMO), presented relief items. The items included mattresses, blankets, clothes, toiletries, and various food items. Also, the Lands Commission donated GHc 500,000 along with a collection of clothes through Citi FM. UNICEF was part of the six UN Agencies that visited a relocated community, Agbeketikpo, which was affected by the Akosombo Dam spillage. UNICEF intervened with educational materials, health & nutrition items, and hygiene kits to North and Central Tongu districts to support the rising needs of those impacted by the flood.

“It is now difficult for my parents to get me learning materials due to the flooding, but these educational materials will help us to read and write. I want to learn to become a nurse,”

[Student, Central Tongu]



Figure 14 VRA Staff donating mobile toilets to flood victims (Source: VRA website, 2023)

The United States Government, through the United States Agency for International Development (USAID), partnered with UNICEF and the Ministry of Education to donate \$500,000 worth of school supplies to children in communities affected by the Akosombo Dam spillage floods. Through the Akosombo Safe Activity, USAID and UNICEF provided tents to serve as temporary school structures and essential school supplies such as recreational kits, and “schools-in-a-box,” which contain stationery and material for teaching and learning. Some Ghanaian celebrities rallied to provide relief and support to flood victims with food items, mattresses, and toiletries.

4.6.2 Emergency Relief Items Checklist

Table 5 Emergency Relief Items

Items Received	Yes	No	Don't Know
Rice	✓		
Maize	✓		
Beans	✓		
Gari	✓		
Cassava			✓
Provisions		✓	
Sachet Water	✓		
Flour			✓
Cooking Utensils		✓	
Fruits & Vegetables		✓	
Cooking oil	✓		
Animal Protein		✓	
Tent	✓		
Mattress/Pillow	✓		
Blanket/Cover Cloth		✓	
Clothes	✓		
Stationary	✓		
School Uniforms/bags			✓
Footwear	✓		

Medicine	✓		
Toiletries	✓		
Chlorine	✓		
Mosquito Nets	✓		
Sanitary pads	✓		
Life Jackets	✓		
Wellington Boots		✓	
Dustbins			✓
Money		✓	

Table 5 contains responses from participants when they were asked to check the various items they received. Food items including rice, gari, beans, and cooking oil were received from various donors. Sachet water was another commodity received in large quantities in both districts. However, respondents elaborated those items like, utensils, fruits and vegetables, animal-source protein, and Wellington boots were not received in some areas whereas some respondents had no idea whether listed items were received or not as they were not in charge.

“as for the items we received most of them, but they lacked cooking utensils, meat, and vegetables. I mean how will they cook the rice if they have no cooking pots”

[Social Welfare Officer, Central Tongu]

“Because we have not received enough items, we cannot get to everyone, but we target those who need it the most, so as and when it comes, we will be expanding the sharing to all,”

[Politician, Central Tongu]

4.6.3 Delay in Receiving Humanitarian Assistance

In both Central Tongu and Ada East Districts, newspapers reported the negligence of the Volta River Authority, NADMO, and the government in coming to their aid. Some expressed their

gratitude for the support but wished it had come earlier when the disaster started. Some of the affected people in an interview with GBC News bemoaned that the relief items that have been disbursed by the National Disaster Management Organization were woefully inadequate considering their numbers.

“This is not a natural disaster. This is a man-made disaster,” he said. He added that “nobody came to warn us” and “the government has refused to take responsibility”

[Chief, Central Tongu]

“A lot of people came to take our pictures with a promise to help, so far, we’ve spoken in the wind.”

[Flood Victim to Maxine Betteridge-Moes, Climate Home News]

4.6.4 Effectiveness of Emergency Relief Items

Assessing the effectiveness of relief distribution during the flood, most participants indicated that they received humanitarian aid during the flood but not afterward. In both districts, key informants noted that the relief items were insufficient to meet the needs of all eligible recipients. In Ada East district, specific groups were excluded and participants attributed it to political interference and discrimination in the distribution process. Some groups who were unaffected by the floods received relief items simply because of their affiliation with a particular political party.

“I don’t want to talk about this issue because it is very sensitive for me. I nearly lost my job simply because I was preventing some people from camping the relief items.”

[KI, Ada East]

However, key informants in both districts reported that the relief items were beneficial and met

the needs of the flood victims.

“People are really going through a lot, people are depressed, traumatized and if care is not taken, people may start taking their lives, so we acknowledge and appreciate the efforts by the University, in donating these items”

[Assemblyman, Central Tongu]

CHAPTER 5

5.0 DISCUSSION

5.1 Introduction

Flooding is a significant public health concern, with far-reaching consequences for the victim's physical and mental well-being. In discussing the effects of the 2023 controlled Akosombo Dam Spillage in the Central Tongu and Ada East districts of Ghana, it is crucial to address key themes from the study. These include the vivid descriptions of flood experiences in each selected community, the immediate effects on livelihood vulnerability, the emergency relief items, and humanitarian support received from various donors and their effectiveness in addressing the needs of flood victims. These findings will be compared with existing research to deepen our understanding and inform strategies for enhancing community resilience and future research prospects.

5.2 Description of Community Experiences at the Time of the Flood

The whole village of Bakpa Awadiokome, including farms and properties, was submerged, resulting in widespread evacuations, according to the study's findings. People who lived in these communities experienced serious effects, such as waking up to find their homes flooded with water. Similarly, people in Kebegodo discovered that their homes were encircled by water, making escape difficult. Since there were no routes that could be used to get to school, the floods in Kebenu caused schools to close, which disrupted instruction. Flooding in Pediatorokope, a sizable island settlement, ruined houses, farms, and personal property. Some locals waited and hoped for the best, while others escaped to higher grounds. The adjoining island of Azizanya was submerged, forcing the people to flee to Big Ada. Mud dwellings, farms, and oyster mining equipment were washed away by floodwaters, resulting in large losses of property and means of subsistence. These

results are consistent with previous research on the effects of floods in Ghana which stated that Ghana's coastal settlements are extremely vulnerable to floods, which can disrupt daily life, damage infrastructure, and force residents to relocate (Armah *et al.*, 2010). Similar to what was said in Central Tongu and Ada East Districts, Nyarko (2002) emphasized that flooding in Accra caused major social and economic disruptions. This repeatedly demonstrate the devastating short- and long-term effects of floods on communities, including loss of livelihood sources and displacement.

A group of Built Environment Practitioners (BEP) who visited certain afflicted places also mentioned in some of the newspapers that higher structures may need to be built in the affected areas to provide some relief to the populations affected by the flooding. BEP came up with this plan after observing that the flat terrain of the area causes rainfall to gather on the ground, making it harder for the people to withstand flooding.

5.2.1 Reactions to Flood

Fear, terror, and hopelessness were among the various physical and emotional reactions to the flood that victims described experiencing. People displayed a wide range of emotions, including fear, and the situation's emotional weight was evident. With little notice, several residents were forced to leave their houses, grabbing what few possessions they could. In addition to destroying houses and other assets, the floods severely distressed people by forcing them to live in makeshift, cramped shelters. Every response, whether in the form of sobs, terror, or stunned silence, highlighted the extreme vulnerability and the innate need to survive in the face of disaster. Dumevi *et al* (2024) reported similar post-flood traumatic stress, anxiety, and deep emotional and psychological rift as victims grapple with a sense of emptiness and come to terms with the altered landscape of their lives.

The observations of the emotional and psychological effects of flooding in this study are also in line with those of Aboagye, (2012) who found that the abrupt loss of houses and means of subsistence caused severe stress and anxiety in flood victims in Ashaiman village. Similarly, in a study conducted in Nigeria by Adeoye *et al* (2015), the impacted communities experienced severe psychological stress because of floods, underscoring the importance of providing mental health care as part of emergency response operations. The director of the disaster management organization attributed the floods to heavy rains in the Volta catchment basin, exacerbated by climate change and global warming. A historian further highlighted additional factors, including the ecological and economic impacts of the Akosombo Dam and the Volta River Authority's management failures (Stephen Miescher, Prevention Web).

5.3 Effects of the Flood on Residents

5.3.1 Health

Flooding in both districts led to an increase in water-borne diseases, respiratory infections, and skin diseases. Overcrowded shelters exacerbated health issues, with reports of diarrhea and malnutrition, particularly among children. The study also identified in newspapers that most adults recorded high blood pressure during the flood, which can be attributed to the shock and pressure encountered as they watched their properties being swept off by the floods. The contamination of water sources and inadequate sanitation facilities may have contributed to the spread of diseases as most residents, especially in the Central Tongu district were still using river water without any prior treatment. Similarly, Asumadu-Sarkodie *et al* (2015) noted that flooding in Accra led to outbreaks of cholera and other diseases due to poor sanitation and water contamination.

The Ghana News Agency's (GNA) visit to the camp revealed that there were no medical facilities, leading to untreated skin rashes and feverish conditions among the displaced. In places where

health facilities were available, they had been closed due to the impacts of the flood. Additionally, survivors faced the constant threat of harassment from reptiles and scorpions (Kekeli K. Blamey, GNA). These results are consistent with a study done by Dumevi *et al* (2024) that evaluated the public health effects of the spillage of the Akosombo and Kpong Dams in Ghana and revealed that thousands of people were forced to flee their homes, leading to crowded conditions in makeshift shelters. This raised concerns about the possible spread of communicable diseases like cholera and typhoid fever, which are spread through contaminated water because of unhygienic and compromised environmental sanitation.

5.3.2 Education

Education and life of students were severely interrupted due to the destruction of some schools while others were used as temporary shelters to accommodate survivors of the flood in other words, the flooding disrupted education by closing schools and repurposing them as shelters. It was noted that in Central Tongu, classes were conducted under trees due to the unavailability of school buildings. The displacement of teachers and students significantly disrupted the academic calendar, affecting the quality of education. The Peoples Dispatch newspaper highlighted that the interruption in learning could have long-term consequences for the affected children, depriving them of their right to education and hindering their prospects. Moreover, these same children will be competing with other students to write their Basic Education Certificate Examination (BECE) and West African Senior Secondary Certificate Examination (WASSCE). According to the GNAT Secretary, the situation underscores the United Nations Children's Fund (UNICEF) principle of education in an emergency which Ghana must consider going forward. If the volunteers hadn't been so kind, the kids would have been involved in juvenile delinquency, child labour, and other vices that hinder the development of young people. Similarly, the impact on education observed

in this study mirrors findings from research by Gyimah-Brempong *et al* (2006) which highlighted that floods disrupt schooling, leading to long-term negative effects on educational attainment.

5.3.3 Properties and Community Resources Destroyed.

The flood damaged critical infrastructure, including roads, bridges, and water supply systems. The loss of these essential services further isolated communities, making it difficult for residents to access health care, markets, and other vital services. Toilet facilities, cemeteries and refuse dumps were also submerged by floodwaters raising concerns about vector-borne diseases and several breeding places for mosquitoes. The flooding of numerous homes, farms, and fishponds also destroyed agricultural output and jeopardized food security in both areas. Vegetable crops in the Ada East district suffered greatly. The most vulnerable communities were those that produced basics like plantains, maize, and cassava and mainly relied on subsistence farming. Acute food shortages could befall affected residents due to the severe hindrance of food production. Many individuals and families found it difficult to obtain three square meals and nutrient-dense foods, and malnutrition among children under five years old was reported in some affected communities even with the availability of micronutrient powders and regular growth monitoring via mobile clinics. Correspondingly in Nepal, the state of food security in the country was negatively impacted by the flooding that destroyed crops, farmlands, and cattle. Also, day labourers in Bangladesh died of malnutrition brought on by a shortage of food (Dewan, 2015). This means food shortages can have long-term impacts on health starting from a vicious cycle of malnutrition among children, pregnant women, and the elderly (Adegoke *et al.*, 2019).

5.3.4 Livelihood Vulnerability

The findings from this current study revealed that both districts suffered tremendously from the floods, which destroyed farmlands and greatly hindered trade, fishing, and other economic activity.

Many of the males who used to work in farming, fishing, and livestock rearing in Central Tongu have either turned to petty businesses or lost their jobs. The depletion of these resources has resulted in the unemployment of many including women, who were frequently employed as petty traders in the fish and oyster business. These results are consistent with findings of two previous studies on the socioeconomic effects of floods in Ghana. The recent study indicated that floods in the Northern areas of Ghana caused large agricultural losses, which decreased food security and increased poverty (Abeka *et al.*, 2020). Likewise, Karley (2009) revealed that Accra's urban floods significantly interrupted economic activity and resulted in revenue losses for those impacted residents. These studies highlight how flooding affects vulnerable communities on a large scale and over time in terms of economic effects.

5.4 Emergency Relief Items Received by Flood Victims

The study found that emergency relief efforts were received and met the needs of flood victims to some extent. Many victims complained that there was not enough support, even though some emergency relief supplies including food, water, and temporary housing were given. Additionally, allegations surfaced regarding poor coordination among aid and agencies and the delays in the delivery of relief supplies. These results are in line with the difficulties facing Ghanaian emergency responders, as reported by Armah *et al* (2010), who pointed out that delays, poor coordination, and a lack of resources frequently make it difficult to respond to flooding emergencies. Furthermore, to provide affected communities with better support, Aboagye (2012) stressed the necessity for enhanced disaster preparedness and response structures.

CHAPTER 6

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study examined the effects of fluvial flooding on livelihood vulnerability in Ghana's Central Tongu and Ada East Districts, focusing on community experiences, resident impact, and emergency aid. Key informant interviews were conducted with 33 participants from various professions, including teachers, health workers, and community leaders, supported by data from published newspapers. Communities like Bakpa Awadiokome and Kebegodo in Central Tongu and Pediatorokope and Azizanya in Ada East were severely affected, with homes, farmlands, and schools submerged, leading to widespread evacuations. The flooding devastated local livelihoods dependent on farming, fishing, and small-scale trading, causing food shortages and financial difficulties. The flood also caused significant damage to infrastructure, including roads, bridges, schools, and essential utilities, further exacerbating the challenges faced by the affected populations. Waterborne illnesses became more prevalent due to the contamination of water sources and overcrowded emergency shelters, while education was disrupted as schools were repurposed as shelters. The lack of prior warning from the VRA heightened the communities' vulnerability. The findings highlight the severe impact of fluvial flooding on the livelihoods, health, and economic stability of the affected districts, emphasizing the need for comprehensive disaster preparedness and response strategies.

6.2 Recommendations

1. The VRA must implement advanced Early Warning Systems and Community Preparedness measures to ensure timely alerts and evacuations in flood-prone areas. Community education and preparedness programs should be conducted to enhance

residents' awareness and readiness to respond to flooding.

2. NADMO should Enhance Flood-Resilient Infrastructure and expand access to Safe WASH Facilities by constructing and rehabilitating flood-resistant infrastructure, including roads, bridges, schools, and healthcare facilities. Ensure that water supply systems are purified to prevent contamination during floods.
3. The District Health Directorates in both districts must establish Comprehensive Health and Psychological Support Services such as health outreach programs to address immediate health needs, including vaccinations, treatment for waterborne diseases, and psychological support for trauma victims and train community health workers in disaster response and mental health care.
4. The Environmental Protection Agency needs to Promote Sustainable Land Use and Environmental Management by implementing sustainable land-use practices and reforestation projects to reduce erosion, improve natural flood defences and encourage community participation in environmental conservation initiatives to build resilience against future floods.

References

- Abeka, E., Asante, F.A., Laube, W. and Codjoe, S.N.A. (2020) 'Contested causes of flooding in poor urban areas in Accra, Ghana: an actor-oriented perspective', *Environment, Development and Sustainability*, 22(4), pp. 3033–3049. Available at: <https://doi.org/10.1007/s10668-019-00333-4>.
- Aboagye, D. (2012) 'Living with Familiar Hazards: Flood Experiences and Human Vulnerability in Accra, Ghana', *Articulo – revue de sciences humaines* [Preprint], (August). Available at: <https://doi.org/10.4000/articulo.2110>.
- Abeka, E., Asante, F.A., Laube, W. and Codjoe, S.N.A. (2020) 'Contested causes of flooding in poor urban areas in Accra, Ghana: an actor-oriented perspective', *Environment, Development and Sustainability*, 22(4), pp. 3033–3049. Available at: <https://doi.org/10.1007/s10668-019-00333-4>.
- Aboagye, D. (2012) 'Living with Familiar Hazards: Flood Experiences and Human Vulnerability in Accra, Ghana', *Articulo – revue de sciences humaines* [Preprint], (August). Available at: <https://doi.org/10.4000/articulo.2110>.
- Addo, I.Y. and Danso, S.Y. (2017) 'Sociocultural factors and perceptions associated with voluntary and permanent relocation of flood victims: A case study of Sekondi-Takoradi Metropolis in Ghana', *Jamba: Journal of Disaster Risk Studies*, 9(1), pp. 1–10. Available at: <https://doi.org/10.4102/jamba.v9i1.303>.
- Adegoke, B.Y.J., Sylla, M.B., Taylor, C. and Klein, C. (2019) 'on the 2017 Rainy Season Intensity and Subsequent Flood Events Over West Africa', (April), pp. 10–14. Available at: <https://doi.org/10.33183/2019.rccs.p10>.
- Adelekan, I.O. (2020) 'Urban dynamics, everyday hazards and disaster risks in Ibadan, Nigeria', *Environment and Urbanization*, 32(1), pp. 213–232. Available at: <https://doi.org/10.1177/0956247819844738>.
- Agronomy, W. (1973) 'WILLIAMSt Agronomy (Soils) Department', (February), pp. 565–567.
- Ahadzie, D.K. and Proverbs, D.G. (2011) 'Emerging issues in the management of floods in Ghana', *International Journal of Safety and Security Engineering*, 1(2), pp. 182–192. Available at: <https://doi.org/10.2495/SAFE-V1-N2-182-192>.
- Ahmed, M. (2020) 'Community Perception Study on the Impact of Shebelle River', (November).

- Amoako, C. and Boamah, E.F. (2015) ‘The three-dimensional causes of flooding in Accra, Ghana’, *International Journal of Urban Sustainable Development*, 7(1), pp. 109–129. Available at: <https://doi.org/10.1080/19463138.2014.984720>.
- Ansah, S.O., Ahiataku, M.A., Yorke, C.K., Otu-Larbi, F., Yahaya, B., Lamptey, P.N.L. and Tanu, M. (2020) ‘Meteorological Analysis of Floods in Ghana’, *Advances in Meteorology*, 2020. Available at: <https://doi.org/10.1155/2020/4230627>.
- Anthonj, C., Nkongolo, O.T., Schmitz, P., Hango, J.N. and Kistemann, T. (2015) ‘The impact of flooding on people living with HIV: A case study from the Ohangwena Region, Namibia’, *Global Health Action*, 8(1). Available at: <https://doi.org/10.3402/gha.v8.26441>.
- Armah, F.A., Yawson, D.O., Yengoh, G.T., Odoi, J.O. and Afrifa, E.K.A. (2010) ‘Impact of floods on livelihoods and vulnerability of natural resource dependent communities in Northern Ghana’, *Water (Switzerland)*, 2(2), pp. 120–139. Available at: <https://doi.org/10.3390/w2020120>.
- Asare, G. and Tuffour, M. (2023) ‘Urban flooding: Coping with Weija Dam spillage by downstream communities in Ghana’, *Jamba: Journal of Disaster Risk Studies*, 16(1), pp. 1–9. Available at: <https://doi.org/10.4102/JAMBA.V16I1.1476>.
- Asumadu-Sarkodie, S., Owusu Phebe, A. and Rufangura, P. (2015) ‘Impact analysis of flood in Accra, Ghana’, *Advances in Applied Science Research*, 6(9), pp. 53–78. Available at: <https://doi.org/10.6084/M9.FIGSHARE.3381460>.
- Ballester, J., Quijal-Zamorano, M., Méndez Turrubiates, R.F., Pegenaute, F., Herrmann, F.R., Robine, J.M., Basagaña, X., Tonne, C., Antó, J.M. and Achebak, H. (2023) ‘Heat-related mortality in Europe during the summer of 2022’, *Nature Medicine*, 29(7), pp. 1857–1866. Available at: <https://doi.org/10.1038/s41591-023-02419-z>.
- Basabe, P. and Bedir, G. (2007) ‘No 主観的健康感を中心とした在宅高齢者における健康関連指標に関する共分散構造分析Title’, *Combustion Science and Technology*, 21(5–6), pp. 508–516. Available at: <https://doi.org/10.1080/00102208008946937>.
- Chen, A.S., Djordjević, S., Leandro, J. and Savić, D.A. (2010) ‘An analysis of the combined consequences of pluvial and fluvial flooding’, *Water Science and Technology*, 62(7), pp. 1491–1498. Available at: <https://doi.org/10.2166/wst.2010.486>.
- Citation, B.Y.U.S. (2002) ‘Application of a Rational Model in Gis for Flood Risk’, 2(1).
- Coleman, J. (1988) ‘Social capital in the creation of human development’, *The American Journal of Sociology*, pp. 95–120.

- Dewan, T.H. (2015) ‘Societal impacts and vulnerability to floods in Bangladesh and Nepal’, *Weather and Climate Extremes*, 7, pp. 36–42. Available at: <https://doi.org/10.1016/j.wace.2014.11.001>.
- Dumevi, C.Y., Owusu-Asenso, C.M., Amoah, B.D., Asiamah, J.J., Vicar, E.K., Kretchy, J.-P., Dayie, N.T.K.D. and Ayeh-Kumi, P.F. (2024) ‘Spillage of Akosombo and Kpong Dams in Ghana: Perspectives on Public Health Impacts on Affected Populations and Proposed Mitigation Strategies’, *International Journal of TROPICAL DISEASE & Health*, 45(7), pp. 55–67. Available at: <https://doi.org/10.9734/ijtdh/2024/v45i71560>.
- Dzodzomenyo, M., Asamoah, M., Li, C., Kichana, E. and Wright, J. (2022) ‘Impact of flooding on microbiological contamination of domestic water sources: a longitudinal study in northern Ghana’, *Applied Water Science*, 12(10), pp. 1–10. Available at: <https://doi.org/10.1007/s13201-022-01757-6>.
- Ghana Statistical Service (2014) ‘Central tongu district’, *2010 Population and housing Census* [Preprint].
- Van de Giesen, N., Andreini, M., Van Edig, A. and Vlek, P. (2001) ‘Competition for water resources of the Volta basin’, *IAHS-AISH Publication*, 1964(268), pp. 199–205.
- Gyimah-Brempong, K., Paddison, O. and Mitiku, W. (2006) ‘Higher education and economic growth in Africa’, *Journal of Development Studies*, 42(3), pp. 509–529. Available at: <https://doi.org/10.1080/00220380600576490>.
- Jonkman, S.N. and Vrijling, J.K. (2008) ‘Loss of life due to floods’, *Journal of Flood Risk Management*, 1(1), pp. 43–56. Available at: <https://doi.org/10.1111/j.1753-318x.2008.00006.x>.
- Karley, N.K. (2009) ‘FLOODING AND PHYSICAL PLANNING IN URBAN AREAS IN WEST AFRICA: SITUATIONAL ANALYSIS OF ACCRA, GHANA Theoretical and Empirical Researches in Urban Management’, *Theoretical and Empirical Researches in Urban Management*, 4(13), pp. 25–41.
- Lempérière, F. (2017) ‘Dams and Floods’, *Engineering*, 3(1), pp. 144–149. Available at: <https://doi.org/10.1016/J.ENG.2017.01.018>.
- Mensah, H. and Ahadzie, D.K. (2020) ‘Causes, impacts and coping strategies of floods in Ghana: a systematic review’, *SN Applied Sciences*, 2(5), pp. 1–13. Available at: <https://doi.org/10.1007/s42452-020-2548-z>.
- Rahman, A., Head, G., Solutions, S. and Solutions, Z.R. (no date) ‘Common flood types

explained’.

Reacher, M., McKenzie, K., Lane, C., Nichols, T., Kedge, I., Iversen, A., Hepple, P., Walter, T., Laxton, C. and Simpson, J. (2004) ‘Health impacts of flooding in Lewes: a comparison of reported gastrointestinal and other illness and mental health in flooded and non-flooded households.’, *Communicable disease and public health / PHLIS*, 7(1), pp. 39–46.

Sandqvist, T. (2019) ‘Dada East’.

Santana, S., Zulfebriges, Z. and Iskandar, D. (2019) ‘Environmental Journalism in the Flood News: An advocacy model’, 307(SoRes 2018), pp. 149–153. Available at: <https://doi.org/10.2991/sores-18.2019.34>.

Soeters, S. and Zoomers, A. (2017) ‘Consolidating Contestation and Conflict through Community-Based Adaptation (CBA)’, *Journal of Geoscience and Environment Protection*, 05(11), pp. 174–193. Available at: <https://doi.org/10.4236/gep.2017.511013>.

Tunstall, S., Tapsell, S., Green, C., Floyd, P. and George, C. (2006) ‘The health effects of flooding: Social research results from England and Wales’, *Journal of Water and Health*, 4(3), pp. 365–380. Available at: <https://doi.org/10.2166/wh.2006.031>.

Vasconcelos, F.T., Faddy, H.M., Merollini, K.M.D., Flower, R.L.P., Dean, M.M. and Viennet, E. (2023) ‘Impact of natural disasters and pandemics on blood supply: A systematic review’, *Health Sciences Review*, 7(March), p. 100087. Available at: <https://doi.org/10.1016/j.hsr.2023.100087>.

World Bank (2019) ‘Climate Change Knowledge Portal: Ethiopia’, pp. 1–6. Available at: <https://climateknowledgeportal.worldbank.org/country/ethiopia>.

APPENDICES

Appendix 1 A Guide for Reviewing Newspaper Content

Section 1: Content Analysis

1. How relevant is the newspaper's content to the topic?
2. Are there specific aspects of flooding that the newspaper addresses adequately?
3. Is the information accurate?
4. Is the source of information reliable?
5. Does the newspaper provide comprehensive coverage of the effects and aids received post-flooding?
6. Was the newspaper published between September 2023 to May 2024?
7. Are there areas that are overlooked?
8. Is the information on flooding associated with the Akosombo Dam Spillage?

Section 2: Structure, Tone and Perspectives

1. How clear and understandable is the language used in newspapers?
2. How effective are the visual elements conveying the effects and aids received post-flooding (photographs, infographics)
3. Is there logical flow and structure to the newspapers(coherence)?
4. Is the information well organized and easy to follow?
5. What tone do the newspapers adopt when discussing the extent of the floods?
6. Is there a balanced representation of different viewpoints? (Stakeholders, community, flood victims)

Appendix 2 Informed Consent

Key informant ID –

Date

TITLE OF STUDY: The Effects of Fluvial Flooding on Livelihood Vulnerability: A Media Analysis Of The Akosombo Dam Spillage.

General Research Information

This study seeks to investigate the effects of fluvial flooding on livelihood vulnerability: A media analysis of the Akosombo Dam Spillage. The study aims to provide evidence-based insights that can inform healthy public policy formulation, adequate healthcare provision, effective disaster preparedness and management, and community resilience-building efforts in flood-prone areas in Ghana. This study will take about 30 minutes. You will need to answer some questions, and your role is to provide accurate answers according to your knowledge. There are no right or wrong answers and therefore, please feel free to ask for clarifications.

Risk/Benefits Involved

There are no foreseeable direct risks associated with your participation in this study except for your time (30 minutes) to be spent answering the questions. There are no direct benefits to you, but the findings will inform healthy public policy formulation, adequate healthcare provision, and effective disaster preparedness and management in your community and Ghana as a whole. No data you provide will be disclosed to anybody except the study team. The data will not associate any individual with specific responses. Thus, by signing this written consent form, you or your representative is authorizing such access. You have the right to access information about you collected as part of the study.

Compensation

There are no compensation packages except verbal appreciation.

Withdrawal From Study

Your participation in this study is voluntary and you may withdraw at any time without penalty.

You will not be adversely affected if you decline to participate or later stop participating.

You or your legal representative will be informed promptly if information becomes available that may be relevant to your willingness to continue participation or withdraw.

Name of Key Informant

Date

.....

.....

Signature or thumbprint of key Informant

.....

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been fully explained to me.

Contact for Additional Information

Please contact me in case of any issues related to the study.

Principal Investigator: Akua Asuamah-Tawiah

Ensign Global College Kpong

Akua.asuamah@st.ensign.edu.gh

(+233203755946)

Appendix 3 Interview Guide

Water Resources and Renewable Energy Department Volta River Authority

Introduction

Could you please provide some background information about yourself, including your role, experience, and expertise related to dam operations and management?

Section A: Process Involved in Damage Spillage

How would you describe the processes involved in spilling a dam?

Probes: What are the typical circumstances under which a dam is spilled?

How often should it be filled?

How long does the spilling last?

What are the primary objectives of spilling a dam?

Section B: Ensuring Safety and Compliance in Dam Spilling Operations

Are there any regulatory or safety considerations that influence this decision? Probe: if yes, what regulatory or safety considerations influence this decision? If no, explain why

What preparations and planning are typically involved before spilling a dam?

How do you ensure the safety of downstream communities, infrastructure, and the environment during this process

What are the actual procedures followed during the spilling of a dam?

Section C: Real-Time Monitoring and Response in Dam Spilling Operations

How is the spilling process monitored and evaluated?

How do you track the volume of water being released?

What mechanisms are in place to adjust or stop spilling operations if necessary?

How are downstream communities, emergency responders, and relevant authorities notified during dam-spilling events?

Section D: Challenges, Responses, and Lessons Learned from Recent Dam Spillage Operations

Can you share any challenges encountered during the recent dam spillage? Probe: How does VRA reduce the impact of flooding when spilling?

What strategies were employed to address these challenges? Probe: Humanitarian efforts to support flood victims?

What lessons have been learned, and how would they influence future spilling operations?

Are there any reports written on the recent dam spillage?

Appendix 4 IRB Ethical Clearance Form



OUR REF: ENSIGN/IRB/EL/SN-265/02
YOUR REF:

April 29, 2024.

INSTITUTIONAL REVIEW BOARD SECRETARIAT

**Akua Asuamah-Tawiah
Ensign Global College
Kpong.**

Dear Akua,

ETHICAL CLEARANCE TO UNDERTAKE POSTGRADUATE RESEARCH

At the General Research Proposals Review Meeting of the *INSTITUTIONAL REVIEW BOARD (IRB)* of Ensign Global College held on Thursday, April 25, 2024, your research proposal entitled “**The Effects of Fluvial Flooding on Livelihood Vulnerability: A Media Analysis of the Mepe Floods in the North Tongu District of the Volta Region of Ghana**” was considered.

You have been granted Ethical Clearance to collect data for the said research under academic supervision within the IRB's specified frameworks and guidelines.

We wish you all the best.

Sincerely,

A handwritten signature in black ink, appearing to read "Rebecca Acquah-Arhin", with a stylized flourish at the end.

**Dr. (Mrs.) Rebecca Acquah-Arhin
IRB Chairperson**

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