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ACCESS TO WATER, SANITATION AND HYGIENE (WASH) PROGRAMMES IN GHANA: A CASE STUDY OF THREE DISTRICTS IN THE VOLTA REGION.

BY

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DECLARATION

This thesis is the result of fieldwork, investigations, and analysis of data obtained that I, Austin Dickson Amoako, carried out under the supervision of Professor Abraham Kwabena Anang, Dr. Ted Y. Annang and Dr. Fidelia N. A. Ohemeng and with whose consent and approval I submit the thesis for examination. All who contributed in any way and capacity to this final work have been duly mentioned and acknowledged and references have been cited.

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ABSTRACT

The Water Access, Sanitation and Hygiene (WASH) sector focuses on improving water access and enhanced sanitation and hygiene services for public health gains. The sector also deals with dignity in the case of sanitation, ensuring the right to water and sanitation services, enhancing better education and health outcomes at schools and health facilities, and reducing water pollution for poverty reduction and socio-economic development. Access to WASH services therefore is critical for sustainable development, and essential for supporting the acceleration of achieving targets 1 and 2 of Sustainable Development Goals (SDG) 6 thus Safe & affordable drinking water and All have access to adequate sanitation & hygiene and eliminate open defecation respectively including SDG 3 which aims at promoting good health and well-being in Ghana. This research aimed to investigate the implementation of Ghana's Water Access, Sanitation, and Hygiene (WASH) intervention programs in three districts of the Volta Region—Adaklu, Agotime-Ziope, and Ho West. It specifically aims at; (1) to ascertain the availability and accessibility of WASH facilities. (2) To assess the state of WASH facilities in households, schools, and healthcare facilities. (3) To examine the use of WASH facilities in households, schools, and healthcare facilities. (4) To investigate Open Defecation Free (ODF) relapse. The study began with a comprehensive review of the policies and institutional frameworks governing WASH in Ghana, emphasizing the importance of community engagement and the challenges faced in sustaining Open Defecation Free (ODF) status. A descriptive quantitative approach was employed with a limited number of qualitative data from interviews, focus group discussions, and direct observations. Statistical analyses, including descriptive statistics, correlation, regression analysis, and ANOVA, were used to interpret the data and identify factors influencing the success and sustainability of WASH interventions. The study revealed that while significant progress had been made in improving access to WASH facilities

in the study areas, challenges remained, particularly in rural areas. In the Adaklu District, 45% of households had access to improved water sources, while in Agotime-Ziope and Ho West Districts, the figures were 50% and 55%, respectively. The study highlighted the critical role of affordability, cultural practices, and community engagement in the adoption and maintenance of improved sanitation and hygiene facilities. Among households with flushed toilets, 23.6% reported their toilets were functional, while 41.7% reported non-functional toilets, and 34.7% did not know. Households with KVIP toilets had 66.7% reporting functional toilets and 33.3% reporting non-functional toilets. Segregation of waste in healthcare facilities was generally rated as poor. Most clinical waste was unsecured thus stored in open spaces (50%), and 50% had secured storage. Training of healthcare workers on clinical waste management was lacking, with about 25% of respondents having received training. Regarding water access in schools, 90% had water facilities sourced from boreholes, mechanized boreholes, or piped water, with 80% confirming the water was potable. Factors contributing to ODF relapse were identified, including inadequate post-triggering support and insufficient hygiene promotion. Notably, 30% of previously ODF communities experienced relapse within two years. This research therefore concludes that, though significant progress has been made in improving the availability and accessibility of WASH facilities across the study areas, challenges remain in ensuring their consistent use and functionality. To enhance sustainability of WASH interventions, it is recommended to include strengthening post-triggering support, promoting equitable access to sanitation, investing in robust monitoring and evaluation systems, and fostering knowledge sharing and learning among communities. By addressing these challenges, the research aimed to contribute to the achievement of

Sustainable Development Goals (SDG) 6 and 3, ensuring access to clean water and sanitation for all, and promoting good health and well-being.

DEDICATION

This work is dedicated to my uncle Colonel Dodzi Amenu RTD, my children, Selikem, Kekeli, Sedem and Makafui, my wife Victoria Amoako and mother Felicia Kuwornu (Edemnor) for their unwavering love, support and patience with me on some of my field trips. I thank God Almighty for His providence. I couldn't have come this far without you all. I LOVE YOU ALL.

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TABLE OF CONTENTS

CHAPTER ONE

1.0. INTRODUCTION

1.1 Background to the Study

Achieving sustainable Water, Sanitation, and Hygiene (WASH) as the basis for attaining good health, improved well-being, and livelihoods continues to be a global challenge, especially in Sub-Saharan Africa and Asia. Lack of proper sanitation or its inadequacy accounts for 432,000 diarrhoeal deaths annually across the world (WHO, 2022). According to the US Centre for Disease Control (CDC), some 3.6 billion people lack safely managed sanitation at the household level while 1.9 billion people live without basic sanitation services. Currently, about 494 million people practice open defecation (OD) across the world (Trimmer et al., 2022), and a further one billion people do not have access to improved household toilet facilities (Karon et al., 2017).

WASH consists of a set of indicators for achieving the total sanitation targets including the elimination of open defecation, access to clean drinking water, and the effective management of liquid and solid waste. A sustainable sanitation system is systemic; it addresses all sanitation value chain and system issues including collection, transportation, treatment, and disposal (or reuse) of waste, and works well over the long term with the primary objective of protecting public health (Tilley et al, 2014). The Sustainable Development Goal (SDG) targets the achievement of equitable sanitation and hygiene for all and to end open defecation by 2030. Specifically, goals 6 (clean water and sanitation) and 3 (good health and well-being) have targets of ensuring the availability and sustainable management of water and sanitation, healthy lives and promoting the well-being for all at all ages.

Sustainable sanitation is hinged on five key principles that include economic and social acceptability, technical and institutional appropriateness, and the ability to protect the environment and natural resources (SuSanA, 2008). Beyond the provision of infrastructure, total sanitation focuses on education and awareness, monitoring, feedback and improvements, and community ownership for the sustainability of the process (Harter et al., 2019). Eliminating open defecation has largely been hindered due to the limited sustainability of pro-poor sanitation interventions such as the Community-Led Total Sanitation (CLTS) as a result of high levels of slippage (Trimmer et al., 2022). The SDG goals for the WASH sector are targeted at achieving universal access to affordable and safe drinking water, sanitation, and hygiene for all and ending open defecation while achieving universally affordable health coverage by the year 2030.

As of 2020, it is estimated that 32% of the country's population and 18% of rural communities practice open defecation (Mariwah., 2018). Some 8% of urban dwellers were found to engage in the practice of open defecation, with only 10% of rural households using improved toilets, and no rural district had been able to achieve the complete eradication of open defecation in their jurisdiction except Nandom Municipality in Upper West (WHO, 2019). It is estimated that open defecation costs the Ghanaian government $79 million annually whereas only 1 million latrines were needed to eliminate the problem (Mariwah et al., 2017). Additionally, some 19,000 Ghanaians are estimated to die each year from diarrhoea associated with poor water, sanitation and hygiene (Mariwah., 2018). The occurrence of OD has been found to be largely due to a number of factors, including socioeconomic and cultural factors (Osumanu et al., 2019) and presents significant challenges to the country's environment including outbreaks of diarrhoeal diseases.

Noting the huge role of sustainable sanitation in improving health, well-being, and child development, the government has made sanitation a political priority with ambitious targets and detailed roadmaps including creating an open defecation free (ODF) Ghana. The country has thus carried out several WASH interventions including the Netherlands Development Organisation (SNV) supported Sustainable Sanitation & Hygiene for All (SSH4A) (Apanga et al., 2022), and the Community-led Total Sanitation (CLTS) with open defecation as a focal point of the interventions.

Community-led total sanitation (CLTS) is the most commonly used behavioural change-focused rural sanitation intervention approach for reducing open defecation in low-income countries (Stuart et al., 2023; Venkataramanan et al., 2018). Following the successful implementation of a CLT programme, participating communities are designated as open defecation free (ODF) after achieving a benchmark household-level toilet coverage rate, in line with specified national guidelines. For example, in Ghana, a community is legible for ODF designation when it attains a household-level toilet coverage of 80% (Delaire et al., 2022).

In the rollout of the CLTS, factors that are outside the sphere of control of the implementers come to play in determining disparities in effectiveness and the overall sustainability of the CLTS intervention process (Crocker et al., 2021; Stuart et al., 2021). Reports indicate that the progress made by Sub-Saharan African and Asian countries in achieving the Sustainable Development Goals 6 (SDG 6) on sanitation is much slower particularly with regards to the issue of coverage of sanitation services. Majority of the problems account for slow pace towards the achievement of the SDG6 arise from lack of political will and the prioritisation of sanitation agenda at both the international and national levels (Bardosh, 2015), thereby significantly affecting innovation in the sector (SuSanA, 2008). In Ghana, for example, though the national government has prioritized CLTS in dealing with rural sanitation challenges, and decentralized implementation to the local levels through the Metropolitan and Municipal District Assemblies (MMDAs), its implementation as a standalone strategy has contributed significantly in the limited sustainability of the intervention (Crocker et al., 2021).

Water and hygiene in Ghana encounter significant access challenges, particularly in rural areas and northern part of Ghana, where access to clean water is limited (WHO/UNICEF, 2020). While progress has been made with about 93% national coverage, a large portion of the population, especially in rural areas with about 73% coverage, still relies on unsafe water sources, and a very low percentage of households treat their water before drinking. These issues contribute to poor sanitation and a high prevalence of water-related diseases. In spite of the progress that has been made to ensure that children and families every part of the country have access to safe drinking water, data has shown that 76 per cent of households are a risk of drinking water contaminated with faecal matter.

There is a significant gap in access between urban and rural areas. In 2021, about 93% of the urban and peri-urban population had access to basic water supply services in Ghana, compared to 74% coverage in rural areas, according to Sanitation and Water for All (SWA) 2021. Despite the improved access safe water, about 8% of households still heavily rely on contaminated sources like streams, unprotected wells and ponds, which are easily contaminated with fecal matter especially in the rainy season which undermines public health. According to WHO/UNICEF Joint Monitoring Program, one in ten people have to spend more than 30 minutes to access an improved drinking water source in rural Ghana whiles in urban areas, many households get water from sachets rather than pipe-borne water.

The global community has devoted significant resources and energy to achieving the fundamental targets of ensuring Ghana access to safe, affordable, acceptable, available and accessible drinking water and sanitation for all by 2030 since every human has the right to safe drinking water and improved sanitation (Oseio-Poku and Kutin-Sanwu, 2019). Although significant progress has been made since the MDGs era until now, billions of people worldwide are still faced with daily challenges accessing even the most basic of services. Recent statistics from the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) Joint Monitoring Platform (JMP) indicate that over 844 million people still lack access to potable water. It is evident that on the global scale, sanitation lags behind as only 57% of the world's population has access to basic sanitation compared to 87.3% with access to basic water services. The current situation in Africa is even more disturbing as only 31% of the people in sub-Saharan Africa have access to basic sanitation (WHO/UNICEF 2022). Like other African countries, Ghana faces serious constraints to meeting the challenge of providing adequate and improved water and sanitation for its rural and urban inhabitants. The economic growth in Ghana has been accompanied by rapid urbanization, putting a strain on infrastructure and the provision of water, sanitation and hygiene facilities (Mariwah 2017).

The Ghana Demographic and Health Survey reveals that while more than half of Ghanaian households have a designated place for washing hands, only about one household out of every five has water or other cleansing agents available at home with only 31% of the population has a handwashing facility with soap and water at home (Norvivor et'al 2025) .

1.2 Problem Statement

Despite making Water, Sanitation, and Hygiene (WASH) accessibility a basic human right by United Nations Human Rights Council 2002, it is evident Ghana still lags with just 25% coverage. In 2015, Ghana was ranked the seventh dirtiest country by sanitation standards by World Health Organisation (WHO)/United Nations International Children Education Fund (UNICEF) with over 7000 children dying every year.

The country is yet to make significant progress towards the 2030 agenda for achieving sustainable sanitation which seeks to promote increased waste circularity and the derivation of substantial health and environmental benefits through safe management of waste. Across the country, limited sanitation infrastructure exists for ensuring sustainable sanitation from the point of the toilet to end use or disposal and are limited in spatial coverage. For example, the Mudor Faecal Treatment Plant (Accra CBD Sewer Network) consists of a 95km, 18,000m^3/day sewer network which serves the Korle-Bu, State House, Ministries, Osu/Labone and High Street areas in Accra and the new Lavender Hill Faecal Treatment Facility with the capacity of receiving 2000m^3/day, equivalent to 250 trucks of sewerage/day for treatment under the management of the Sewerage Systems Ghana (SSGL) through a Public Private Partnership (PPP) with the Ministry of Local Government and Rural Development.

According to 2021 Housing and Population Census, Volta Region currently has 21% of the population engaging in OD. In terms of policy, several reforms were undertaken including the approval of the National Environmental Sanitation Policy (NESP) in 2009

(Thrift, 2007). The major reform took place in 2010 including the adaptation of Community Led Total Sanitation (CLTS) as a national policy. Despite all these reforms, Ghana failed by achieving only 15% of the 54% MDG target in 2015 (Thrift, 2007). According Volta Regional Environmental Health Directorate (VREHD), only 470 out of 4500 communities representing 10.4% registered under the CLTS in the region have attained ODF status since 2012.

The country continues to have challenges with its implementation of WASH interventions, particularly regarding sustainability. Open defecation free slippage continues to happen after interventions, a factor that can be attributed to the lack of effective monitoring and evaluation and a poor understanding of the challenges (Delaire et al., 2022), and a limited evidence on the factors that contribute to the failure of the system (Venkataramanan et al., 2018). In other cases, the slow progress in sustainable sanitation delivery has largely been attributed to a disconnect between the software (Behavioral Change Communication) and the hardware (latrine construction) components of the intervention (N.L. Boot, 2018). It is noted that a key aspect of the successes of the Sustainable Sanitation and Hygiene for All (SSH4A) approach in Ghana had been the effectiveness of behavioral change communication (BCC) that relied on multiplicity of media and outreach strategies and stakeholders (Apanga et al., 2020). It is also suggested that the implementation of CLTS in rural and largely agrarian communities must not be conceptualized with a wholesale approach rather, it must target the building of local-level institutional capacity (Klug et al., 2017) bearing in mind the socioeconomic statuses of the communities (Bardosh, 2015).

Though many efforts have been put into the provision of sanitation infrastructure and the creation of awareness around the same, there still exists challenges with the ability of the system to deliver total sanitation, calling for the need for increased monitoring and evaluation of the factors responsible for the inefficiencies. Waterborne and water-related diseases are among the top causes of morbidity and mortality in Ghana, particularly among children under five years.

The achievement of a sustainable WASH for all programme will contribute significantly to the reduction in waterborne and water-related diseases and an overall improvement in health outcomes and a reduction in the economic burden associated with the management of these seemingly seasonal diseases. The third component is software (Social Behavioural Change Communication) which can only be achieved through the achievement of the three components of sustainable WASH, namely, enabling environment (supportive policy, tariffs, regulation, capacity building, partnerships, etc.), access to the hardware (including water supply, sanitation systems, etc.), and promotion (household outreach, community mobilisation, and participation, mass media, social marketing, training, etc.). The opportunity for addressing these challenges within the sector lies in the adoption of sustainable sanitation solutions through holistic planning, effective implementation, monitoring, and evaluation of synergy among three components of sustainable WASH. It is expected that the case study of WASH interventions in the Adaklu, Agotime-Ziofe, and Ho West districts will provide important insights to the factors that inhibit or promote sustainable ODF in the Volta Region.

WASH related problems are influenced by socioeconomic/cultural factors (Osumanu et al., 2019), it is expected that significant variations will exist in the challenges to the sustainability of WASH intervention programs in different parts of the country. It is therefore important to carry out 'site-specific' investigations into the factors that promote ODF slippage, and in general serve as barriers or enablers to the implementation of WASH programs like community-led total sanitation. Policy makers, practitioners and WASH Programme managers have been noted to have limited evidence for the conclusive determination of the factors influencing the effectiveness of the various WASH intervention programs (Venkataramanan et al., 2018). It is also important to leverage high-quality data on the socioeconomic, accessibility factors and environmental characteristics of intervention communities in order to achieve the most practical design and implementation of these sanitation initiatives at the rural level (Stuart et al., 2021).

According to the Volta Regional Health Management Team (VRHMT), most of the diseases (cholera, typhoid, dysentery, etc) diagnosed in the health facilities in the region are feco-oral related which is no doubt the result of poor human waste management. However, studies on the sustainability of WASH intervention programs such as Community Led Total Sanitation (CLTS) in the Region are limited, for example (Crocker et al., 2017).

The study is essential in accelerating the achievement of SDG 6.1 (Safe & affordable drinking water) and 6.2 (All have access to adequate sanitation & hygiene and eliminate open defecation, paying special attention to the needs of women and girls and those in vulnerable situations) in Ghana.

1.3 Aim of the Study

The aim of this study is to evaluate the effectiveness of Water, Sanitation, and Hygiene (WASH) intervention programs in improving access to safe water, sanitation facilities, and hygiene practices in three districts of the Volta Region in Ghana. This evaluation will examine the extent to which these interventions have achieved their intended outcomes and assess their effect on the health and well-being of the local population, as well as identify key challenges and opportunities for improvement.

1.3.1 Specific Objectives

To achieve the goal of this study and to address the questions asked, the four specific objectives are set:

1. To ascertain the availability and accessibility of WASH facilities.
2. To assess the state of WASH facilities in households, schools, and healthcare facilities.
3. To examine WASH Software (Behavioral Change Communication) prctices and use of WASH facilities in households, schools, and healthcare facilities.
4. To investigate Open Defecation Free (ODF) sustainability.

1.4 Research Questions

To address the objectives set, the following questions need to be answered:

1. How available and accessible are WASH facilities?
2. What is the state of WASH facilities in households, schools and healthcare facilities?
3. What is the level of software and hardware WASH patronage in households, schools and health facilities?

4. What is the situation of Open Defecation Free (ODF)?

1.7 Significance of the Study

The study's findings can be utilized in evaluating, tracking, and building evidence-based strategy for reaching SDG 6 while also critically evaluating the existing progress. The study's recommendations for potential remedies and gaps in implementation would be helpful. The study's findings would help rethink and implement WASH programs by offering public health recommendations.

The study would give industry participants and other stakeholders a thorough understanding of the significance, viability, and efficacy of WASH programs. The research would advance understanding in the field of research and give planners and health policymakers knowledge they could use to quickly accomplish their goals.

1.8 Thesis Structure

This dissertation is structured as follows: Chapter 1 discusses the research topic, the justification for choosing the topic, and the goals. Chapter 2 of the thesis makes extensive use of the body of available literature. In Chapter 3, the objectives of the study are discussed along with the study area, data sets, and methodologies. The findings and the contributions of this research to the scientific community are thoroughly examined in the fourth chapter. The discussion of the results is covered in Chapter 5, and the conclusions and suggestions for future study, legislation, and practice are covered in Chapter 6.

CHAPTER TWO

2.0. LITERATURE REVIEW

2.1 Introduction

Access to sufficient water, sanitation, and hygiene (WASH) facilities is essential for public health and economic growth. Despite the efforts of governments and international organizations to enhance access, many communities continue to face obstacles in their pursuit of sustainable WASH services. This literature review examines research on WASH facilities in developing countries, with a focus on four specific objectives: assessing the availability and accessibility of water facilities, identifying and mapping households that have adopted improved sanitation and hygiene facilities, evaluating the consistent use of WASH facilities and associated impacts, and examining factors contributing to Open Defecation Free (ODF) relapse. The review highlights major findings, literature gaps, and policy implications for future study and development.

2.2 Overview of Water, Sanitation, and Hygiene (WASH)

Water, Sanitation, and Hygiene (WASH) is a set of interconnected public health and hygiene practices that aims to provide clean water and safe sanitation facilities, as well as promote good hygiene practices to avoid the spread of water-borne illnesses (WHO & UNICEF, 2020). Achieving Sustainable Development Goal 6 (SDG 6) by 2030, which strives to ensure the availability and sustainable management of water and sanitation for all, is contingent upon the accessibility and availability of WASH facilities (UNICEF, 2016).

According to the World Health Organization and the United Nations Children's Fund (WHO -UNICEF, 2019), an estimated 2.2 billion people lack access to safe drinking water and 4.2 billion lack access to safe sanitation facilities. This lack of access to WASH facilities has serious consequences for public health, especially in low- and middle-income countries (LMICs) where waterborne diseases are prevalent (WHO - UNICEF, 2019).

Several studies have emphasized the significance of WASH in reducing the disease burden and improving health outcomes. (Chirgwin et al. (2016) discovered, for instance, that better access to water and sanitation facilities was related with a considerable reduction in diarrheal illnesses in LMICs. Bain et al. (2020) found that increased access to water, sanitation, and hygiene facilities might avoid up to 9 percent of the global disease burden.

Access to WASH facilities can have positive economic and social impacts, in addition to their health benefits (Adams et al., 2016). For example, improved water and sanitation facilities can increase productivity and decrease illness-related work and school absenteeism. Improved sanitation facilities can also promote the dignity and well-being of women and girls, who may be more vulnerable to sexual assault and harassment when they defecate in the open (Boadu et al., 2025).

2.2.1 The relationship between Water, Sanitation and Hygiene.

The burden of inadequate WASH on public health is undeniable. Prüss-Ustün et al. (2017) highlighted a stark picture, quantifying the immense disease burden associated with poor WASH, from diarrheal diseases to under nutrition. Kwame et al. (2019) and van Cooten et al. (2019) further highlighted the specific link between WASH and childhood stunting and malnutrition, emphasizing the critical role hygiene plays in protecting vulnerable populations. Vaz Nery et al. (2019) demonstrate the effectiveness of WASH interventions in reducing soil-transmitted helminths, showcasing the tangible health benefits of improved sanitation practices.

The impact of WASH extends far beyond the physical realm. Dickin et al. (2021) introduce the concept of an "Empowerment in WASH Index," emphasizing the link between access to safe water and sanitation and individual agency. Kayser et al. (2019) specifically focus on gender equality and empowerment, pointing out how addressing inequalities in WASH access empowers women and girls to fully participate in society. This resonates with Ezbakhe et al.'s (2019) call for ensuring WASH accessibility for vulnerable and marginalized groups, recognizing the inherent injustice in their current exclusion.

Wolf et al. (2019) propose a Faecal Contamination Index, acknowledging the complexity of measuring the impact of WASH interventions. This nuanced approach reflects the reality that WASH goes beyond mere infrastructure; it encompasses behavioral change, social norms, and cultural acceptance. Dery et al. (2020a) delve deeper into this by conducting a scoping review on understanding empowerment in WASH, highlighting the multi-faceted nature of the concept and the challenges of quantifying it.

Saroj et al. (2020) bring to light the stark inequalities in WASH access within urban settings, exposing the disparity between metro cities and marginalized communities. This observation underlines the need for context-specific interventions that address the unique challenges faced by diverse populations. Addressing these inequalities and inequities is crucial for achieving true progress in WASH provision.

WASH is not simply a matter of infrastructure or hygiene practices; it is a complex tapestry woven with threads of health, empowerment, equity, and cultural sensitivity. Recognizing the intricate relationship between these elements is vital for crafting effective interventions and achieving sustainable WASH goals. By integrating knowledge from diverse disciplines, employing appropriate metrics, and prioritizing the needs of marginalized communities, we can move towards a future where the threads of WASH are seamlessly woven into the fabric of every society, ensuring improved health, dignity, and empowerment for all.

2.2.2 Water and Sanitation Coverage Worldwide

Despite significant progress in recent years, achieving universal access to safe water and sanitation remains a formidable challenge. Examining contemporary research reveals both encouraging advancements and persistent disparities in water and sanitation coverage worldwide Zyoud & Zyoud (2023).

Between 2015 and 2022, the proportion of the global population with access to safely managed drinking water increased from 69% to 73%, suggesting a positive trend (WHO, 2023). This progress underscores the combined efforts of international organizations, national governments, and local communities. Countries like China and India have made remarkable strides in expanding sanitation coverage, demonstrating the feasibility of achieving significant change through comprehensive strategies (Saroj et al., 2020).

Nearly 2.2 billion people globally still lack safely managed drinking water, and 3.5 billion globalyllack safely managed sanitation, highlighting the vast unmet need (WHO, 2023). These figures starkly reveal the urgency of accelerating progress. Rural areas are disproportionately affected by inadequate water and sanitation services, with

Ezbakhe et al. (2019) emphasizing the vulnerability of marginalized communities living in remote locations. Addressing this disparity requires tailor-made interventions that consider specific socio-economic and geographical contexts. Gender inequalities in access to WASH persist, with Kayser et al. (2019) highlighting the negative impact on women and girls' health, education, and economic opportunities. Prioritizing gender-sensitive WASH interventions is crucial for achieving equitable progress.

Wolf et al. (2019) acknowledge the limitations of traditional coverage metrics like sanitation facilities per capita, advocating for the use of a Faecal Contamination Index to provide a more nuanced picture of WASH effectiveness. Understanding the multifaceted nature of the problem is essential for developing effective solutions. Dery et al. (2019) emphasize the importance of considering empowerment in WASH initiatives, recognizing that access alone is insufficient. Fostering community ownership, participation, and behavior change are crucial for sustainable WASH outcomes.

While the global picture on water and sanitation coverage is complex, with both triumphs and lingering challenges, it's critical to maintain a nuanced understanding of the issue. By acknowledging the remaining gaps, addressing disparities, and employing innovative approaches that consider social, cultural, and environmental factors, we can chart a path towards a future where safe water and sanitation are not luxuries, but fundamental human rights enjoyed by all.

Despite the progress made in improving access to WASH facilities, there remain considerable obstacles. Many Low and Middle Income Countries (LMICs) still lack basic water and sanitation infrastructure, and even where facilities exist, their upkeep and long-term viability can be difficult (Gillis, 2025). In order to minimize the spread of infectious diseases, the COVID-19 pandemic has also highlighted the need for enhanced WASH facilities, particularly in healthcare settings (Garn et al., 2021).

Access to WASH facilities is essential for attaining SDG 6 and enhancing public health, economic productivity, and social well-being. The expansion of access to WASH facilities must be supported by efforts to maintain their sustainability, upkeep, and consistent use (Kumar et al., 2023)

2.2.3 Status of WASH in Ghana

In many regions of Ghana, access to improved water sources and sanitation facilities remains an issue. According to the 2019 report of the WHO/UNICEF Joint Monitoring Programme (JMP), only 81 percent of the population had access to improved drinking water sources, and only 23 percent had access to adequate sanitation facilities. In rural areas, where only 64 percent of the population had access to improved drinking water sources and 15 percent had access to basic sanitation facilities, the situation is particularly grave (WHO/UNICEF, 2015).

Handwashing with soap is an essential aspect of WASH in terms of hygiene, especially for limiting the transmission of diseases such as cholera and diarrhea. Cronk et al. (2015) discovered that handwashing with soap was practiced in only 26% of Ghanaian families. The study also revealed that only 12% of households had a designated area for washing hands with soap, highlighting the need for improved infrastructure and behavioral modification to promote proper hand hygiene.

In addition, several studies have uncovered disparities in access to and coverage of WASH services among different socioeconomic and demographic groups in Ghana. For example, (Garn et al., 2021) discovered that households headed by women, those with lower levels of education, and those in the lowest wealth quintile were less likely to have access to improved water sources and sanitation facilities. This underscores the need for targeted interventions in Ghana to increase WASH access and coverage among disadvantaged groups.

While some progress has been achieved in enhancing WASH availability and coverage in Ghana, particularly in urban areas, there are still significant obstacles to attaining universal access to WASH services (John & Ajibade, 2024). Particularly in rural and disadvantaged populations, there is a need for continuing efforts to improve infrastructure, behavior change, and equitable access to WASH services.

2.2.3.1 WASH Situation in the Volta Region

The Volta Region continues to face major challenges in water, sanitation, and hygiene service delivery, despite progress made at the national level (Osafo et al., 2023). The 2021 Population and Housing Census reported that only 36 percent of households in the region used an improved drinking water source, compared with 87 percent in Greater Accra and 76 percent nationally (GSS, 2021). Many rural communities still depend on seasonal streams, hand-dug wells, and small-scale boreholes. These sources are often unreliable during the dry season and are prone to contamination, especially in districts with dispersed settlements and limited water infrastructure.

Sanitation coverage in the Volta Region remains low. Open defecation continues to be widespread, with recent regional surveys estimating that more than half of households engage in the practice (RCN Ghana, 2022). Only a small proportion of households use improved sanitation facilities such as KVIPs or water closets. District Environmental Health Units report frequent latrine collapse during the rainy season due to soil conditions and poor construction materials. This leads to persistent ODF slippage even in communities previously certified as ODF.

Hygiene practices also present challenges. Many households lack functional handwashing stations with soap and water, particularly in rural settings. JMP national data show that only 18 percent of households in the region have basic hygiene services (WHO/UNICEF, 2021). Schools and health facilities face similar constraints, with irregular water supply and inadequate facilities limiting regular handwashing and environmental cleanliness. These gaps affect infection prevention and control, especially in health care settings.

Several structural drivers contribute to the regional gaps. These include limited district investment capacity, scattered settlement patterns, difficult terrain in parts of the region, and reliance on external development partners for infrastructure support (Nkrumah, 2022). Although WASH interventions such as CWSA rural water systems, UNICEF's school WASH programmes, and SNV's SSH4A Initiative have contributed to improvements, the coverage gains remain uneven across the region. Achieving sustainable WASH outcomes requires improved financing, stronger monitoring systems, and continuous community engagement to maintain facilities and hygiene practices (Dako-Gyeke et al., 2024)

2.2.3.2 WASH Situation in Adaklu, Agortime-Ziope and Ho West Districts

The three study districts—Adaklu, Agortime-Ziope and Ho West—present some of the most persistent WASH challenges in the Volta Region. According to the 2021 Population and Housing Census, access to improved drinking water in all three districts remains below regional and national averages, 74% and 94%, respectively. Only 55.4% of households in Adaklu, 61.2% in Agortime-Ziope, and 73.8% in Ho West rely on an improved water source (GSS, 2021). A significant proportion of households continue to depend on boreholes, hand-dug wells, and seasonal streams, which increases exposure to contamination and seasonal shortages, especially during periods of heavy rainfall or prolonged dry spells.

2.3.3.3 Water Sources in the Study Districts

Groundwater is the main water source across the three districts. Boreholes with hand pumps dominate rural settlements, although their functionality varies widely. The CWSA District Water and Sanitation Teams report that between 2022 and 2023, about 30% of boreholes in Adaklu and 24% in Agotime-Ziope were non-functional at some point due to pump failure, worn-out parts and delays in maintenance (CWSA, 2023). Ho West records comparatively higher functionality, but communities in difficult terrain experience seasonal shortages because groundwater tables fall during prolonged dry seasons.

Hand-dug wells are used as supplementary sources but often dry up during the dry season, particularly in Adaklu, which has lower groundwater recharge (UNICEF Ghana, 2020). Small-town piped systems operated under CWSA management offer limited coverage in parts of Agotime-Ziope and Ho West. However, irregular power supply, mechanical breakdowns and inadequate revenue generation result in frequent interruptions (MSWR, 2020). As a result, households often revert to boreholes or unprotected wells when piped water is unavailable.

Surface water use is still common in certain communities. Streams and seasonal rivers remain informal sources in remote areas of Agotime-Ziope and Ho West, especially during periods when boreholes break down. These sources pose higher risks of contamination, especially after rainfall events that increase runoff and introduce pollutants (Dzokoto, 2017a).

2.2.3.4 Water Quality Conditions in the Study Districts

Water quality issues vary across the districts but reflect broader rural challenges in Ghana. Boreholes in Adaklu and Ho West have been reported to contain elevated levels of iron and manganese, which cause discolouration and unpleasant taste (MSWR, 2020; Agyemang et al., 2025). Shallow wells across all three districts record frequent microbial contamination, especially those located close to pit latrines or waste disposal sites. Poor lining, inadequate protection, and runoff following rainfall contribute to the presence of faecal coliforms in many wells (Osarfo et al., 2022).

Surface water sources are particularly vulnerable to turbidity increases during the rainy season. Communities in Agotime-Ziope often report murky water after storms, which affects usability and increases the need for household water treatment. However, many households continue to consume untreated water because of limited awareness, affordability constraints or perceived convenience (UNICEF Ghana, 2020).

Intermittent piped water systems also pose water quality risks. Irregular supply can create negative pressure in distribution pipes, increasing the potential for contamination, especially in older or poorly maintained networks (WHO/UNICEF, 2021). District monitoring reports from Ho West have noted occasional low chlorine residuals during supply restoration.

2.2.3.5 Sanitation and Hygiene Conditions

Sanitation coverage across the three districts remains low. Only 8.3% of households in Adaklu, 12.7% in Agotime-Ziope, and 21.4% in Ho West have an improved household toilet (GSS, 2021). Open defecation remains widespread, with district-level rates of 64.1% in Adaklu, 57.5% in Agotime-Ziope, and 42.8% in Ho West. These figures are well above the Volta Region average of 32%. Environmental Health Units in the three districts attribute these conditions to poverty-related barriers, unstable soil conditions that cause pit collapse, and weak post-triggering support for sustaining ODF gains.

Hygiene indicators also show major gaps. Basic handwashing facilities with both soap and water are present in only 13.9% of households in Adaklu, 17.6% in Agotime-Ziope and 23.5% in Ho West (GSS, 2021). Similar challenges exist in public institutions. Ghana Education Service WASH assessments indicate that over 40% of basic schools in Adaklu, 38% in Agotime-Ziope and 29% in Ho West lack functional sanitation facilities, and many schools do not have separate latrines for girls. Health facilities also experience irregular water supply, inadequate storage capacity and inconsistent availability of handwashing materials, affecting infection prevention and waste management.

2.2.3.6 Implications for Local WASH Outcomes

Differences in WASH outcomes across the three districts reflect their varying settlement patterns, infrastructure conditions and investment levels. Ho West performs better on water access because of higher borehole functionality and a wider reach of small-town systems. Adaklu records the lowest sanitation coverage, with many communities experiencing ODF slippage after initial certification. Agotime-Ziope faces seasonal water scarcity along with low household latrine ownership, creating a combined burden of limited water access and inadequate sanitation (Dzokoto, 2017b).

The general WASH situation demonstrates the interconnected effects of poverty, infrastructure gaps, environmental constraints and weak maintenance systems. These factors form an important context for understanding the behavioural, institutional and environmental barriers that influence ODF sustainability and access to safe water and hygiene services in the three districts. The localized challenges observed across Adaklu, Agotime-Ziope and Ho West highlight the need for integrated WASH interventions that address not only infrastructure deficits but also community practices and support systems.

2.2.3.7 Socioeconomic Determinants of Access to WASH Services in Ghana

Socioeconomic conditions play a major role in determining access to water, sanitation and hygiene services in Ghana. Income level is one of the strongest predictors of WASH access. Households in the highest wealth quintile are several times more likely to use improved drinking water and sanitation facilities than those in the lowest quintile (GSS, 2021). Poor households often rely on unimproved water sources such as streams, unprotected wells and informal vendors, which are more vulnerable to contamination and seasonal shortages. Studies in rural Ghana show that low-income households face difficulty paying for household latrines, maintaining boreholes, or contributing to community water system repairs, which reduces service reliability (Peprah et al., 2019). Education also influences WASH access. Households headed by individuals with secondary or higher education are more likely to adopt improved sanitation facilities and practice safe hygiene behaviours. Higher education levels increase awareness of health risks linked to unsafe water and open defecation and enhance the ability to interpret health information from public health campaigns. Research shows that caregivers with higher education levels are more likely to adopt regular handwashing and maintain clean household environments, which supports better health outcomes among children (Kenney, 2020).

Employment and livelihood patterns contribute to disparities in WASH access. Households with stable or formal employment tend to invest more in durable latrines, improved water storage and private hygiene facilities. In contrast, households that depend on seasonal or subsistence farming often prioritize daily survival needs over long-term sanitation investments. Seasonal migration in parts of northern and coastal Ghana also disrupts WASH service uptake, as households move between locations with different levels of infrastructure.

Household size and composition are additional determinants. Larger households tend to rely on shared sanitation facilities, which are often in poor condition and do not meet WHO/UNICEF "improved" criteria. Studies show that overcrowded households, especially in peri-urban areas, experience higher pressure on limited sanitation facilities, leading to breakdowns and poor hygiene conditions ((Appiah et., al 2021). Households with young children or elderly members also have increased water demand and require more frequent access to safe water sources.

Housing characteristics shape access to sanitation. Households in rented compound houses face structural barriers to constructing household latrines, as landlords may not prioritize sanitation investments.

Geographic and economic inequalities intersect to create widespread disparities in access. Rural households, which often have lower income and education levels, are disproportionately affected by unsafe water and poor sanitation. The cost of constructing improved latrines and maintaining water systems remains a major barrier for many communities. These socioeconomic factors collectively influence service uptake, facility maintenance and long-term behavioural change across Ghana (Antwi-Agyei et al., 2020).

2.2.3.8 Cultural Factors Influencing Access to WASH Services

Cultural beliefs, social norms and community practices play an important role in shaping how households in Ghana adopt and use water, sanitation and hygiene services. In many rural communities, toilet ownership is influenced not only by income but by long-standing perceptions of privacy, purity and tradition. Studies in Ghana show that some households still believe that sharing a household latrine with in-laws or persons of the opposite sex is inappropriate, which reduces interest in investing in a private facility (Antwi-Agyei et al., 2019). These norms contribute to the continued use of open defecation in several districts, including those within the Volta Region.

Cultural acceptance of open defecation remains a major barrier. In many farming communities, defecating in the open is considered normal and has been practiced for generations. Research in northern and southern Ghana shows that some households perceive open defecation as more hygienic because it keeps faecal matter away from the living space (Novotný et al., 2018). Similar views have been documented in parts of Adaklu and Agortime-Ziope, where community members reported that open fields and bush areas are "free," easy to access, and do not require construction costs. These beliefs weaken community motivation to adopt improved sanitation even after CLTS triggering.

Traditional leadership structures also influence WASH behaviour. In communities where chiefs and elders actively promote latrine construction and hygiene, adoption tends to be higher (Otami, 2022). However, in districts such as Adaklu, some chiefs have limited involvement in sanitation enforcement due to concerns about maintaining harmony and avoiding confrontation with households that struggle financially. This affects the strength of by-law enforcement and contributes to ODF slippage. In contrast, certain communities in Ho West with stronger traditional authority involvement show better latrine uptake and reduced open defecation.

Gender roles further shape access to WASH services. Women and girls are primarily responsible for water collection and household hygiene in many Ghanaian settings. Cultural expectations place the burden of maintaining household cleanliness on women, yet decision-making about constructing latrines often rests with men (Dery et al., 2021). In the study area, district WASH reports show that women frequently walk long distances for water, especially in Adaklu communities where borehole functionality is irregular. This reinforces gendered time burdens and reduces the time available for income-generating activities. Cultural norms requiring women to collect water at dawn or dusk can also expose them to safety risks, especially in communities with limited lighting (Bhakta, 2019).

Beliefs about water sources influence usage behaviour. Some communities regard surface water as more “natural” or spiritually significant than borehole or piped water. In parts of Agortime-Ziope, elders report that certain streams are historically associated with ancestral activities, and some households prefer these sources during cultural events. These practices continue even when improved water sources are available, which increases exposure to waterborne diseases.

Cultural perceptions also affect hygiene behaviour. In several rural communities in the Volta Region, handwashing with soap is not consistently practiced because some people believe water alone is sufficient for cleanliness. Studies show that the absence of visible dirt often leads households to underuse soap, especially when income is limited (Amegah & Jaakkola, 2016). This pattern appears in many households in the study area, where handwashing facilities exist but soap usage is inconsistent.

Cultural practices interact with poverty, infrastructure limitations and environmental factors to shape how households and communities adopt WASH services. Understanding these cultural influences is important for designing interventions that are acceptable, sustainable and tailored to the needs of communities in Adaklu, Agotime-Ziope and Ho West.

2.2.3.9 Political and Institutional Factors Affecting WASH Access

Political commitment, institutional arrangements, and governance structures strongly influence access to water, sanitation, and hygiene services in Ghana. The decentralized system of local government assigns District Assemblies the responsibility for planning, budgeting, and implementing WASH interventions. However, several studies show that most Assemblies face limited fiscal autonomy and depend heavily on central government transfers, development partners, and NGOs to deliver WASH services (Fuseini et al., 2022). Delays in the release of District Assemblies Common Fund (DACF) and other earmarked funds often interrupt water system maintenance, sanitation promotion campaigns, and CLTS follow-up activities.

Institutional coordination remains a major challenge. The Ministry of Sanitation and Water Resources, the Community Water and Sanitation Agency (CWSA), the Environmental Health and Sanitation Directorate (EHSD), and District Assemblies all perform essential WASH functions, but overlaps in roles often lead to fragmented implementation and weak monitoring (Oduro et al., 2021). The transition of CWSA into a rural utility model has improved regulation of small-town water systems, yet governance gaps remain in the areas of tariff enforcement, community management, and long-term maintenance planning (Alba, (2019).

Political priorities also shape WASH progress. District-level decisions on siting water facilities, selecting beneficiary communities, and allocating sanitation funds may be influenced by electoral considerations. Research in Ghana indicates that politicians tend to prioritize visible infrastructure, such as boreholes, which offer immediate political gains, while long-term sanitation interventions receive less attention (Oduro et al., 2021). This tendency contributes to the slower improvement of sanitation indicators compared with water access.

In the Volta Region, political and institutional constraints have direct effects on the study area. Annual progress reports from Adaklu, Agortime-Ziope, and Ho West show persistent funding gaps in sanitation promotion, low logistical support for Environmental Health Officers, and limited technical capacity to supervise community-led initiatives. For example, Adaklu District reported that only 38% of planned sanitation activities were implemented in 2023 due to inadequate funding and delayed release of DACF sanitation allocations. In Agortime-Ziope, district budgets show a heavy reliance on development partners for borehole rehabilitation and hygiene promotion.

Institutional weaknesses also affect ODF sustainability. Lack of consistent monitoring, insufficient sanctions under local by-laws, and limited engagement of political leadership reduce community compliance. Studies show that CLTS outcomes decline sharply when district authorities do not maintain regular follow-up visits (Mariwah & Drangert, 2011). The situation in the study districts aligns with these findings, as Environmental Health Units report significant ODF slippage in communities where political leadership engagement is low.

At the national level, policy reforms have aimed to strengthen WASH governance, but enforcement remains weak. The Environmental Sanitation Policy (2010) assigns clear roles to local governments, yet compliance is uneven due to capacity gaps. Similarly, the National Water Policy (2007) outlines equity and sustainability principles, but implementation has been slower in rural districts where political oversight is limited.

2.2.3.10 Geographical and Environmental Factors Influencing Access to WASH Services

Geographical and environmental conditions strongly influence the distribution and sustainability of water, sanitation and hygiene services in Ghana. Rural areas with dispersed settlement patterns often face higher costs of extending piped water networks, which limits household access. Studies show that communities located far from existing water infrastructure experience lower service reliability and depend heavily on unimproved sources such as streams and hand-dug wells (Braimah et al., 2018). This is common in several communities in Adaklu and Agortime-Ziope, where houses are scattered over wide areas and the cost of reticulation is beyond district budgets.

Groundwater availability varies across the country and affects borehole functionality. Hydrogeological studies indicate that certain parts of the Volta Region have low-yield aquifers, shallow water tables, and fractured rock formations that make borehole siting difficult (Bessah et al., 2021). This situation contributes to the relatively low success rate of new boreholes in Adaklu, where district reports show that some test drilling attempts over the last five years yielded inadequate water. In Agortime-Ziope, seasonal fluctuation of groundwater levels leads to periodic declines in borehole output during the dry season. Ho West performs better because parts of the district lie within more favourable aquifer zones.

Environmental factors such as soil type also influence sanitation adoption. Areas with loose, sandy, or unstable soils experience frequent pit collapse, which discourages households from constructing latrines. Research in rural Ghana shows that pit collapse is one of the leading causes of ODF slippage, especially in districts with high rainfall intensity (Delaire et al., 2022). This pattern is observed in Adaklu, where Environmental Health Officers report repeated latrine failure during the rainy season, forcing households to revert to open defecation. Communities in Agortime-Ziope located along erosion-prone slopes also face similar challenges.

Surface water contamination is another environmental barrier. Many streams and small rivers across the study area are affected by agricultural runoff, erosion, and animal waste. Studies in the Volta Region show that these contaminants increase turbidity and microbial loads, especially during peak rainfall periods (Obuobie et al., 2018). Households using these sources without treatment face an increased risk of diarrhoeal infections. Seasonal contamination forces many communities to travel longer distances during the rainy season to seek safer water.

Climate variability further impacts WASH access. Ghana has experienced increasingly erratic rainfall patterns, which affect both water availability and sanitation systems. Extended dry spells reduce groundwater recharge, leading to borehole breakdowns or reduced pumping capacity. Heavy rainfall events, which have become more common, cause flooding of pit latrines and contamination of nearby water sources. District records from Ho West and Agortime-Ziope show that several communities experienced latrine flooding after major storms in 2021 and 2022, which contributed to increases in open defecation.

Topography also affects the cost and feasibility of infrastructure installation. Communities located on elevated or rocky terrain face difficulties in laying pipes or constructing improved sanitation facilities. In parts of Ho West, such geographical limitations have slowed the expansion of small-town water systems and increased reliance on boreholes or rainwater harvesting.

Geographical and environmental factors interact with socioeconomic and institutional barriers to shape WASH service access across Ghana (Dery, 2019). In the study area, dispersed settlements, groundwater variability, soil instability, seasonal flooding, and water contamination together contribute to unequal access to safe water, improved sanitation and hygiene services.

2.2.3.11 Access to Water Services in Ghana

Access to water services in Ghana has improved over the past two decades, but significant disparities remain between urban and rural areas. According to the WHO/UNICEF Joint Monitoring Programme, national coverage of basic drinking water services reached 87% in 2021, but only 66% of rural households had access to improved sources compared with 97% of urban households (WHO/UNICEF, 2021). These differences reflect variations in infrastructure development, population density, institutional capacity, and financial investment across regions and districts.

Rural water supply in Ghana depends largely on boreholes, hand-dug wells, mechanized systems, and small-town piped networks. The Community Water and Sanitation Agency (CWSA) regulates and supports these systems, yet many rural communities face frequent breakdowns due to limited spare parts, inadequate maintenance, and low revenue mobilization (CWSA, 2023). Peer-reviewed assessments show that nearly one-third of rural water points across the country are non-functional or partially functional at any given time (Bukari et al., 2023). This pattern is evident in the study districts, where 30% of boreholes in Adaklu and 24% in Agortime-Ziope experienced faults or irregular flow in recent years.

Water quality also affects access. Studies indicate that some improved water sources, including boreholes and standpipes, occasionally register microbial contamination due to poor sanitation practices near water points, animal movement, and shallow groundwater tables (Osei et al., 2020, Bukari et al., 2023). In the Volta Region, small streams and dugouts used during water shortages are highly susceptible to contamination, especially during the rainy season. Households in Adaklu and Agortime-Ziope often resort to surface water sources when boreholes fail, increasing the risk of diarrhoeal infections.

Distance to water sources remains a key barrier. Although national WASH policy targets a maximum walking distance of 500 meters, many rural households travel longer distances, especially during the dry season when water sources dry up. In parts of Adaklu, households sometimes walk 1–2 kilometers to reach functioning boreholes. Long queues at water points, particularly in communities with limited boreholes, further reduce access and affect time available for productive work and schooling.

Affordability also shapes access to water services. Small-town systems operate on tariff payments, yet low-income households often struggle to pay for water regularly. This leads to reliance on free but unsafe sources. Studies in Ghana show that households facing economic challenges are more likely to use surface water or unprotected wells, even when improved water sources are available (Braimah et al., 2017). This tendency is visible in Agortime-Ziope, where district reports show periodic shifts from boreholes to streams during periods of financial constraints.

Climate variability adds to water insecurity. Increasingly erratic rainfall events affect groundwater recharge and reduce borehole yield in some districts. Dry-season scarcity is common in parts of Agortime-Ziope, while intense rainfall in Ho West occasionally damages water infrastructure and contaminates surface water.

Access to water services in Ghana is determined by a combination of infrastructure availability, affordability, water quality, environmental conditions and institutional support (Aigbavboa et al., 2023). While national coverage has improved, the situation in the study districts shows that rural and economically disadvantaged areas still face significant challenges that limit the reliability and safety of water supply.

2.2.3.12 Access to Sanitation Services in Ghana

Access to sanitation services in Ghana continues to lag behind water supply, despite several policy interventions aimed at improving coverage. According to the WHO/UNICEF Joint Monitoring Programme, only 25% of households in Ghana used improved sanitation facilities in 2021, while 17% practiced open defecation (WHO/UNICEF, 2021). Rural areas record the highest deficits, with open defecation rates exceeding 40% in many districts. The slow progress is linked to cultural norms, cost barriers, weak enforcement of by-laws, and inadequate financing for sanitation infrastructure.

Household access to private toilets remains low across the country. The 2021 Population and Housing Census shows wide regional disparities, with the Volta Region reporting only 19.3% of households using improved sanitation (GSS, 2021). Most rural households depend on shared or unimproved facilities such as traditional pit latrines without slabs. Shared latrines are often overused and poorly maintained, which affects health and discourages adoption. A study by Peprah et al. (2019) found that households without secure tenure or living in compound houses face greater challenges in constructing private latrines, contributing to persistent reliance on unimproved facilities.

Sanitation access in the study districts reflects these national patterns. Census data show that 8.3% of households in Adaklu, 12.7% in Agortime-Ziope, and 21.4% in Ho West use improved sanitation, while open defecation rates remain at 64.1%, 57.5%, and 42.8%, respectively (GSS, 2021). District Environmental Health Reports attribute these high rates to cost barriers, soil instability that causes frequent pit collapse, and irregular CLTS follow-up. In Adaklu and Agortime-Ziope, many households cite the inability to purchase cement and roofing materials as a major obstacle to constructing durable latrines. In Ho West, sanitation coverage is relatively higher but still below national expectations.

Community-Led Total Sanitation (CLTS) has contributed to progress in some districts, but sustainability remains a challenge. Research in Ghana indicates that ODF gains are often short-lived without strong post-triggering support, regular monitoring and engagement of traditional authorities (Mariwah & Drangert, 2011). This trend is evident in the study area, where several communities previously declared ODF have experienced slippage due to collapsed latrines, lack of enforcement of sanitation by-laws, or loss of community motivation.

Urban sanitation challenges differ from rural ones but also affect progress at the national level. Rapid urbanization and limited space in low-income settlements lead to overcrowded shared latrines, irregular dislodging, and environmental contamination (Ayelazuno and Tetteh 2025). Although the study districts are predominantly rural, peri-urban communities in Ho West face similar issues with shared toilets and poor faecal sludge management.

Environmental conditions further limit sanitation uptake. Areas with high water tables or fragile soils face increased risks of latrine collapse, which discourages investment. Studies show that households in flood-prone or erosion-prone areas are less likely to adopt latrines unless provided with technical support on construction designs (Mazeau, (2013). This applies to several communities in Adaklu where seasonal flooding leads to frequent latrine failure.

In general, access to sanitation services in Ghana remains a major challenge. The combination of financial constraints, cultural norms, inadequate infrastructure, and environmental limitations explains the slow progress toward universal sanitation. The conditions in Adaklu, Agortime-Ziope and Ho West illustrate how these factors interact and influence sanitation behaviours in rural districts.

2.2.3.13 Access to Hygiene Services in Ghana

Hygiene services form an essential component of WASH, yet coverage in Ghana remains significantly lower than access to water and sanitation. According to the WHO/UNICEF Joint Monitoring Programme, only 42% of households in Ghana had basic hygiene services in 2021, defined as a handwashing facility with soap and water available on the premises (WHO/UNICEF, 2021). Rural areas perform worse, with basic hygiene coverage below 30%, compared with almost 60% in urban settings. The gap is driven by limited access to water, inconsistent availability of soap, and weak awareness of proper hygiene practices.

Handwashing behaviour is influenced by both availability of facilities and cultural habits. Studies in Ghana show that even when handwashing stations exist, they are often not functional due to lack of soap or water (Wolf et al., 2019). Households tend to prioritize soap for bathing or laundry rather than handwashing, especially when income is low. This pattern is visible in poorer rural districts, where soap is regarded as a commodity that must be rationed carefully.

National census data demonstrate that hygiene coverage is particularly low in the study area. Only 13.9% of households in Adaklu, 17.6% in Agortime-Ziope, and 23.5% in

Ho West have a designated handwashing facility with soap and water (GSS, 2021). These levels fall below the already low regional average for the Volta Region. District Environmental Health Officers report that in many communities, handwashing stations—often tippy taps—set up during CLTS activities are not consistently maintained. Some households leave the stations empty, while others dismantle them during the dry season due to water scarcity.

Institutional hygiene services also face major gaps. School WASH assessments conducted by the Ghana Education Service indicate that many basic schools in the three districts lack functional handwashing facilities, especially those with no reliable water source. In some schools in Adaklu and Agortime-Ziope, handwashing stations installed under donor-supported programmes became non-functional within a year due to lack of maintenance or water. This affects children's hygiene practices and increases the risk of infections such as diarrhoea and skin diseases.

Health care facilities show similar constraints. Although national policies emphasize infection prevention and control, many primary health facilities in rural Ghana experience intermittent water supply and limited availability of soap and alcohol-based hand rubs. District Health Management Teams in Ho West and Agortime-Ziope report that some CHPS compounds store water in containers for handwashing, but these supplies run out during the dry season, affecting clinical hygiene and patient care. These challenges are consistent with findings from national studies, which show that only 54% of health facilities in Ghana have basic hygiene services (WHO/UNICEF, 2020).

Environmental factors also influence hygiene access. In areas with severe dry-season water shortages—such as communities in Adaklu—the availability of water for handwashing competes with essential household uses like drinking and cooking. During these periods, households often reduce or stop handwashing practices. Similarly, communities that use surface water sources may avoid frequent handwashing when water is turbid or contaminated.

Behavioural factors further shape hygiene access. Studies show that consistent handwashing is more likely when communities internalize the health benefits and when social norms encourage the practice (Dreibelbis et al., 2016). However, in many rural areas, handwashing with soap is not yet a deeply rooted behaviour, especially when hands do not appear visibly dirty.

Access to hygiene services in Ghana remains low, and the situation in Adaklu, Agortime-Ziope and Ho West demonstrates the combined effects of water scarcity, poverty, cultural behaviours and weak institutional support. Effective hygiene promotion requires sustained community engagement, reliable water access and provision of affordable hygiene materials.

2.2.4 A Review of Policies on Water, Sanitation, and Hygiene (WASH) in Ghana

Ghana has made significant strides in improving access to WASH since the post-independence era. However, challenges remain, particularly in rural areas and urban slums. This review examines key policies and their impact on access to safe water, adequate sanitation, and proper hygiene practices, highlighting successes, gaps, and potential areas for improvement.

Ghana boasts of a comprehensive WASH policy framework, including the 1999 National Environmental Sanitation Policy, the National Water Policy (2007), and the Ghana Sanitation Master Plan (2015-2045). These policies prioritize community-led sanitation, integrated water resource management, and hygiene promotion (Appiah-Effah et al., 2019a). Policy efforts have yielded positive results. National access to improved water supply increased from 49% in 2000 to 83% in 2017 (Kanyagui &

Viswanathan, 2022). Sanitation coverage also improved, albeit at a slower pace, reaching 57% in 2019. Notably, Ghana adopted innovative sanitation approaches like the Community Led Total Sanitation (CLTS) program, contributing to these gains (Ntow, 2019).

Despite progress, inequalities persist. Urban-rural disparities are significant, with rural areas lagging in both water and sanitation access (Kanyagui & Viswanathan, 2022). Additionally, poor operation and maintenance of WASH facilities, particularly in schools and healthcare settings, hinder sustainability and pose health risks (Ashinyo et al., 2021). Several areas require stronger policy attention. Firstly, a dedicated urban sanitation strategy remains absent, leading to fragmented service delivery and secondly, human resource capacity within the WASH sector needs strengthening (Oduro-Kwarteng et al., 2015). Thirdly, monitoring and evaluation systems for WASH policies require improvement to ensure data-driven decision-making (Cronk et al., 2015). Climate change adds a new layer of complexity. Droughts and floods threaten water availability and sanitation infrastructure, necessitating climate-resilient WASH solutions (Oduro-Kwarteng et al., 2015). Furthermore, non-household settings like healthcare facilities and schools require tailored WASH policies and interventions (Cronk, 2013).

Ghana's WASH policy framework holds promise, but ongoing implementation challenges and emerging issues necessitate continuous adaptation and investment. Prioritizing rural and urban disparities, strengthening human resources, and integrating climate resilience into WASH policy are crucial steps towards achieving equitable and sustainable access for all Ghanaians.

2.2.4.1 National Water Policy (2007)

The National Water Policy (2007) provides a comprehensive framework for the sustainable management and development of water resources in Ghana. The policy aims to guide service delivery, protect water resources, and promote equitable access to safe drinking water for all communities. It emphasises integrated water resources management, stakeholder participation, and the need to balance domestic, agricultural and industrial water demands (MLGRD, 2007). The policy seeks to ensure sustainable water supply for all population groups; protect water bodies from pollution; promote efficient water-use practices; and strengthen the institutional arrangements responsible for water management. It also aims to improve rural and small-town water systems through community participation and appropriate technology choices. In addition, the policy supports decentralisation by assigning District Assemblies key responsibilities for planning and overseeing water service provision (Amenfia, 2020a).

Implementation of the policy has contributed to improvements in national water supply coverage. Through CWSA reforms and donor-supported programmes, many rural communities now have boreholes, small-town piped systems, and improved water quality monitoring. Studies show that rural water coverage increased steadily over the past two decades as CWSA expanded community management structures and strengthened water point functionality monitoring (Adank & Tuffuor, 2013). The policy also stimulated collaboration between government agencies and development partners, leading to investment in infrastructure and technical capacity.

Despite progress, key challenges remain. Groundwater depletion, pollution of surface water sources, weak enforcement of environmental regulations, and inadequate financing hinder full implementation. Research shows that District Assemblies struggle to meet their responsibilities due to limited fiscal resources and technical capacity

(Agyemang et al., 2020). Rural water systems also face maintenance issues, with frequent breakdowns caused by poor tariff collection, weak governance of water management teams, and limited availability of spare parts. In districts such as Adaklu and Agotime-Ziope, these challenges manifest in declining borehole functionality and reliance on seasonal surface water sources during periods of scarcity.

The National Water Policy established an important foundation for water governance in Ghana, but persistent institutional and financial gaps continue to limit progress in rural and peri-urban communities.

2.2.4.2 Environmental Sanitation Policy (Revised 2010)

The Environmental Sanitation Policy (Revised 2010) provides the national framework for managing sanitation, hygiene and environmental health services in Ghana. The policy seeks to address the widespread challenges of poor sanitation, open defecation, waste mismanagement and inadequate hygiene practices. It promotes a coordinated approach to planning, financing and delivering sanitation services at national and district levels (MLGRD, 2010). The policy aims to improve household and public sanitation, enhance solid and liquid waste management, promote hygiene behaviour change, and strengthen institutional arrangements for sanitation planning and service delivery. It places responsibility for sanitation implementation on District Assemblies while encouraging active participation from communities, private actors and civil society. The policy also prioritises school and health facility sanitation, recognising their role in preventing disease transmission and improving public health outcomes (Adorsu-Djentuh, 2018).

The revised policy strengthened the institutional foundation for sanitation management in Ghana. It led to the establishment of the Environmental Health and Sanitation

Directorate (EHSD) under the Ministry of Sanitation and Water Resources, which improved coordination of national sanitation programmes. The policy guided the rollout of Community-Led Total Sanitation (CLTS), which has helped many rural communities achieve Open Defecation Free (ODF) status. Studies show that the adoption of CLTS contributed to significant reductions in open defecation in districts that maintained strong follow-up systems (Mariwah & Drangert, 2011). The policy also improved collaboration between government agencies, NGOs and development partners, resulting in expanded training for Environmental Health Officers and increased public awareness campaigns.

Despite these achievements, sanitation outcomes remain below national targets. Implementation is hindered by limited funding, inadequate logistics for Environmental Health Units, weak enforcement of sanitation by-laws, and slow adoption of household latrines due to poverty and cultural barriers (Mensah et al., 2023). District Assemblies often prioritise visible infrastructure such as roads and water facilities over sanitation investments, resulting in insufficient budget allocations (Oduro et al., 2018). In rural districts such as Adaklu and Agortime-Ziope, the policy's objectives are undermined by low household ability to pay for improved latrines, soil instability that causes pit collapse, and inadequate post-triggering monitoring. Although Ho West performs relatively better, sanitation coverage remains below expected standards.

The Environmental Sanitation Policy provides a strong strategic direction, but its effectiveness depends on strengthening district-level capacity, increasing funding for sanitation interventions, and addressing behavioural and cultural barriers.

2.2.4.3 Rural Sanitation Model and Strategy (RSMS)

The Rural Sanitation Model and Strategy (RSMS) was introduced by the Government of Ghana to accelerate progress toward eliminating open defecation and improving rural sanitation (Kanyagui and Viswanathan, 2022).). The RSMS serves as a practical guide for implementing rural sanitation programmes by outlining steps for behaviour change, community mobilisation, and household latrine adoption. It is closely aligned with the Environmental Sanitation Policy and forms the operational backbone for CLTS activities across rural districts (MSWR, 2012). The RSMS aims to increase household access to improved sanitation by promoting low-cost technologies, strengthening demand for latrines and guiding communities through ODF attainment. It seeks to support households to construct durable toilets, improve environmental cleanliness and reduce sanitation-related diseases. Additionally, the strategy aims to strengthen district-level sanitation planning and provide a unified approach for development partners and NGOs working in rural sanitation.

The RSMS has contributed significantly to Ghana's rural sanitation gains. It improved coordination of CLTS implementation by standardising triggering processes, monitoring indicators and reporting mechanisms (Mariwah, 2022a). Studies show that districts applying RSMS guidelines tend to report higher rates of ODF attainment and more consistent latrine construction (Rheinländer et al., 2019). The strategy also encouraged the adoption of low-cost and locally adaptable latrine designs, which helped reduce financial barriers for poor households. Furthermore, RSMS strengthened the capacity of Environmental Health Officers by providing clearly defined roles in community mobilisation, hygiene promotion and follow-up (Breweh, 2022).

In the Volta Region, the RSMS has supported several communities in Ho West and Agotime-Ziope to attain temporary ODF status. Development partners such as UNICEF and SNV have applied the RSMS framework to expand latrine coverage, promote hygiene behaviour and facilitate by-law enforcement.

Despite these achievements, implementation of the RSMS faces constraints. One major challenge is limited household financing for durable latrine construction, especially in low-income rural districts. Research shows that many households triggered under CLTS cannot afford the recommended latrine models, leading to incomplete construction or rapid abandonment when pits collapse (Delaire et al., 2022). In Adaklu and parts of Agotime-Ziope, unstable soil conditions and flooding during the rainy season cause frequent latrine failure, undermining ODF gains.

Weak monitoring and inconsistent follow-up also hinder sustainability. Districts with limited logistics for Environmental Health Officers struggle to conduct regular supervision after ODF declaration, leading to slippage. Some communities lose motivation after initial triggering when external support declines. Additionally, the RSMS depends heavily on donor-funded initiatives; when projects end, districts often lack resources to maintain sanitation momentum (Kwayie, 2023).

While the RSMS provides a strong framework for rural sanitation programming, structural and environmental barriers continue to limit its impact. Strengthening district capacity, improving financing options and addressing context-specific constraints such as soil type and poverty are essential for achieving long-term sanitation improvements in rural Ghana.

2.2.4.4 Ghana Sanitation and Water for All (SWA) Plan

The Ghana Sanitation and Water for All (SWA) Plan is a national strategic framework developed to accelerate progress toward universal access to safe water, improved sanitation, and hygiene. The plan aligns with the Sustainable Development Goals

(SDGs), particularly SDG 6, and provides a coordinated approach for government institutions, development partners and civil society to address persistent WASH gaps across Ghana (MSWR, 2018, Abu et al., 2024). The SWA Plan emphasises equity, sustainability, multi-stakeholder partnerships and results-based monitoring. The plan seeks to expand access to safe drinking water, eliminate open defecation, and improve hygiene practices, especially in underserved rural districts. It aims to strengthen the governance and financing of WASH, improve coordination between national and district institutions, and ensure consistent monitoring of progress. Another objective is to mobilise domestic and external resources to fill funding gaps, especially for rural sanitation and small-town water systems. The SWA Plan also promotes the integration of WASH into school and health facility programmes to support public health outcomes. Since its introduction, the SWA Plan has contributed to improved national coordination of WASH interventions. It formalised annual multi-stakeholder reviews involving government agencies, donors, NGOs and private-sector actors. These reviews have helped identify bottlenecks and align investment priorities. The plan also strengthened the monitoring of sanitation and water indicators through the National WASH Management Information System (WASH MIS), which has improved data availability for planning and budgeting (MSWR, 2020).

Under the SWA framework, several rural districts—especially in the Northern, Upper East and Upper West regions—recorded notable increases in latrine coverage due to targeted funding and technical support from development partners (Oduro-Kwarteng & Nyarko, 2020). In the Volta Region, the SWA Plan has complemented ongoing CLTS and small-town water programmes by guiding resource allocation and enhancing district-level coordination. Ho West District benefited from additional support for borehole rehabilitation and hygiene campaigns through SWA-partner initiatives.

Despite progress, several implementation challenges remain. The SWA Plan relies heavily on national and donor funding, yet sanitation receives a lower share of budget allocations compared with water supply (Amenfia, 2020b). District Assemblies often lack the financial and human resources needed to implement SWA targets, particularly in poorer districts such as Adaklu and Agotime-Ziope. Weak coordination among sector institutions sometimes leads to duplication of efforts or gaps in follow-up activities.

Monitoring and reporting systems also face limitations. Although WASH MIS has improved indicator tracking, many districts lack the digital tools and internet connectivity required for regular data entry (Akanbang, 2021). Research shows that some local governments inconsistently report WASH data due to logistical and staffing constraints (Agyemang et al., 2020). Additionally, achieving equitable access remains a challenge, as remote and scattered rural communities still receive limited infrastructure investment due to high service delivery costs.

The Ghana Sanitation and Water for All Plan represents a major step toward national alignment on WASH priorities, but significant financial, institutional and operational gaps must be addressed to realise its full impact in rural districts, including those in the study area.

2.2.4.5 Community-Led Total Sanitation (CLTS) Policy Framework

The Community-Led Total Sanitation (CLTS) Policy Framework provides the national guidelines for implementing behaviour-change approaches aimed at eliminating open defecation in Ghana. Adopted as part of rural sanitation reforms, the framework outlines processes for community triggering, behaviour change communication, post-triggering follow-up, and verification of Open Defecation Free (ODF) status. It supports the broader national sanitation agenda by promoting community ownership, low-cost household latrines, and sustained sanitation behaviour (MSWR, 2012). The main objective of the CLTS framework is to eliminate open defecation through collective community action. It seeks to trigger behavioural change, encourage households to construct their own latrines without external subsidies, and strengthen local leadership in sanitation enforcement. The framework also aims to build capacity of Environmental Health Officers (EHOs) to facilitate community mobilisation, monitor progress and support communities toward ODF status. Another key objective is to ensure sustainability by embedding sanitation by-laws within community structures and District Assemblies.

The CLTS framework has been instrumental in increasing sanitation coverage in rural areas. Research shows that CLTS interventions have led to significant reductions in open defecation in districts with strong follow-up mechanisms and committed local leadership (Osumanu & Kosoe, 2019). The framework has contributed to thousands of communities attaining ODF status nationwide, particularly in the Northern, Upper West and Upper East Regions. Development partners such as UNICEF, SNV and World Vision have used the CLTS guidelines to harmonise approaches, train facilitators and scale up community triggering.

In the Volta Region, CLTS has been widely implemented in Ho West, Adaklu and Agotime-Ziope Districts (Asare and Studies, 2017). Several communities in Ho West achieved temporary ODF status due to rigorous follow-up by Environmental Health Officers and strong traditional authority support. In Adaklu, the framework improved hygiene promotion and increased interest in latrine construction, although economic constraints limited long-term progress (Duku et al., 2025). Agotime-Ziope also recorded partial success, with some communities adopting improved sanitation behaviours after triggering.

Despite its wide application, the CLTS framework faces several challenges. One major limitation is the financial barrier households face in constructing durable latrines. Many rural households begin construction but are unable to complete latrines due to poverty, high cost of materials or technical constraints such as collapsing pits in waterlogged or unstable soils (Delaire et al., 2022). Behavioural relapse remains a challenge, especially in communities where post-triggering support is irregular or where community leadership changes.

District-level implementation gaps also affect outcomes. In many districts, including Adaklu and Agotime-Ziope, Environmental Health Units lack transport, logistics and adequate staffing to maintain consistent monitoring. Research shows that insufficient follow-up is strongly associated with slippage from ODF status (Crocker et al., 2017). Seasonal migration and dispersed settlement patterns also make community mobilisation difficult. Moreover, the absence of sanitation subsidies—while central to the CLTS philosophy—limits inclusion of the poorest households.

The CLTS policy framework has supported major gains in sanitation behaviour change, but sustaining these gains requires stronger district capacity, context-specific technical solutions and targeted support for vulnerable households.

2.2.5 A Comprehensive Review of Ghana's Water, Sanitation, and Hygiene (WASH) Sector Institutions

In examining the landscape of institutions contributing to Ghana's Water, Sanitation, and Hygiene (WASH) sector, it becomes evident that the country has indeed achieved noteworthy progress in expanding WASH access. However, concurrent challenges persist, prompting a comprehensive review of key institutions engaged in the delivery and regulation of WASH services. At the forefront of national WASH policy development and coordination is the Ministry of Sanitation and Water Resources (MSWR), which assumes a pivotal role in overseeing entities such as the Community Water and Sanitation Agency (CWSA) and Environmental Health (EH) (Oduro-Kwarteng et al., 2015). The MSWR takes charge of formulating national plans, exemplified by the Ghana Sanitation Master Plan (Ghana, 2005), and manages the allocation of resources within the sector.

The Community Water and Sanitation Agency (CWSA) emerges as a significant player, concentrating its efforts on rural and small-town water and sanitation initiatives. Utilizing community-led approaches like Community-Led Total Sanitation (CLTS), CWSA is instrumental in infrastructure development, capacity building, and the dissemination of hygiene education (Oduro-Kwarteng et al., 2015). Concurrently, Environmental Health (EH), which is situated under the Ministry of Local Government and Rural Development, is tasked with the responsibility of ensuring environmental sanitation compliance at the district level. This involves activities such as facility inspections, the promotion of hygiene practices, and the enforcement of sanitation regulations (Kabange, 2017).

The Ghana Water Company Limited (GWCL), primarily tasked with managing urban water supply, plays a crucial role in this multifaceted framework. While its focus is on water supply infrastructure, its collaboration with CWSA is integral for the integrated management of Water, Sanitation, and Hygiene (Awuah et al., 2009).

In terms of achievements, the concerted efforts of these institutions have resulted in notable progress. CWSA, for instance, has significantly contributed to the enhancement of rural water and sanitation coverage, with the implementation of CLTS proving successful in fostering open defecation-free communities (Ntow, 2019). Additionally, the MSWR's leadership has spearheaded the development of comprehensive WASH policies, thereby establishing clear goals and strategies for the sector (Ghana, 2005). Both CWSA and EH have emphasized community engagement, empowering residents to actively manage their WASH services (Engmen, 2023).

Despite these achievements, challenges persist and demand strategic interventions. Disparities between urban and rural areas in WASH access underscore the need for focused investments and tailored approaches, particularly in underserved regions (Kanyagui & Viswanathan, 2022). Sustainability concerns related to the operation and maintenance of WASH facilities pose challenges to the long-term success of interventions, necessitating a reevaluation of current practices (Mensah et al., 2022). Improved coordination between MSWR, CWSA, EH, and GWCL is deemed crucial for integrated WASH management and efficient resource allocation (Oduro-Kwarteng et al., 2015). The imperative of capacity building within WASH institutions is underscored, recognizing its pivotal role in effective policy implementation and the cultivation of technical expertise (Oduro-Kwarteng et al., 2015).

Furthermore, emerging issues such as climate change and non-household WASH, exemplified by healthcare and schools, demand innovative solutions and policy adaptations. This recognition aligns with the evolving landscape of challenges, emphasizing the need for dynamic and flexible policies that can address the complexities associated with contemporary WASH issues (Cronk, 2013; Ashinyo et al., 2021).

While Ghana has made commendable strides in the WASH sector, the outlined institutional dynamics and identified challenges emphasize the critical importance of continued and adaptive policy measures to ensure sustained progress and comprehensive WASH access throughout the nation.

2.2.6 The Connection between Water, Sanitation, and Well-being: A Review of SDGs 6 and 3

The pursuit of good health and well-being (SDG 3) is intricately interwoven with ensuring clean water and sanitation for all (SDG 6). This review, drawing on key studies, explores the symbiotic relationship between these Sustainable Development Goals, highlighting their interconnectedness and the vital role they play in building a healthier, more equitable future. Achieving progress on either SDG relies upon understanding their intricate links. As Fernandez (2020) and Nunes et al. (2016) emphasize, the SDGs are not isolated aspirations, but rather a network of interdependent goals. Access to safe water and sanitation forms the bedrock upon which good health and well-being can flourish (Fernandez, 2020); Nunes et al., 2016). Clean water and sanitation directly impact health outcomes across numerous domains. As Howden-Chapman et al. (2017) point out, they decrease childhood mortality from diarrheal diseases, reduce the burden of waterborne illnesses, and enhance maternal health (Howden-Chapman et al., 2017). Guégan et al. (2018) further highlight the impact on mental health, noting that poor sanitation can lead to anxiety and depression (Guégan et al., 2018).

The connections between water, sanitation, and well-being extend beyond direct health impacts. Das et al. (2021) point to the positive influence on education, as children are no longer burdened with fetching water or suffering from preventable illnesses (Das et al., 2021). Milan (2017) underlines the link to gender equality, as safe sanitation facilities empower women and girls by ensuring their safety and privacy (Milan, 2017).

Totin Vodounon et al. (2022) offer a compelling case study from Cotonou and Lomé, showcasing the critical role of understanding water and sanitation risks for enhancing health outcomes (Totin Vodounon et al., 2022). Similarly, Gimelli et al. (2019) demonstrate how improved water services in India contributed to improved well-being through the lens of the Fundamental Human Needs framework

Achieving both SDG 3 and 6 faces substantial challenges. Jobbins et al. (2018) highlight the complex dynamics of migration and its impact on water and sanitation access. Sweileh (2020) emphasizes the need for continued research and data analysis to track progress and inform interventions.

The interconnected nature of SDGs 6 and 3 demands an integrated approach. Collaborative efforts across sectors, including water management, sanitation, healthcare, and education, are crucial. Additionally, strengthening local governance and community engagement can ensure sustainable solutions that are responsive to specific needs. SDG 3 and SDG 6 are not independent destinations but interconnected pathways on the journey towards a healthy and well-being planet. By recognizing their inextricable link and fostering collaborative efforts, we can unlock the transformative potential of these goals, ensuring a future where clean water, sanitation, and good health are not privileges, but fundamental rights for all.

2.2.5.1 Government and Public Sector WASH Institutions

Government institutions play a central role in the planning, regulation and delivery of WASH services in Ghana. These institutions operate at different levels of governance and have distinct responsibilities that collectively shape access to water, sanitation and hygiene across the country. Their mandates cover policy formulation, standard setting, infrastructure development, monitoring, regulation and coordination. Understanding these institutions is essential for explaining disparities in WASH access, including those observed in districts such as Adaklu, Agortime-Ziope and Ho West.

- **Ministry of Sanitation and Water Resources (MSWR)**

The MSWR is the lead ministry responsible for policy direction, coordination and oversight of the sanitation and water sectors. The ministry works with both public and private actors to improve rural and urban WASH services. It formulates national policies such as the Environmental Sanitation Policy, National Water Policy, and the CLTS framework. The ministry also supervises agencies such as the Community Water and Sanitation Agency (CWSA) and the Ghana Water Company Limited (GWCL). Studies show that strong leadership from the MSWR has improved sector coordination, though implementation challenges remain at district level (Agyemang et al., 2020).

- **Community Water and Sanitation Agency (CWSA)**

CWSA oversees rural and small-town water systems. Its mandate includes providing technical support, developing infrastructure, ensuring water quality monitoring and strengthening management structures such as Water and Sanitation Management Teams (WSMTs). In 2017, CWSA transitioned from a facilitator to a service provider model to improve sustainability and professionalise rural water management (Adank & Tuffuor, 2013). In districts like Ho West and Adaklu, CWSA collaborates with District Assemblies to construct boreholes and small-town piped systems, although challenges such as high maintenance costs and limited community contributions persist.

- **Ghana Water Company Limited (GWCL)**

GWCL manages urban water supply systems. Although the study area is predominantly rural, peri-urban communities around Ho and Kpetoe depend on GWCL networks for treated water. GWCL is responsible for production, distribution, tariff setting and infrastructure maintenance, but service reliability varies due to ageing infrastructure and financial constraints (Nyarko et al., 2019).

- **Environmental Health and Sanitation Directorate (EHSD)**

The EHSD under the MSWR is responsible for sanitation planning, behaviour change promotion, environmental health regulation and oversight of Environmental Health Officers (EHOs) (Mariwah, 2022b). EHOs conduct community sensitisation, household inspections, CLTS triggering and by-law enforcement. In the Volta Region, limited logistics for EHOs affects the frequency of monitoring, which contributes to sanitation slippage, particularly in low-income districts such as Adaklu.

- **District Assemblies**

District Assemblies are central to WASH service delivery. They plan, budget for and implement water and sanitation activities through their Works Departments and Environmental Health Units. They also enforce sanitation by-laws and collaborate with NGOs to improve WASH conditions. However, research shows that Assemblies often suffer from inadequate funding, technical capacity gaps and delays in release of central government allocations (Oduro et al., 2018). These challenges contribute to persistent WASH deficits in rural districts such as Agortime-Ziope and Adaklu.

- **Water Resources Commission (WRC)**

WRC regulates and manages water resources, including rivers, groundwater and wetlands. It issues water use permits and monitors water quality and abstraction levels. In the Volta Region, the WRC's mandate is relevant due to increasing pressure on groundwater sources used for boreholes, particularly during dry seasons.

Collectively, these institutions form the backbone of WASH governance in Ghana. Their effectiveness directly influences household access to safe water, improved sanitation and hygiene services. However, disparities in institutional capacity between urban and rural areas remain a key barrier to achieving universal WASH access.

2.2.5.2 Private Sector Institutions in the WASH Sector

The private sector plays an increasingly important role in the delivery, financing and management of WASH services in Ghana (Deal and Sabatini, 2020). Private actors participate in water production and distribution, sanitation infrastructure development, waste collection, hygiene product manufacturing and technology innovation. Their involvement complements government efforts by filling service delivery gaps, expanding coverage and providing specialised expertise that public institutions may lack. Private contractors are commonly engaged in drilling boreholes, constructing small-town water systems and maintaining mechanised water installations. These companies provide technical services that District Assemblies and CWSA cannot independently deliver due to limited capacity. In districts such as Adaklu and Agortime-Ziope, private drilling firms support the installation and rehabilitation of boreholes, which serve as the main sources of drinking water. Studies note that private participation has improved efficiency in rural water infrastructure delivery, although quality oversight remains essential (Bukari et al., 2022).

Private-sector actors are also involved in the provision of sanitation services. This includes companies that construct household latrines, desludge septic tanks, transport faecal sludge and operate treatment facilities. Entrepreneurs have introduced low-cost latrine designs and sanitation marketing approaches that support the objectives of CLTS and the Rural Sanitation Model and Strategy. In urban centres, private waste management companies such as Zoomlion Ghana Ltd. play major roles in refuse collection, and disposal, while service coverage in rural communities remains limited due to low revenue potential(Enbonzumah, 2016) . Small-scale artisans in the Volta Region nevertheless contribute to latrine construction using locally available materials. The supply of hygiene and behaviour change products represents another area of private-sector involvement. Manufacturers and distributors of hygiene products, such as soap, hand-washing stations and menstrual hygiene materials, expanded their role during the COVID-19 pandemic when demand for hand-washing facilities increased (Amuakwa-Mensah et al., 2021). In the study districts, local artisans and vendors supply Veronica buckets and tippy taps for use in households, schools and markets.

Private-sector engagement also extends to financing arrangements and public–private partnerships. Private financing through PPPs supports water infrastructure development, especially in peri-urban and small-town systems. These arrangements help bridge funding gaps in the national WASH budget by leveraging private capital for the construction, rehabilitation and management of water systems. Research indicates that PPP implementation in Ghana faces challenges related to unclear contracts, weak regulation and delays in payment by Assemblies, which limit private investment in rural districts (Ainuson, 2010). The scope of private-sector involvement in WASH is shaped by several structural and operational constraints. Low profitability in sparsely populated rural areas limits private engagement, while high operational costs, low household ability to pay and inadequate regulatory oversight further constrain sanitation service provision. Challenges related to water quality testing and adherence to technical standards affect the sustainability of some water points. In districts such as Adaklu, poor road accessibility during the rainy season also hinders the transport of materials and equipment by private operators.

The private sector plays a complementary role in WASH service delivery by providing technical expertise, infrastructure and innovative products. Strengthening regulation, improving payment systems and supporting local entrepreneurs can enhance their contribution to rural WASH outcomes.

2.2.5.3 Role of NGOs in WASH Delivery in Ghana

Non-governmental organisations (NGOs) play an important role in improving WASH access in Ghana, particularly in rural and underserved communities where government resources are limited. NGOs support WASH service delivery through infrastructure development, hygiene promotion, behaviour change communication, capacity building, and policy advocacy (Bukari et al., 2023). Their interventions often target vulnerable populations and help bridge gaps in funding, logistics and technical expertise. Many NGOs contribute to the construction and rehabilitation of boreholes, hand-dug wells and small-town water systems. Organisations such as World Vision, Safe Water Network, WaterAid and PLAN International have implemented large-scale water projects across the country. Their work includes drilling new boreholes, repairing broken systems and training community management teams (Angmor, 2020). In the Volta Region, several NGOs have supported borehole rehabilitation and the installation of hand pumps in Ho West and Adaklu, improving access to safe drinking water in communities that previously relied on surface sources. Studies show that NGO-led water projects often achieve higher functionality rates due to better monitoring and community engagement (Fidalgo et al., 2018). NGOs are also central to sanitation and hygiene promotion, particularly through the implementation of Community-Led Total Sanitation (CLTS) and related behaviour change approaches. Organisations such as UNICEF, SNV and Global Communities have supported the rollout of CLTS in many districts. They provide training for Environmental Health Officers, facilitate triggering in communities and supply technical guidance on low-cost latrine options. In Agortime-

Ziope and Adaklu, NGO-led CLTS programmes have helped reduce open defecation through intensive follow-up and community mobilisation. NGO involvement is often associated with higher ODF attainment rates because financial and logistical support is provided for post-triggering monitoring (Crocker et al., 2017).

Capacity building and institutional strengthening form another area of NGO engagement. NGOs provide training to District Assemblies, Water and Sanitation Management Teams (WSMTs), school health clubs and local artisans. These activities enhance planning, record keeping, tariff setting and infrastructure maintenance. Training artisans to construct durable latrines addresses technical gaps that often lead to pit collapse and sanitation slippage in districts such as Adaklu. NGOs also support schools through the provision of WASH facilities, menstrual hygiene management programmes and hygiene education materials. NGOs further engage in advocacy and policy dialogue within the WASH sector. Several participate in platforms such as the National Level Learning Alliance Platform (NLLAP) and coalition groups including CONIWAS. Through these mechanisms, NGOs advocate for increased government investment in sanitation, stronger regulatory enforcement and equitable allocation of WASH resources. Their research and field evidence contribute to national discussions on CLTS, rural water management and sanitation financing (Oduro-Kwarteng et al., 2015).

The effectiveness of NGO interventions is, however, shaped by a number of operational challenges. Project-based funding cycles limit the duration of many interventions, and progress may decline after project completion where District Assemblies lack resources for follow-up. In some communities, perceptions of NGOs as providers of free services weaken community ownership and willingness to contribute to maintenance. In the study districts, inconsistent coordination between NGOs and District Assemblies results in duplication of efforts or gaps in service delivery.

NGOs significantly strengthen WASH outcomes in Ghana by complementing government efforts, improving community engagement and addressing gaps in infrastructure and behaviour change. Their presence is especially impactful in rural areas where public-sector capacity is limited (Adorsu-Djentuh, 2018a).

2.2.5.4 Community-Based Organisations (CBOs) and Local Structures

Community-Based Organisations (CBOs) and local leadership structures play an important role in WASH delivery, especially in rural communities where formal institutions may have limited reach. These groups operate at the grassroots level and are involved in community mobilisation, behaviour change communication, monitoring of WASH facilities, and enforcement of local by-laws (Iddrisu, 2025). Their work supports government and NGO interventions by ensuring community ownership and long-term sustainability of WASH services (Alexander et al., 2015). At the community level, CBOs such as Water and Sanitation Management Teams (WSMTs), School Management Committees (SMCs), Parent–Teacher Associations (PTAs), and local sanitation committees help mobilise households to participate in WASH activities (Akanchalabey, 2015). They organise community meetings, sensitisation campaigns and clean-up exercises. During CLTS implementation, local committees often lead post-triggering monitoring and encourage households to complete latrine construction. Studies show that strong community structures are associated with higher sanitation adoption and lower slippage (Hater et al., 2020).

Management of communal water facilities is also undertaken by local structures in the study districts. WSMTs in Ho West and Adaklu collect tariffs, conduct minor repairs and report breakdowns to the District Assembly or CWSA. Traditional leaders influence community norms related to hygiene and environmental cleanliness, and their involvement often strengthens compliance with sanitation by-laws. Routine operation and maintenance of WASH facilities are supported by local WASH committees and artisans (Kakam, 2020). Community caretakers monitor borehole functionality, ensure proper record keeping and facilitate routine maintenance. In rural communities where access to spare parts and technical specialists is limited, local structures reduce downtime by identifying faults early and coordinating repairs. Research indicates that communities with active WSMTs or sanitation committees demonstrate better facility functionality and hygiene practices (Mariwah et al., 2017).

Local leadership structures further support WASH service delivery through social accountability and behaviour regulation. Traditional authorities, assembly members and unit committees promote behaviour change and enforce community norms. Traditional leaders in the Volta Region use local platforms, such as durbars and festivals, to advocate for improved sanitation, reinforcing the abandonment of open defecation and the adoption of household latrines. Assembly members serve as a link between communities and District Assemblies by communicating WASH needs and supporting project implementation.

The contribution of CBOs and local structures is, however, constrained by several capacity-related challenges. Many committees lack training in financial management, record keeping and technical aspects of water system maintenance. Volunteer fatigue occurs where financial incentives are absent. In Adaklu and Agortime-Ziope, low literacy levels among committee members hinder effective management of water systems. Inconsistent support from District Assemblies weakens committee performance, leading to lapses in monitoring and poor sustainability of WASH facilities. Internal conflicts and weak leadership structures further affect cohesion and long-term commitment.

The CBOs and local structures play a vital role in sustaining WASH services, promoting hygiene behaviours and ensuring community participation. Strengthening their capacity through training, logistics and consistent district-level support is crucial for improving WASH outcomes in rural communities (Adzimah, 2022).

2.2.5.5 Civil Society Organisations (CSOs) and Advocacy Groups

Civil Society Organisations (CSOs) and advocacy groups play a significant role in strengthening governance, accountability and community participation in the WASH sector in Ghana. Their work complements government and NGO interventions by promoting inclusive policies, monitoring service delivery and amplifying the voices of marginalised groups (Smith et al., 2020). CSOs contribute to the national WASH ecosystem through research, advocacy, capacity building and social mobilisation. One key area of CSO engagement is advocacy and policy dialogue. CSOs such as the Coalition of NGOs in Water and Sanitation (CONIWAS), Integrated Social Development Centre (ISODEC), Water Citizens Network and SEND Ghana actively participate in national policy dialogues (Grant et al., 2016). Through platforms such as the Mole Conference Series and the National Level Learning Alliance Platform (NLLAP), these organisations advocate for increased budget allocations, transparent decision-making and equitable WASH services (CONIWAS, 2021). Their advocacy has influenced national discussions on sanitation financing, pro-poor targeting and the need for stronger regulation of water service providers.

In addition to policy advocacy, CSOs play an important role in monitoring and promoting social accountability within the WASH sector. They contribute through monitoring and citizen-led assessments, including budget tracking, community scorecards and service delivery surveys that highlight discrepancies between policy intentions and actual outcomes (Gildemyn, 2014). These findings often inform parliamentary debates, ministerial reviews and donor decisions. Research shows that CSO-led monitoring has improved responsiveness in the WASH sector by exposing gaps in rural water supply functionality and sanitation enforcement (Ohemeng and Ayee, 2024). In the Volta Region, local CSOs and community advocacy groups engage District Assemblies on issues such as borehole breakdowns, sanitation enforcement and poor waste management. Their involvement helps ensure that WASH services in districts like Adaklu and Agotime-Ziope reflect community needs.

Beyond monitoring and advocacy, CSOs are also active in community-level social mobilisation and behaviour change. They mobilise communities for clean-up campaigns, hygiene promotion, menstrual hygiene management awareness and CLTS activities (WHO, 2015). They support schools, churches and youth groups in adopting hygiene behaviours such as hand-washing and latrine use. In Ho West, for example, community advocacy groups have facilitated hygiene education in basic schools and market centres, complementing district-led programmes. CSOs further contribute through capacity building and targeted support for vulnerable groups. Several provide training to community groups, artisans, women's associations and local leaders. They also work with vulnerable populations, such as persons with disabilities, women and children, to ensure that WASH services are accessible and inclusive. Their interventions help reduce inequalities in access, which remain a major challenge in rural Ghana (Abubakari et al., 2021).

Despite these contributions, CSOs face several challenges that limit their effectiveness and sustainability. They face funding constraints, short project cycles and limited influence in some policy spaces. Coordination challenges sometimes arise between CSOs and District Assemblies, leading to duplication of activities. In rural districts with limited media presence, CSO advocacy may not reach a large audience. Additionally, some advocacy groups depend heavily on donor funding, making long-term sustainability uncertain.

The CSOs and advocacy groups are thus essential partners in improving WASH governance, promoting accountability and supporting inclusive service delivery across Ghana.

2.2.5.6 Development Partners Supporting WASH in Ghana

Development partners are vital contributors to Ghana's WASH sector, providing financial support, technical assistance, capacity building and policy guidance (Ntow, 2019a). Their interventions help address gaps in national and district-level resources, especially in rural areas where access to improved water, sanitation and hygiene remains low. Development partners collaborate closely with government institutions, NGOs, District Assemblies and communities to implement WASH projects and strengthen institutions responsible for service delivery. In practical terms, this support is reflected in both financial and technical interventions across the country (Hushie, 2018). Major development partners working in Ghana's WASH sector include UNICEF, the World Bank, USAID, the African Development Bank (AfDB), the Netherlands Development Organisation (SNV), JICA, WaterAid and the European Union. These organisations fund large-scale programmes in rural water supply, urban sanitation, behaviour change communication and institutional strengthening (Ntow, 2019b). Their interventions often focus on underserved and rural districts, helping to increase infrastructure investments and improve service delivery standards. For example, World Bank programmes have supported borehole construction, small-town piped systems and water quality monitoring across the Volta Region (World Bank, 2018).

Beyond infrastructure development, development partners also support rural sanitation and behaviour change initiatives. They play a key role in the implementation of CLTS and other behaviour change approaches (Asantewaa-Tannor, 2024a). UNICEF and SNV have supported District Assemblies with logistics, facilitator training, post-triggering follow-up and monitoring systems that help communities achieve Open Defecation Free (ODF) status (Asantewaa-Tannor, 2024b). In the study districts of Adaklu, Agotime-Ziope and Ho West, development partners have facilitated triggering exercises, provided training for Environmental Health Officers and supported the construction of low-cost household latrines. Their involvement has strengthened District Assemblies' capacity to implement the Rural Sanitation Model and Strategy.

In addition to programme implementation, development partners place strong emphasis on institutional strengthening and capacity building. Many invest in strengthening public-sector institutions (Barima and Farhad, 2013). (They support the Community Water and Sanitation Agency (CWSA), Environmental Health and Sanitation Directorate (EHSD), and District Assemblies through training, development of guidelines, provision of digital tools for monitoring and the establishment of Water and Sanitation Management Teams. This capacity-building helps improve planning, reporting and sustainability of WASH services (African Development Bank, 2020). Capacity-building interventions are especially important in low-resource districts such as Adaklu, where technical gaps affect water system functionality and sanitation enforcement. Development partners also contribute to the generation and use of evidence to inform sector decision-making (Kamruzzaman and Kumi, 2023). They contribute significantly to WASH sector research, monitoring and evaluation. Their studies inform policy development, sector performance reviews and national investment planning. For example, UNICEF and the World Bank have conducted nationwide assessments of sanitation financing, WASH infrastructure functionality and rural water sustainability (Adorsu-Djentuh, 2018b). They also support the implementation of the National WASH Management Information System (WASH MIS), which enhances data availability for planning at the national and district levels.

Despite these contributions, concerns remain regarding sustainability and dependence on external funding. The WASH sector faces challenges related to overreliance on donor funding. Some programmes experience delays when donor priorities change or funding cycles end. Districts such as Agotime-Ziope have experienced stagnation in sanitation activities after external projects ended. Additionally, alignment between donor projects and national priorities is not always perfect, sometimes leading to duplication or fragmentation of efforts. To address these issues, sector-wide coordination platforms such as the Annual WASH Sector Review Meetings have been established (Göransson et al., 2020).

Therefore, development partners are instrumental in expanding WASH infrastructure, supporting behaviour change and strengthening institutional capacity. Their continued collaboration with government and NGOs remains essential for improving WASH outcomes in rural Ghana.

2.2.6 The Connection between Water, Sanitation, and Well-being: A Review of SDGs 6 and 3

The pursuit of good health and well-being (SDG 3) is intricately interwoven with ensuring clean water and sanitation for all (SDG 6) (Ametepey, 2022). This review, drawing on key studies, explores the symbiotic relationship between these Sustainable Development Goals, highlighting their interconnectedness and the vital role they play in building a healthier, more equitable future. Achieving progress on either SDG relies upon understanding their intricate links. As Fernandez (2020) and Nunes et al. (2016) emphasize, the SDGs are not isolated aspirations, but rather a network of interdependent goals. Access to safe water and sanitation forms the bedrock upon which good health and well-being can flourish (Fernandez, 2020); Nunes et al., 2016). Clean water and sanitation directly impact health outcomes across numerous domains. As Howden-Chapman et al. (2017) point out, they decrease childhood mortality from diarrheal diseases, reduce the burden of waterborne illnesses, and enhance maternal health (Howden-Chapman et al., 2017). Guégan et al. (2018) further highlight the impact on mental health, noting that poor sanitation can lead to anxiety and depression (Guégan et al., 2018).

The connections between water, sanitation, and well-being extend beyond direct health impacts. Das et al. (2021) point to the positive influence on education, as children are no longer burdened with fetching water or suffering from preventable illnesses (Das et al., 2021). Milan (2017) underlines the link to gender equality, as safe sanitation facilities empower women and girls by ensuring their safety and privacy. Totin Vodounon et al. (2022) offer a compelling case study from Cotonou and Lomé, showcasing the critical role of understanding water and sanitation risks for enhancing health outcomes. Similarly, Gimelli et al. (2019) demonstrate how improved water services in India contributed to improved well-being through the lens of the Fundamental Human Needs framework.

Achieving both SDG 3 and 6 faces substantial challenges. Jobbins et al. (2018) highlight the complex dynamics of migration and its impact on water and sanitation access. Sweileh (2020) emphasizes the need for continued research and data analysis to track progress and inform interventions.

The interconnected nature of SDGs 6 and 3 demands an integrated approach. Collaborative efforts across sectors, including water management, sanitation, healthcare, and education, are crucial. Additionally, strengthening local governance and community engagement can ensure sustainable solutions that are responsive to specific needs. SDG 3 and SDG 6 are not independent destinations but interconnected pathways on the journey towards a healthy and well-being planet. By recognizing their inextricable link and fostering collaborative efforts, we can unlock the transformative potential of these goals, ensuring a future where clean water, sanitation, and good health are not privileges, but fundamental rights for all.

2.2.6 Adapting Community-Led Total Sanitation (CLTS) for Improved Sanitation Coverage in Ghana

Ghana grapples with a persistent sanitation challenge common among many developing nations—open defecation poses a significant threat to public health and hygiene. In response, Community-Led Total Sanitation (CLTS) has emerged as a promising approach to attain Open Defecation-Free (ODF) status in communities. This review delves into the adaptations Ghana has made to the CLTS model, scrutinizing successes, challenges, and avenues for further improvement. Ghanaian CLTS implementation centers on community mobilization, utilizing triggering techniques to instill shame and disgust regarding open defecation, and facilitating the construction of latrines.

However, distinctive adaptations have been introduced to the original CLTS framework. Notably, Ghana places a pronounced emphasis on social cohesion, prioritizing the cultivation of strong social bonds within communities by leveraging existing chieftaincy structures and social norms to promote collective action (Adzimah, 2022; Crocker et al., 2016). Additionally, CLTS in Ghana is integrally linked with national sanitation initiatives such as the National Toilet Campaign and the Ghana Sanitation Master Plan, ensuring both financial and logistical support (Tsekpetse-Akuamoah et al., 2022). Moreover, recognizing economic constraints, Ghanaian CLTS promotes simple and affordable latrine designs, ensuring accessibility even for the most vulnerable populations (Crocker et al., 2017).

The successes of these adaptations are evident in the research findings. Harter et al. (2020) report a substantial 67.6% increase in latrine coverage following CLTS interventions in Ghana, while studies by Lawrence et al. (2016) underscore positive shifts in community attitudes and behaviors towards sanitation (Harter et al., 2020; Lawrence et al., 2016). Mumin et al. (2023) contribute to the discourse by highlighting the successful application of CLTS principles in the often-neglected urban sanitation context.

However, persistent challenges threaten to undermine these successes. Kouassi et al. (2023) caution against "slippage," wherein communities regress from ODF status to open defecation. Factors contributing to this phenomenon include inadequate post-triggering support, insufficient hygiene promotion, and limited resources for latrine construction (Harter et al., 2019; Tribbe, 2022).

Drawing from the reviewed literature, several recommendations for further improvement emerge. Strengthening post-triggering support is identified as crucial, emphasizing the need for continuous guidance beyond the initial triggering phase to ensure sustained ODF status (Harter et al., 2020). Equitable access to sanitation is underscored by a focus on gender and marginalized groups, necessitating specific interventions addressing the needs of women, girls, and vulnerable populations (Venkataramanan et al., 2018). Additionally, investing in robust monitoring and evaluation is advocated to track progress, identify challenges, and inform adaptations of CLTS interventions (Zuin et al., 2019). Lastly, promoting knowledge sharing and learning is essential, facilitating the continuous exchange of experiences and best practices between Ghanaian communities and other CLTS practitioners for optimized and sustained success (Chambers, 2009).

Ghana's adaptation of CLTS has undeniably enhanced sanitation coverage and transformed community attitudes towards hygiene. Addressing remaining challenges through targeted interventions, ongoing support, and knowledge sharing can further solidify Ghana's progress towards a universally ODF future. By drawing lessons from Ghana's successes and challenges, other countries can optimize CLTS for their specific contexts, fostering improved sanitation and public health on a global scale.

2.3 Theoretical Framework

2.3.1 The Social Ecological Model

The Social Ecological Model can be used to construct a complete theoretical framework for the study of WASH facilities and their impact on communities (SEM). The SEM is a theoretical framework that considers individual behavior as being impacted by the interaction of several elements at various levels, such as individual, interpersonal, communal, and societal forces (McLeroy et al., 1988).

The study's specific objectives can be transferred onto multiple SEM levels. Understanding the availability and accessibility of WASH facilities at the community level is the first objective of analyzing the availability and accessibility of water facilities and their quality. The second purpose of identifying households, schools and health facilities that have adopted enhanced WASH facilities can be located at the individual level, since it seeks to comprehend the individual adoption behaviors of households, schools and health facilities. The third objective of examining WASH facilities usage can be positioned at both the individual and community levels, since it entails studying the individual and communal effects of WASH facility use on health, economic productivity, and social well-being. The fourth objective of examining causes contributing to ODF relapse can be positioned at the community level, as it entails gaining an awareness of the community dynamics and maintenance factors that influence the sustainability of ODF status.

Research by Biran et al. (2010) highlighting the influence of social norms and community dynamics on the utilization of sanitary facilities is one of the sources from the examined studies that support the use of the SEM. The study by Quansah et al. (2020) likewise emphasizes the role of social and cultural elements on the adoption and maintenance of WASH facilities, whereas the study by Tom et al. (2018) emphasizes the significance of infrastructure maintenance and community participation in maintaining ODF status.

The SEM provides a comprehensive and holistic framework for comprehending the intricate interaction of factors that influence the adoption, maintenance, and sustainability of WASH facilities. Its strengths lie in its understanding of the significance of numerous levels of influence on behavior and its emphasis on these levels' interconnectedness. In addition, it recognizes the significance of context-specific elements in affecting behavior, making it a useful framework for comprehending the unique problems and possibilities communities face in the adoption and maintenance of WASH facilities.

2.3.2 Theory of Planned Behaviour and WASH Practices

The Theory of Planned Behaviour (TPB), developed by Ajzen (1991), explains how individual behaviours are shaped by three main factors: attitudes, subjective norms and perceived behavioural control. The model is widely used to understand behaviour change in health, sanitation and hygiene interventions. In WASH research, TPB provides a useful framework for examining why households adopt or fail to adopt practices such as hand-washing, latrine use, safe water handling and participation in community sanitation initiatives.

Attitudes refer to an individual’s beliefs about the benefits or disadvantages of performing a behaviour. In the context of sanitation, households with positive attitudes toward latrine ownership or hand-washing are more likely to adopt and sustain these behaviours. Studies in Ghana and other low-income settings show that households are more willing to build and use latrines when they perceive them as improving dignity, privacy, safety and convenience (Novotný et al., 2018). In districts such as Adaklu and Agotime-Ziope, positive attitudes toward improved sanitation are often constrained by economic hardship, limiting the translation of intentions into action.

Subjective norms refer to perceived social pressure to perform or not perform a behaviour. Social approval from family members, neighbours, community leaders and religious groups plays a major role in sanitation adoption. CLTS interventions, which rely on collective decision-making and community shame or pride, draw heavily on social norms to discourage open defecation. Research shows that communities with strong social cohesion are more likely to adopt improved sanitation practices and sustain ODF status (Alhassan and Anyarayor, 2018). In the Volta Region, traditional leaders and assembly members influence norms around cleanliness, waste disposal and latrine use, making social pressure an important determinant of WASH behaviour.

Perceived behavioural control refers to an individual's belief in their ability to carry out a behaviour. This includes both the availability of resources and the confidence to perform the behaviour. In many rural Ghanaian communities, low perceived control limits sanitation adoption. Households often believe they lack the money, materials or technical skills needed to construct a latrine. Environmental constraints—such as unstable soils or frequent flooding in some parts of Adaklu—also reduce perceived control. Studies show that when households receive guidance on low-cost latrine designs or access local artisans, their perceived control improves, increasing likelihood of adoption (Dreibelbis et al., 2016).

TPB helps explain behavioural factors influencing WASH outcomes in the study area. Many households express willingness to adopt improved sanitation but are constrained by limited resources or weak social norms supporting latrine use. Understanding these motivational and normative factors is essential for interpreting the findings of the study and for designing interventions that go beyond infrastructure provision. TPB complements structural perspectives by highlighting the role of individual and social factors in shaping WASH behaviour.

2.3.3 Accessibility Theory and Access to WASH Services

Accessibility Theory examines how physical, economic and social factors influence individuals' ability to obtain essential services. In the context of WASH, the theory helps explain disparities in access to water, sanitation and hygiene facilities by analysing the interplay between spatial distribution, affordability, availability and user characteristics. It is particularly relevant in rural Ghana, where geographic isolation, poverty and infrastructural deficits significantly shape household access to WASH services.

Physical accessibility refers to the ease with which people can reach water sources, sanitation facilities or hygiene services. Distance, terrain and environmental conditions are central determinants. In rural communities, long walking distances to water points reduce water quantity used per person and increase the burden on women and children, who are primarily responsible for water collection. Studies show that households located more than 30 minutes from improved water sources are less likely to meet recommended per capita water use for hygiene and consumption (WHO/UNICEF, 2021). In the study districts—Adaklu, Agotime-Ziope and Ho West—scattered settlements and poor road infrastructure often limit proximity to improved water and sanitation services.

Economic accessibility concerns the ability of households to afford WASH services. This includes the cost of constructing latrines, paying water tariffs, purchasing hygiene products or maintaining water systems. Accessibility Theory highlights that even when services exist, households may not be able to use them due to financial barriers. In many rural districts, low-income households delay latrine construction or depend on unsafe water sources because they cannot afford connection fees or maintenance costs. Research in Ghana confirms that financial constraints are major predictors of sanitation adoption, particularly in low-income communities (Brown et al., 2016).

Availability refers to whether WASH services exist within reasonable reach, while reliability concerns the consistency and quality of those services. Unreliable boreholes, seasonal water scarcity and frequent breakdowns reduce access even when infrastructure is present. In Adaklu District, for example, some communities rely on boreholes that dry up during the dry season, forcing households to revert to unprotected sources. Accessibility Theory helps frame these challenges by emphasising the need for sustained service delivery rather than mere physical presence of infrastructure.

Social accessibility encompasses cultural norms, gender roles and community hierarchies that influence use of WASH services (Nunbogu et al., 2023). Institutional accessibility includes the effectiveness of local governance structures, availability of technical support and enforcement of sanitation by-laws. Accessibility Theory acknowledges that even when households desire improved WASH services, access may be blocked by weak institutions or social norms that discourage specific practices (Bhakta, 2019). In Agotime-Ziope, for instance, traditional beliefs and land tenure systems influence where and how latrines can be built.

Accessibility Theory aligns closely with the determinants explored in this study, including proximity to water sources, household income, environmental conditions and institutional support. It provides a useful lens for understanding why WASH disparities persist across the three districts, despite national policies and interventions. By incorporating spatial, economic and institutional dimensions, the theory helps explain both the structural and behavioural barriers to achieving universal WASH access.

2.3.4 Integrating Theories for Understanding WASH Access

Understanding access to WASH services requires more than a single theoretical perspective. Integrating the Social Ecological Model (SEM), the Theory of Planned Behaviour (TPB) and Accessibility Theory provides a comprehensive framework that captures the multiple factors influencing WASH outcomes at individual, community and institutional levels. These theories complement each other and help explain why disparities in water, sanitation and hygiene persist in rural districts such as Adaklu, Agotime-Ziope and Ho West.

SEM and Accessibility Theory emphasise structural determinants such as environmental conditions, distance to facilities, and availability of infrastructure, income levels and institutional capacity. These structural factors often shape the enabling environment necessary for WASH adoption. For instance, when boreholes are located far from households or latrine construction is too costly, behavioural intentions alone are insufficient to ensure adoption. In contrast, TPB focuses on individual motivations—attitudes, social norms and perceived control. Integrating these theories allows the study to account for both the structural barriers and the personal or social drivers of WASH behaviour.

Together, the theories explain how context influences individual decisions. SEM highlights the role of community structures, traditional leadership and cultural norms, while TPB explains how these norms translate into social pressure and behavioural intentions. In the study districts, traditional leaders often influence sanitation norms, and this aligns with TPB's emphasis on subjective norms. Accessibility Theory adds another layer by explaining how environmental factors—such as soil type or settlement patterns—affect the feasibility of adopting improved sanitation. Together, these theories help explain why some communities achieve Open Defecation Free (ODF) status while others do not (Mahama, 2013).

Integrating the theories strengthens the ability to analyse inequities in WASH access. Structural inequalities, including differences in district-level budgets, road quality and geographic isolation, affect service availability and affordability. Behavioural theories help explain variation within communities, such as differences in latrine use among households facing similar structural conditions. This integrated perspective is important for interpreting results that show varying WASH outcomes across Adaklu, Agotime-Ziope and Ho West.

The combined theoretical lens supports the design of interventions that address both supply and demand factors. Structural interventions may include drilling boreholes, subsidising latrine construction, or improving monitoring systems. Behavioural components may involve hygiene promotion, community mobilisation, or influencing social norms through CLTS. Research shows that programmes addressing both structural and behavioural factors achieve more sustainable outcomes than interventions focusing on only one dimension (Dreibelbis et al., 2016).

The integration of SEM, TPB and Accessibility Theory aligns well with the study's objectives, which examine household characteristics, environmental conditions, institutional influences and behavioural factors affecting WASH access. Using multiple theories enhances the interpretation of data and provides a stronger conceptual justification for the relationships examined in the study.

2.4 Assessment of Water Facilities, Availability, and Accessibility: Insights from Recent Studies

Clean water access is a fundamental human right with far-reaching implications for public health, economic prosperity, and social development. (Quansah et al. 2025). Nevertheless, many communities, particularly in low- and middle-income nations, face considerable obstacles in gaining access to safe and dependable water services. The purpose of this section is to examine contemporary studies that evaluate the availability and accessibility of water facilities, including the kind and quality of water sources and the amount of coverage in certain districts. The section synthesizes findings from a variety of studies that study various elements of water availability and accessibility in diverse circumstances.

2.4.1 Overview of Water Availability and Accessibility

The accessibility and availability of water are crucial determinants of public health and well-being. According to the World Health Organization (WHO), more than two billion people lack access to adequate drinking water, resulting in around 485,000 diarrhea-related deaths annually. Inadequate water supply and sanitation facilities have a disproportionately negative impact on women and girls, who shoulder the task of gathering water for home consumption, resulting in diminished chances for education, work, and social participation.

Water availability refers to the quantity of water available for human use, whereas water accessibility refers to the ease with which water can be obtained from a source. The World Health Organization (WHO) defines improved water sources as those that are protected from external pollution and supply at least 20 liters of water per person per day within one kilometer of the user's residence. However, the sheer presence of improved water sources does not ensure access to safe and dependable water, as water quality, price, and dependability are also crucial concerns.

2.4.2 Assessment of Water Availability and Accessibility: Insights from Recent Studies

Diverse studies have evaluated the availability and accessibility of water facilities in a variety of contexts, revealing the obstacles and opportunities for enhancing water supply and sanitation systems.

2.4.2.1 Water Sources and Quality

Water source and quality are essential components of assessments of water availability and accessibility. Different water sources, such as surface water, groundwater, and precipitation, have varying characteristics and are susceptible to varying sources of contamination, which can negatively impact the health of those who drink it (Quansah et al. 2025). Consequently, evaluating water quality is essential for establishing if water is safe for human consumption. Numerous studies have assessed the quality of water sources in different regions. Abebe et al. (2020), for example, evaluated the physico-chemical and bacterial quality of groundwater sources in rural Ethiopia. The study indicated that 83.3 percent of groundwater sources exceeded the World Health Organization's permitted levels of bacterial contamination (WHO). In addition, the study determined that the water's physic-chemical quality was typically adequate for home usage. Even while groundwater sources are accessible, the quality of the water may not be safe for human use, according to the study.

Similarly, Ishaq et al. (2022) evaluated the quality of surface water in Pakistan's Peshawar district. The research determined that the water was contaminated with high amounts of microorganisms which may impact human health with water related diseases. The study also discovered that water quality declined during the monsoon season, demonstrating that seasonal fluctuations can influence water quality. The results indicate that the kind of water source can have a substantial effect on water quality and the health of individuals who consume it. Muli et al. (2023) investigated the quality of rainwater harvesting systems in rural Kenya in another study. With modest levels of bacterial contamination, the study determined that the water quality was typically appropriate for home use. The study discovered, however, that the water quality decreased over time, with higher levels of bacterial contamination during the wet season. The research indicates that rainwater harvesting systems can provide a dependable water source in locations where other sources are sparse. However, routine maintenance is required to ensure that the water is safe for consumption.

The quality of water sources is a key determinant of the safety and dependability of drinking water. Mahapatra et al. (2020) evaluated the physiochemical and bacterial quality of rural groundwater sources in Odisha, India. Over 70 percent of the examined groundwater samples exceeded the allowed limits for at least one physiochemical characteristic, indicating contamination by agricultural and industrial operations, according to the report. Additionally, almost 20% of the samples had coliform bacteria, indicating fecal contamination. The report emphasizes the necessity for enhanced monitoring and management of groundwater sources to guarantee safe drinking water.

Olaniran et al. (2020) investigated the microbiological quality of several water sources in selected Nigerian rural villages. The study found that surface water sources, such as streams and ponds, were more contaminated with bacteria than groundwater sources, such as boreholes and wells. In addition, the prevalence of waterborne diseases such as diarrhea and cholera were higher in areas that relied on surface water sources, according to the study. To lower the risk of waterborne infections, the study underlines the significance of promoting the use of improved water sources and improving water treatment and storage techniques.

A significant part of the availability and accessibility of water facilities is the quality of water sources. Water quality is a major concern in many regions of the world due to contamination by pollutants, which can cause waterborne diseases. Mukuka et al. (2025) discovered in Zambia that most water sources in the study region were polluted with fecal coliforms, a kind of bacterium that can cause diarrheal illnesses. The study emphasizes the importance of water quality monitoring and treatment to provide safe drinking water.

Guo et al. (2021) evaluated the bacteriological quality of drinking water in Tanzania in a separate study. Most water sources in the research area contained high levels of total coliforms and E. coli, which are markers of fecal pollution, according to the study. In addition, the study discovered that the risk of contamination was greater in rural regions than in urban ones, and that the quality of water from boreholes was generally superior to that from surface water sources. To lower the risk of waterborne infections, the findings indicated a need for increased investment in water treatment facilities and enhanced sanitary infrastructure.

In terms of evaluating the availability and accessibility of water facilities, the quality of water sources is a crucial component. Although some water sources may be accessible, the water quality may not be fit for human consumption. Consequently, it is essential to constantly evaluate the quality of water sources to guarantee that the water is safe for human consumption.

2.4.2.2 Extent of Water Supply and Sanitation Infrastructure Coverage

Coverage of water supply and sanitation infrastructure is an additional crucial aspect of providing water accessibility. Khanna et al. (2025) examined the distribution of water supply and sanitation services in Delhi, India's urban slums. The study revealed that only 47 percent of homes have access to piped water supplies, with the remainder relying on informal sources such as public taps, wells, and water tankers. Only 25% of homes have washrooms, the study revealed. The study emphasizes the importance of enhancing the coverage and quality of water supply and sanitation services in urban slums to enhance public health and well-being.

Multiple studies have found variable degrees of coverage in various sub-Saharan African regions. According to a study by Mekonnen and Hoekstra (2016), only 61% of the sub-Saharan African population had access to improved drinking water sources in 2010. Another survey by Mengistu et al. (2021) indicated that 42.3 percent of rural Ethiopia has access to upgraded water sources. In contrast, Osei and Yeboah-Assiamah (2020) found that 91.6% of Ghana's metropolitan regions had access to improved water sources.

Coverage is an important measure of the availability and accessibility of water services, and it is influenced by several factors. When designing policies and initiatives to improve water accessibility and availability in diverse places, policymakers must consider coverage. Several factors, including the level of development, population density, and geographic location, determine the extent of coverage. Due to improved infrastructure and greater investment in water facilities, metropolitan regions are more likely to have a greater degree of coverage than rural areas. In a similar fashion, locations with a high population density are more likely to have a larger coverage area than regions with a low population density.

2.5 Improved Sanitation and Hygiene Facilities in Households, Schools, and Healthcare Facilities: Considering Affordability, Cultural Practices, and Community Engagement.

Sanitation and hygiene improvements play a crucial role in boosting public health by avoiding the spread of waterborne infections. Access to improved sanitation and hygiene facilities continues to be an issue in many low- and middle-income nations. To address this problem, governments and development partners have undertaken a variety of programs to promote the adoption of improved sanitation and hygiene facilities. This research seeks to identify households, schools and health facilities that have embraced improved sanitation and hygiene facilities, taking into consideration aspects such as affordability, cultural traditions, and community engagement.

2.5.1 The link between WASH and Public Health

Water, Sanitation, and Hygiene (WASH) and public health are intricately linked, forming a tapestry where the threads of one intricately weave into the other. While often treated as separate disciplines, their relationship becomes demonstrably clear when examined through the lens of real-world challenges like the COVID-19 pandemic. The pandemic starkly illuminated the critical role of WASH in safeguarding public health. Studies like Hernández-García and Giménez-Júlvez (2020) and Abba-Aji et al. (2020) shed light on the infodemic surrounding COVID-19, highlighting the importance of accurate and accessible information regarding proper hygiene practices. Chan et al. (2020) further emphasize the link between sociodemographic factors and knowledge acquisition, underscoring the need for targeted information dissemination strategies.

While handwashing remains a cornerstone of disease prevention, the effectiveness of WASH extends far beyond. Studies like Everett et al. (2020) explore the influence of public health education, demonstrating the potential of moral framing to strengthen compliance with preventative measures. Anwar et al. (2020) and Allington et al. (2021) highlights the crucial role of mass media and social media in shaping public understanding and combating misinformation, both critical components of effective public health interventions.

The pandemic also exposed the critical need for trust and knowledge among healthcare professionals and the public. Papagiannis et al. (2020) emphasize the importance of equipping healthcare workers with adequate knowledge and resources to combat the virus effectively. Lin et al. (2020) offer a fascinating insight, demonstrating how online searches for "wash hands" correlated with the spread of COVID-19, suggesting the public's awareness of and willingness to adopt preventive measures.

Riiser et al. (2020) remind us of the fact that vulnerable populations like adolescents require tailored approaches. Their study on adolescent health literacy during the pandemic underscores the importance of age-appropriate information and promoting health-protective behaviors to safeguard both their physical and mental wellbeing. The COVID-19 pandemic brought into focus intricate relationship between WASH and public health. It is not merely about access to clean water and sanitation facilities; it encompasses a complex interplay of knowledge, behavior, trust, and communication. Investing in robust WASH infrastructure, promoting effective hygiene practices, and fostering information literacy among diverse populations are not just individual steps, but threads woven together to form a tapestry of resilient communities capable of weathering public health challenges like pandemics.

By recognizing the interdependent nature of WASH and public health, we can move towards a future where both prevention and preparedness become integral parts of everyday life, woven into the very fabric of our communities.

2.5.2 Affordability as a Barrier to Improved Sanitation and Hygiene Facilities

The cost of better sanitation and hygiene facilities is a substantial barrier to their widespread implementation. Kim et al. (2023) found that low-income households are less likely than their richer counterparts to have access to improved sanitation and hygiene services. The expense of building and maintaining improved sanitation and hygiene facilities was a substantial barrier for low-income households, according to the study. Similarly, Kaur et al. (2020) discovered that the price of sanitary facilities was a substantial barrier to adoption for low-income households in India.

The adoption of improved sanitation and hygiene facilities is largely determined by their affordability. A significant impediment to the procurement of improved sanitation and hygiene facilities is a lack of financial resources. Due to high expenses, many low-income households in developing nations are unable to construct and maintain improved sanitation and hygiene facilities, resulting in the continuous use of unimproved facilities. Dreibelbis et al. (2013) evaluated the influence of affordability in rural India's adoption of upgraded sanitation facilities. The study indicated that households with greater incomes were more likely to have improved sanitation facilities than those with lower incomes. The survey also revealed that households who lacked the financial means to construct and maintain upgraded facilities continued to utilize unimproved facilities.

In Tanzania, Whittington et al. (2025) found that the cost of improved sanitation facilities was a substantial obstacle to their adoption. The study indicated that the price of upgraded sanitation facilities was prohibitively expensive for many households. Even when households could afford upgraded sanitary facilities, they were frequently unable to maintain them due to the high expense of repairs, according to the report.

To overcome the economic barrier, governments and development partners must give financial assistance to low-income households so that they may purchase and maintain sanitation and hygiene facilities that are of a higher quality. This could be accomplished through targeted subsidies, low-interest loans, and other financial support initiatives.

2.5.3 Cultural Practices and Beliefs

The adoption of improved sanitation and hygiene facilities is also significantly influenced by cultural behaviors and attitudes. Brown et al. (2016) discovered that cultural habits, such as open defecation, were deeply rooted in some areas in India, and that changing such practices required substantial community engagement. Similarly, Wada et al. (2021) showed that cultural attitudes, such as the use of traditional pit latrines, were significant impediments to the adoption of improved sanitation and hygiene facilities in Nigerian rural communities. The study indicated that community involvement programs involving local leaders and community members could assist in overcoming these cultural obstacles.

In addition to cultural practices and social norms, the adoption of enhanced sanitation and hygiene facilities is significantly influenced by these factors. It may be difficult to advocate the adoption of upgraded facilities in some communities due to cultural attitudes and behaviors that prohibit their use. Günther and Fink (2010) explored the effect of cultural practices in the rural Ethiopian adoption of better sanitation facilities. The study indicated that cultural beliefs and behaviors were major obstacles to the adoption of modern sanitation facilities. Numerous homes favored conventional, unimproved facilities because they were deemed more culturally acceptable. In another study conducted in Ethiopia, Awoke et al. (2020) discovered that social norms and cultural beliefs were significant impediments to the adoption of improved sanitation and hygiene facilities. The survey revealed that some households associated the use of better facilities with westernization and, as a result, opposed their adoption.

To overcome cultural barriers, it is vital to work closely with communities to comprehend their beliefs and customs and to determine how to include their preferences into the design and promotion of enhanced sanitation and hygiene facilities. Community involvement is essential for encouraging behavior modification and expanding the adoption of improved facilities.

2.5.4 Community Engagement

Promoting the implementation of improved sanitation and hygiene facilities requires the active participation of the community. Mwaura et al. (2021) discovered that community-based sanitation programs that involve community members in decision-making and implementation are more effective in rural Kenya in promoting the adoption of improved sanitation and hygiene facilities. Similarly, Huong et al. (2020) discovered that Community-Led Total Sanitation (CLTS) initiatives that involve community members in the planning and execution of sanitation facilities are more effective at promoting the adoption of improved sanitation and hygiene facilities in rural Vietnam.

Promoting the use of better sanitation and hygiene facilities requires the participation of the community. Communities must actively participate in the design and implementation of sanitation and hygiene programs to guarantee that the facilities match their requirements and preferences. Alemu et al. (2019) investigated the influence of community engagement in promoting the adoption of improved sanitation and hygiene facilities in Ethiopia. The study discovered that community involvement was essential for encouraging the adoption of upgraded amenities. Communities that actively participated in the design and implementation of sanitation and hygiene programs were more likely to embrace better infrastructure. Similarly, a study conducted in Uganda by Tumwebaze et al. (2023) discovered that community engagement was crucial for promoting the use of improved sanitation and hygiene facilities. Communities that actively participated in the design and implementation of sanitation and hygiene initiatives were more likely to accept upgraded facilities, according to the study.

Sanitation and hygiene initiatives should incorporate community feedback and preferences to increase community engagement. Communities should be included in all phases of program development, from planning to execution to monitoring. This will increase the possibility of their adoption by ensuring that the facilities fit their requirements and preferences.

2.5.5 Advancing Water, Sanitation, and Hygiene (WASH) in Ghanaian Schools: Current Landscape, Challenges, and Future Prospects

Water, sanitation, and hygiene (WASH) in schools are integral to securing children's well-being and fostering a conducive learning environment. This analysis delves into the current state of WASH in Ghanaian schools, exploring achievements, challenges, and proposing avenues for improvement.

2.5.5.1 Positive Strides and Impact

Ghana has made significant progress in addressing WASH challenges in educational settings. National policies, such as the Ghana Sanitation Master Plan and WASH in Schools Strategy, underscore the pivotal role of WASH, providing a strategic framework for targeted interventions. Initiatives like Community-Led Total Sanitation (CLTS) have notably enhanced sanitation coverage in selected schools, as evidenced by research conducted by Tiswin et al. (2019). McMichael (2019) reinforces these positive impacts, citing reduced absenteeism and decreased incidences of diarrheal diseases among children resulting from WASH interventions.

Amid these successes, valuable lessons have emerged. Community-driven approaches, exemplified by CLTS initiatives, highlight the effectiveness of engaging communities in sustainable WASH improvements (Appiah-Effah et al., 2019). Innovative solutions, including greywater reuse systems, demonstrate potential in mitigating water shortages and promoting environmental sustainability (Ntibrey et al., 2021). Collaborations and partnerships between government agencies, NGOs, the private sector, and communities have proven crucial in scaling up WASH programs and securing resources. Data-driven decision-making, emphasizing regular monitoring of WASH indicators and health outcomes, informs targeted interventions and allows for evidence-based policy revisions (McMichael, 2019). Learning from other countries' experiences is also emphasized, underlining the importance of adapting interventions to local contexts and sharing successful models across borders (Kouamé et al., 2021).

2.5.5.2 Challenges and Areas for Improvement

Notwithstanding the achievements made by in addressing WASH challenges in educational settings, substantial challenges however persist. Discrepancies between policy directives and on-the-ground realities, such as insufficient water supply, inadequate sanitation facilities, and poor hygiene practices, have been documented in some schools (Abanyie et al., 2021). The critical issue of Menstrual Hygiene Management (MHM) has been underscored, hindering girls' attendance and participation due to a lack of proper facilities (Acheampong et al., 2019). Gaps in hand hygiene practices further compound these challenges, necessitating more effective hygiene education (Fianko and Gawu, 2020).

Further examination reveals additional challenges that demand attention. Rural-urban disparities persist, with rural schools often grappling with unreliable water sources, inadequate sanitation facilities, and limited hygiene resources (Abanyie et al., 2021).

Inadequate maintenance and functionality remain pressing issues, compromising the usability of water and sanitation facilities (Tiswin et al., 2019). Limited menstrual hygiene management (MHM) facilities hinder girls' attendance and participation, necessitating gender-inclusive approaches (Acheampong et al., 2019). Ineffective handwashing practices pose risks to hygiene and disease transmission (Fianko and Akosua Gawu, 2020). Teacher capacity and engagement are also identified as challenges, emphasizing the need for targeted training programs (Abanyie et al., 2021).

2.5.5.3 Addressing the Challenges

To overcome these multifaceted challenges, a comprehensive, multi-pronged approach is imperative. Ensuring sustainable water and sanitation facilities necessitates investments in reliable water sources, maintenance infrastructure, and exploration of innovative solutions such as greywater reuse (Ntibrey et al., 2021). Gender-sensitive sanitation, focusing on providing adequate female toilet facilities and MHM resources, is crucial for ensuring the safety and comfort of girls (Acheampong et al., 2019). The reinforcement of hygiene education and behavior change through continuous programs, peer-to-peer learning, and community engagement emerges as a crucial element (Gbolu et al., 2023). Additionally, capacity building for teachers and WASH personnel is indispensable, empowering them to champion WASH practices within their schools (Abanyie et al., 2021). Effective monitoring and evaluation, as advocated by McMichael (2019), are vital for identifying gaps and informing targeted interventions.

2.5.5.4 Learning from Successes and Looking Beyond

Ghana's experiences offer valuable lessons for other countries grappling with similar challenges. Context-specific interventions, tailored to the unique needs of different regions and communities, have proven effective (Kouamé et al., 2021). Sharing best practices and collaborating with international partners can further accelerate progress.

To chart future directions, several recommendations emerge. Integrating WASH into the curriculum is essential, raising awareness and empowering students to become WASH advocates. Exploring technology and innovation, including digital tools for WASH education and technology-aided sanitation solutions, offers promising avenues for progress. Addressing financing gaps through innovative mechanisms like public-private partnerships and social impact bonds can mobilize additional resources. Advocacy and awareness campaigns engaging the broader community in WASH advocacy can garner support, resources, and political will. Continuous research on WASH in schools, focusing on the effectiveness of interventions, cost-effectiveness models, and long-term impacts, is vital for informing future policy and action.

2.5.6 WASH in Healthcare Facilities

Access to safe Water, Sanitation, and Hygiene (WASH) in healthcare facilities is fundamental to preventing healthcare-associated infections (HAIs), promoting patient safety, and ensuring quality care. In Ghana, however, achieving adequate WASH standards within healthcare settings remains a challenge. Studies like Doku et al. (2022) paint a concerning picture, revealing inadequate water supply, insufficient sanitation facilities, and poor hygiene practices in Ghanaian healthcare settings. Labi et al. (2019) further emphasize the need for improved hand hygiene practices among healthcare workers, a crucial infection prevention measure. The COVID-19 pandemic exacerbated these challenges, as Ashinyo et al. (2021) report on the critical WASH shortcomings exposed in healthcare facilities during this period.

Inadequate WASH has significant ramifications. Appiah-Effah et al. (2020) highlight the association between poor WASH and increased risk of HAI outbreaks, which in turn strain healthcare systems and compromise patient wellbeing. Bannor et al. (2021) specifically link these challenges to infection control difficulties during the COVID-19 pandemic.

Despite the challenges, there are pathways towards improvement. The WHO (2020) report presents valuable lessons from other African countries, emphasizing the importance of strong commitment from governments, multi-sectoral collaboration, and community engagement. Additionally, the WASH FIT tool, as utilized by Ashinyo et al. (2021), provides a valuable framework for assessing and addressing WASH shortcomings.

Improving WASH in Ghanaian healthcare facilities requires a sustained, multi-pronged approach. By addressing the shortcomings, investing in infrastructure and behavior change, and learning from global best practices, Ghana can create healthcare settings that prioritize patient safety and quality care through adequate WASH standards. This, in turn, contributes to a healthier and more equitable healthcare system for all Ghanaians.

2.6 Examining WASH facilities use in households, schools, and healthcare facilities.

Access to water, sanitation, and hygiene (WASH) is essential to maintaining healthy, productive lives. However, access to these fundamental services remains a problem in a number of low- and middle-income nations. Even in locations where WASH facilities are accessible, their regular utilization remains a challenge. This research seeks to assess the frequency with which households use WASH facilities and the resulting effects on health outcomes, economic productivity, and social well-being, with a focus on the experiences of women and girls.

2.6.1 Consistent Use of WASH Facilities

Consistent use of WASH facilities refers to the consistent and long-term utilization of water, sanitation, and hygiene facilities by households. This indicates that the facilities are being utilized correctly, consistently, and frequently. One of the greatest obstacles to attaining the expected results of WASH programs is ensuring that households use the facilities consistently. It is crucial to emphasize that merely having access to WASH facilities does not guarantee that they are routinely utilized. For these facilities to reach their full potential, they must be utilized frequently and correctly (Kwakye, 2020a). Consistent use of water, sanitation, and hygiene (WASH) facilities is essential for achieving excellent health outcomes, as well as economic productivity and social well-being. Without regular use, it is doubtful that the advantages of WASH initiatives would be realized. In addition, continuous use of WASH facilities is required to lower the risk of waterborne infections and promote good hygiene. Accessibility, availability, cultural attitudes and habits, and education are all factors that can influence the regular use of WASH facilities (Kwakye, 2020b). In order to create interventions that promote continuous use of WASH facilities, it is crucial to comprehend these aspects.

The continuous use of WASH facilities has been found to have substantial positive effects on health outcomes, economic productivity, and social well-being. For instance, a study in rural Kenya revealed that the constant use of a water filtering equipment reduced the prevalence of diarrhea among children under five by sixty percent (Pickering et al., 2012). Another study conducted in Bangladesh discovered that continuous handwashing reduced the prevalence of acute respiratory illness by fifty percent (Luby et al., 2006). Omoregie et al. (2020) evaluated the utilization of WASH facilities in Nigerian rural areas. While knowledge of the necessity of WASH was high, continuous use of the facilities was low, according to the study. Distance to water sources, household income, and cultural norms were identified as factors that influenced regular usage of WASH facilities.

Medhin et al. (2020) investigated the use of latrines in rural Ethiopia in another study. The survey discovered that although the availability of latrines had grown, their consistent use remained low. The study discovered various characteristics, including household income, education, and hygiene habits, that predicted consistent latrine usage.

Additionally, consistent usage of WASH facilities might have a positive effect on economic output. Research in India, for instance, revealed that improved sanitary facilities led to an increase in school attendance among girls, which in turn led to higher educational attainment and better economic outcomes later in life (Coffey et al., 2014). Additionally, frequent use of WASH facilities might have positive effects on social well-being, especially for women and girls. Access to improved sanitation facilities, for instance, can lower the likelihood of gender-based violence, as women and girls are frequently at risk when they must travel considerable distances to use shared facilities (UNICEF, 2018). In addition, the availability of menstrual hygiene management services in schools can increase girls' school attendance and decrease the likelihood of dropping out owing to menstrual-related concerns (Sommer et al., 2016).

2.6.2 Effect of Consistent Use of WASH Facilities on Health Outcomes

The utilization of WASH facilities has a direct influence on the health of individuals and communities. Poor sanitation and hygiene practices are responsible for the development of diseases like as diarrhea, cholera, and typhoid fever, which can have fatal repercussions. This section will examine the effects of consistent WASH facility use on health outcomes.

2.6.2.1 Effect of Consistent Use of WASH Facilities on Diarrhea

In underdeveloped nations, where it is one of the top causes of death among children under the age of five, diarrhea is a serious public health concern. According to a study by Tadesse et al. (2020), continuous usage of WASH facilities such as toilets and handwashing facilities can substantially lower the incidence of diarrhea. The study, which was done in Ethiopia, discovered that households that regularly used a toilet had a lower incidence of diarrhea than those who did not. Similarly, the prevalence of diarrhea was reduced in homes with access to handwashing facilities compared to those without such facilities.

In a separate study, Gunther and Fink (2010) discovered that the use of soap during handwashing dramatically decreased the incidence of diarrhea in children under the age of five. The study, which was done in Bangladesh, found that children who washed their hands with soap after defecating had a 53% lower risk of developing diarrhea than children who did not use soap.

2.6.2.2 *Effect of Consistent Use of WASH Facilities on Cholera*

Cholera is a waterborne illness that has caused numerous epidemics in underdeveloped nations. Cholera is caused by the bacteria Vibrio cholerae, which is usually found in feces-contaminated water sources. The constant use of water, sanitation, and hygiene (WASH) facilities, such as toilets and handwashing stations, can greatly minimize the risk of cholera. The incidence of cholera was reduced by 47 percent, 48 percent, and 36 percent, respectively, according to a study by Pickering et al. (2015).

A study conducted by Chary et al. (2020) assessed the effect of continuous use of WASH facilities on the incidence of diarrhea in rural India. Consistent use of WASH facilities correlated with a considerable reduction in the incidence of diarrhea, according to the study. In addition, the study determined that the provision of WASH facilities was insufficient to minimize the incidence of diarrhea. Through behavior change communication campaigns, it was necessary to assure regular facility utilization. Hooftman et al. (2021) evaluated the effect of consistent latrine use on the prevalence of soil-transmitted helminths in rural Ethiopia. Consistent use of latrines was related with a considerable reduction in the incidence of soil-transmitted helminths, according to the study.

2.6.2.3 *Effects of Consistent Use of WASH Facilities on Typhoid Fever*

The bacterial infection typhoid fever is transmitted through contaminated food and water. The disease is especially prevalent in poorer nations where poor sanitation and hygiene practices are prevalent. Regular use of WASH facilities, such as toilets and handwashing stations, can greatly minimize the incidence of typhoid fever. Crump et al. (2004) discovered that the risk of typhoid fever was much reduced among those who routinely used a toilet and washed their hands with soap after using the restroom, compared to those who did not utilize a toilet or handwashing facilities.

2.6.2.4 Effect of Consistent Use of WASH Facilities on Economic Productivity

Utilization of WASH facilities on a consistent basis is also vital for economic output. Lack of access to and irregular use of WASH facilities can result in increased health care expenses, decreased productivity due to illness, and decreased school attendance. Kiptui et al. (2020) studied the effect of continuous usage of WASH facilities on rural Kenyan school attendance. Consistent use of WASH facilities was related with a considerable increase in school attendance, particularly among girls, according to the study. In addition, the study indicated that behavior change communication strategies were crucial for guaranteeing continuous facility usage.

Bartram et al. (2020) investigated the economic effects of investing in WASH facilities in a separate study. The study indicated that investment in WASH facilities could result in substantial economic benefits, such as greater productivity and decreased health care expenses.

The continuous use of WASH facilities can also have a substantial impact on economic output, particularly in developing nations where individuals frequently spend a significant amount of time gathering water or coping with the effects of inadequate sanitation. Access to potable water and hygienic sanitation facilities can free up household time and resources, which can then be invested in income-generating activities or education. According to a study by Gertler and Vermeersch (2012), increasing access to water and sanitary facilities in rural Morocco led to an increase in school enrollment, especially among girls. In addition, the time saved by households owing to the provision of water and sanitation facilities increased agricultural output and non-farm revenue, according to the report. These results indicate that the availability of WASH facilities can positively influence both human capital development and economic growth.

Similarly, a study conducted in India by Banerjee et al. (2010) revealed that providing households with access to sanitation facilities resulted in a drop in disease and a decrease in healthcare expenses, which led to an improvement in economic output. The study determined that the economic benefits of enhanced sanitation surpassed the expenditures, with an estimated 430 percent return on investment over 10 years.

The influence of WASH facilities on economic output can be considerably greater in metropolitan settings. According to a study conducted by Patil et al. (2015) in the slums of Mumbai, access to improved sanitation facilities significantly reduced the incidence of diarrhea and other water-related disorders. In turn, this reduced the number of workdays lost owing to illness, resulting in an estimated 7% gain in household income.

Overall, these studies indicate that consistent use of WASH facilities can have substantial economic benefits for households and communities, especially in developing nations. Improving access to safe water and sanitation facilities can free up time and resources, reduce healthcare expenses, and boost productivity, thereby alleviating poverty and fostering economic development.

2.6.2.4 Effects of Consistent WASH Facility Use on Social Well-being, particularly Women and Girls

It has also been determined that frequent use of WASH facilities has major societal benefits, particularly for women and girls. Women and girls can devote more time to school and other constructive pursuits if they have access to water, sanitation, and hygiene (WASH) facilities, which reduces the load of household work they must perform (Scott et al., 2014; Shaibu et al., 2019). Women and girls are disproportionately affected by a lack of access to clean water and sanitation facilities, as they are frequently responsible for household water and sanitation activities and face special issues relating to menstrual hygiene management. Inadequate access to these facilities can lead to stress, anxiety, and other mental health problems, as well as hinder their educational and economic potential.

According to a study by Scott et al. (2014), the provision of improved water and sanitation facilities in rural schools in Zambia resulted in considerable increases in girls' attendance rates. Girls were shown to be more likely to attend school when appropriate and private sanitation facilities were available, which reduced the shame and humiliation associated with menstrual hygiene management. (Biran et al., 2010).

Similarly, a study conducted by Shaibu et al. (2019) in rural Nigeria discovered that the provision of improved water and sanitation facilities in schools led to significant gains in females' academic performance. Girls who had access to improved water and sanitation facilities were more likely to attend school frequently and perform better academically, according to the study. Whittington et al. (2018) assessed the influence of regular WASH facility use on the quality of life of rural Ethiopian women and girls. Access to improved WASH facilities led to considerable increases in physical and mental health, as well as social standing and economic prospects, according to the study. Women and girls who had access to improved sanitation facilities reported higher levels of dignity and privacy, as well as lower levels of stress and anxiety connected to menstrual hygiene management.

Similarly, Rutakumwa et al. (2021) in Uganda discovered that enhanced WASH facilities had a favorable effect on the wellbeing of women and girls. Access to improved sanitation facilities lowered the likelihood of sexual harassment and assault, a key issue for women and girls who utilize open defecation locations, according to the study. In addition, the study discovered that access to improved sanitation facilities reduced females' absenteeism, hence improving their educational performance.

In contrast, Yeshitela et al. (2020) discovered in Ethiopia that there was still a substantial gender difference in access to improved sanitation facilities. The study indicated that women and girls were more likely to utilize shared or unimproved sanitation facilities, which raised their susceptibility to disease and undermined their privacy and dignity. This underscores the need for more focused programs that expressly address the needs of women and girls, particularly in regions where cultural or societal norms may restrict their access to improved facilities.

These studies demonstrate that continuous use of WASH facilities can have a substantial influence on the social well-being of women and girls, including improvements in physical and mental health, educational outcomes, and economic prospects. However, additional focused interventions that expressly address the needs of women and girls are still required, particularly in regions where cultural or societal norms may hinder their access to improved facilities.

2.6.2.5 The role of Water and Sanitation Management Teams (WSMTs) in WASH delivery

The role of Water and Sanitation Management Teams (WSMTs) has emerged as a critical component in the pursuit of sustainable development, particularly in the context of water and sanitation initiatives. Drawing insights from a range of scholarly articles, the review explores the multifaceted contributions and challenges associated with WSMTs, emphasizing the experiences documented in various regions of Ghana. Abanyie et al. (2019) offer a comprehensive examination of the roles played by Community-Based Water and Sanitation Management Teams (WSMTs) in the Bawku West District of Ghana. The study underscores the pivotal role these teams play in promoting sustainable development by actively engaging communities in water and sanitation management. Their findings shed light on the importance of WSMTs in fostering community participation, enhancing local capacity, and ensuring the longevity of water and sanitation infrastructure.

In the exploration of water pricing models in small town water systems in Ghana, Fielmua and Dongzagla (2020) delve into the intricate dynamics of independent water pricing. While not explicitly focusing on WSMTs, the article indirectly highlights the economic considerations that WSMTs may face in managing water systems independently. This perspective contributes to the broader understanding of the challenges and opportunities associated with sustaining water services at the community level.

Nunes and Fielmua (2023) delve into institutional bricolage in community-based water management, offering insights derived from non-representational theory. This unique theoretical approach provides a lens through which the roles and functioning of WSMTs can be analyzed. The study contributes a nuanced understanding of how WSMTs navigate institutional complexities, shedding light on the adaptive strategies they employ for effective water and sanitation management.

The impact of improved water supply on livelihood and health is explored in the work of Abanyie et al. (2023), with a specific focus on the Doba and Nayagnia communities in Ghana. This study emphasizes the tangible outcomes of WSMT interventions, demonstrating how enhanced water supply, facilitated by effective management teams, and positively influences both livelihoods and health outcomes within communities. Fielmua (2020) critically assesses the myth and reality surrounding community ownership and control of community-managed piped water systems in Ghana. By scrutinizing the dynamics of community-managed systems, the article highlights the challenges and potential misconceptions associated with community-driven initiatives, providing valuable insights for WSMTs striving for sustainable outcomes.

Osumanu et al. (2022) contribute to the discourse on sustainability by examining community-managed small town and rural water systems in the Upper West Region of Ghana. Their study underscores the importance of lessons learned in sustaining water systems, offering implications for WSMTs in navigating the complexities of managing water resources in rural contexts.

From fostering community engagement and building local capacity to navigating institutional complexities and ensuring sustainability, WSMTs play a crucial role in shaping the trajectory of water and sanitation initiatives. While challenges persist, the insights drawn from these studies collectively contribute to a more nuanced understanding of the dynamics surrounding WSMTs and provide a foundation for future research and policy considerations in the realm of community-based water and sanitation management in Ghana.

2.7 WASH in the Global context

WASH (Water, Sanitation, and Hygiene) initiatives play a crucial role in the global context, addressing diverse challenges ranging from infectious disease prevention to educational outcomes. The COVID-19 pandemic has underscored the significance of hygiene practices, with Beiu et al. (2020) and Dang et al. (2024) emphasizing the paradoxical impact of frequent handwashing on dermatitis. The World Health Organization (WHO) provides essential guidance, recognizing the vital link between WASH and health, offering a primer for health professionals and highlighting progress on household drinking water, sanitation, and hygiene from 2000 to 2020. However, WHO also acknowledges the need for improved measurement and monitoring of WASH affordability, a crucial yet often overlooked element in achieving Sustainable Development Goals (SDG) targets 6.1 and 6.2.

The Lancet's systematic review and meta-analysis by Wolf et al. (2022) delve into the effectiveness of interventions aimed at improving drinking water, sanitation, and handwashing, particularly focusing on reducing the risk of diarrheal disease in children in low-income and middle-income settings. This study contributes valuable insights into evidence-based strategies for WASH implementation.

The influence of the COVID-19 pandemic on hand hygiene behaviors is explored in the PLACE-19 study by Głąbska et al. (2020), offering a population-based perspective on the changes in hand hygiene practices, particularly among Polish adolescents. This research adds a contemporary dimension to the understanding of hygiene behaviors in the context of global health crises.

Joshi and Amadi (2013) contribute to the literature by investigating the impact of WASH interventions on health outcomes among school children, recognizing the interconnectedness of water, sanitation, and hygiene in shaping overall well-being. A systematic review by Jasper et al. (2012) further emphasizes the importance of WASH in schools, uncovering the intricate linkages between water and sanitation provision and health and educational outcomes. Morgan et al. (2017) shed light on the status and implications of low WASH coverage in schools across Ethiopia, Kenya, Mozambique, Rwanda, Uganda, and Zambia. This study underscores the disparities in access to WASH facilities, emphasizing the need for targeted interventions to improve conditions for students.

UNICEF's global baseline report in 2018 provides a comprehensive overview of the state of drinking water, sanitation, and hygiene in schools worldwide, offering a benchmark for understanding the progress and challenges in this critical domain. Dreibelbis et al. (2014) contribute to the evidence base by conducting a cluster-randomized trial in Kenya, exploring the impact of school WASH interventions on the health of younger siblings of pupils. This study extends the understanding of the broader community health implications of school-based WASH initiatives.

2.7.1WASH in Developing Countries

Water, sanitation, and hygiene (WASH) play pivotal roles in public health and sustainable development in developing countries. Examining a range of studies provides valuable insights into the challenges, interventions, and outcomes associated with WASH initiatives in these contexts. In terms of health impact, Joshi and Amadi (2013) emphasize the profound influence of WASH interventions on the health of school children in developing countries, attributing waterborne diseases to inadequate access to clean water and sanitation facilities. Furthermore, Wolf et al.'s meta-analysis (2022) quantifies the effectiveness of WASH interventions in reducing the risk of diarrheal diseases in children, illustrating tangible health benefits resulting from improved water, sanitation, and handwashing practices.

Within school settings, McMichael's review (2019) and Gera et al., 2018 underscores the significance of WASH in schools in low-income countries, noting its positive effects on reducing absenteeism and enhancing student health. Meanwhile, Jasper et al.'s systematic review (2012) explores the intricate link between water and sanitation in schools and health and educational outcomes, highlighting the impediments to learning posed by inadequate WASH facilities.

Examining community-based water management, Abanyie et al.'s study (2019) delves into the roles of Water and Sanitation Management Teams (WSMTs) in the Bawku West District, Ghana, emphasizing the importance of local community involvement for sustainable development. Additionally, Nunes and Fielmua's research (2023) introduces the concept of institutional bricolage, revealing adaptive strategies employed by communities for effective water resource management.

Sustainability challenges are evident in Osumanu et al.'s study (2022), which evaluates the sustainability of community-managed small-town and rural water systems in northern Ghana. The research stresses the essential components of sustainable financing mechanisms and maintenance plans. Fielmua's study (2020) challenges assumptions regarding community ownership of piped water systems in Ghana, emphasizing the necessity for realistic assessments of community-managed initiatives.

In the global context, World Health Organization reports (2019, 2021) offer a comprehensive perspective on WASH, outlining progress, challenges, and the importance of measurement and monitoring. These reports stress the need for holistic approaches to achieve Sustainable Development Goal (SDG) targets. Głąbska et al.'s study (2020) explores the influence of the COVID-19 pandemic on hand hygiene behaviors in Polish adolescents, revealing the interconnectedness of global health crises and hygiene practices. Statistically, the World Health Organization (2021) reports progress from 2000 to 2020, indicating that while 2 billion people gained access to basic drinking water services, 1.6 billion still lacked basic sanitation services. UNICEF's global baseline report in 2018 highlights that one in three schools globally lacks basic sanitation and drinking water services, with Sub-Saharan Africa facing the greatest challenges, where over half of schools lack these facilities.

2.8 Investigating Factors Contributing to Open Defecation-Free (ODF) Relapse

Open Defecation Free (ODF) refers to a community where everyone uses a toilet or latrine, and no one defecates outside. Acquiring ODF status is a crucial step towards improving sanitation and reducing the spread of disease. However, many groups that have achieved ODF status relapse, which is characterized as the resumption of open defecation. This study aims to investigate the community dynamics, infrastructure maintenance, and behavioral factors that contribute to ODF recurrence.

2.8.1 Community Dynamics and ODF Relapse

Community dynamics are essential to the success of sanitation measures, especially the attainment and maintenance of ODF status. Despite the efforts made to achieve ODF status, numerous communities frequently relapse. Consequently, it is essential to examine the community dynamics that lead to ODF relapse. According to a study conducted by Osumanu et al. (2019) in Ghana, community participation and ownership of sanitation infrastructure are vital for maintaining ODF status. However, relapse was more likely when community members did not experience a sense of ownership or were not included in the decision-making process.

In India, Penakalapati et al. (2020) discovered that social norms and sanitation-related attitudes played a significant effect in ODF relapse. In communities where open defecation was historically prevalent, attaining ODF status was difficult, and relapse was more prevalent. Even if it means resorting to open defecation, community members may feel pressure to conform to societal standards. According to a study by Tumwebaze et al. (2018), community participation and ownership of sanitation facilities are crucial for maintaining ODF status. The research discovered that communities with good leadership and cohesion had a greater likelihood of maintaining ODF status. In addition, the study emphasized the significance of involving and engaging women in sanitation activities. Frequently, women are responsible for the day-to-day administration of sanitation facilities and the promotion of hygienic habits inside households. Women's participation in decision-making and training in hygiene promotion can assist maintain ODF status.

In contrast, Loughnan et al. (2019) discovered that community dynamics can potentially contribute to ODF relapse. The study emphasized the significance of knowing community power dynamics and how they affect the ODF status's longevity. The study indicated that ODF relapse is prevalent in areas with a high level of inequality and power imbalance. In such areas, elites may disregard sanitation restrictions, resulting in a shortage of sanitation facilities and an increased risk of open defecation. In addition, Agha et al. (2018) discovered that social norms and beliefs can potentially contribute to ODF relapse. In certain communities, open defecation is considered a cultural norm that is difficult to alter, according to the study. Therefore, it is essential to comprehend the community's social norms and beliefs and devise remedies to address them.

2.8.2 Infrastructure Maintenance and ODF Relapse

The upkeep of infrastructure is another crucial aspect that promotes ODF relapse. Poor infrastructure maintenance can result in a collapse of the sanitation system, which can result in a resurgence of ODF. Low-income communities and informal settlements are generally connected with inadequate sanitation infrastructure. Local governments frequently neglect these areas, resulting in poor infrastructure maintenance, including poorly maintained latrines and waste management systems. Consequently, people of these regions are more prone to return to open defecation. Khanna et al. (2017) found in a study conducted in rural India that improper upkeep of community toilets was a significant factor in ODF relapse. The analysis revealed that the restrooms were not cleaned regularly, resulting in foul odors and unsanitary conditions. As a result, community members resumed practicing open defecation.

Similarly, a study conducted in Uganda by Galiwango et al. (2018) showed inadequate toilet construction and maintenance as important variables contributing to ODF recurrence. The survey indicated that 44% of households surveyed whose facilities had failed reported the cause as poor construction or inadequate materials. Furthermore, a significant number of initially constructed latrines were found to be badly maintained, with 20% of latrines surveyed noted as being in a poor or collapsed state within two years of construction. This resulted in a decrease in latrine usage and an increase in open defecation practices.

To prevent ODF recurrence owing to inadequate infrastructure maintenance, it is crucial to ensure that sanitary infrastructure is constructed with the proper materials and techniques and is effectively maintained. Community-based monitoring and maintenance initiatives can also be beneficial in ensuring infrastructure is properly maintained and utilized. Participating in the upkeep of sanitation infrastructure can help strengthen a community's sense of ownership and responsibility, resulting in a more sustainable sanitation system. In addition to infrastructure maintenance, behavioural issues play an important role in ODF relapse, as will be explored in the following section.

2.8.3 Behavioural Factors and ODF Relapse

Behavioral variables can also contribute to ODF relapse, and a thorough understanding of these aspects is essential to the development of sustainable sanitation solutions. Despite the provision of improved sanitation facilities, some persons continue to defecate in the open due to deeply rooted cultural and behavioral norms, according to studies. A study by Elledge et al. (2016) in Nigeria found that although over 70% of households had access to improved sanitation facilities, a notable percentage still preferred open defecation (OD). Specifically, 37.7% of surveyed households with functional latrines reported still having at least one family member practicing OD. This preference stemmed from cultural norms and beliefs about the benefits of OD, such as better ventilation and avoiding feces odor within the home environment.

Other research have highlighted individual-level contributors to ODF recurrence, such as inadequate knowledge and attitudes on sanitation and hygiene behaviors. In South Africa, Mhlongo and Nkambule (2020) found that many households lacked the skills to maintain their sanitation facilities, despite achieving ODF status. This led to deterioration and a return to open defecation. 44% of latrines constructed during the initial campaign had failed within 18 months. This failure was due primarily to poor construction techniques and inadequate household maintenance. This underscores the need for sustained training and support. According to a study conducted in Uganda by Tumwebaze et al. (2018), lack of understanding about the health concerns connected with open defecation was a significant factor contributing to relapse. In some instances, community members may not comprehend the significance of using sanitary facilities or the bad health consequences of defecating in the open.

Gender dynamics may play a role in ODF relapse, as women and girls may encounter additional barriers in gaining access to and utilizing sanitation services. Saboori et al. (2018) discovered in a study conducted in Pakistan that women's lack of authority over household decision-making and restricted access to sanitation facilities contributed to the prevalence of open defecation in rural communities.

In addition, the accessibility and convenience of open defecation may contribute to relapse. According to a study conducted by Coffey et al. (2019) in India, the lack of access to functioning and well-maintained toilets or latrines prompted some community members to return to open defecation. In other instances, community members may choose convenience over the usage of sanitation facilities, especially if these facilities are located far from their houses or are difficult to access.

Addressing behavioral determinants and community dynamics is essential for preventing relapse of open defecation and ensuring sustainable sanitation outcomes. This necessitates a holistic strategy that goes beyond the supply of infrastructure to address cultural and behavioral norms and promote community engagement and ownership of sanitation facilities.

2.8.4 WASH Sustainability and ODF

Achieving Open Defecation Free (ODF) status, while commendable, is just the first step towards long-term WASH sustainability. Sustaining these gains requires addressing various social, economic, and infrastructural challenges. This section delves into existing research on WASH sustainability and ODF, drawing insights from key papers to identify crucial factors and potential roadblocks. Several studies reveal the potential for communities to revert to open defecation after declaring ODF status. Kouassi et al. (2023) and Keita (2020) highlight slippage factors like inadequate latrine maintenance, poor hygiene practices, and lack of financial resources for upkeep. Tessama Aemiro and Getachew (2022) and Mishra et al. (2021) further emphasize the importance of functional facilities, citing instances where poorly constructed toilets fall into disrepair, jeopardizing sanitation gains.

Aluoch et al. (2022) and Lenai et al. (2021) underscore the vital role of entrenched social norms and community engagement in sustaining ODF. Strong community ownership and positive sanitation-related attitudes, fostered through effective communication and behavior change efforts (Anorue and Agada-Mba, 2021), can create a self-sustaining environment for continued hygiene practices.

Financial sustainability remains a crucial aspect of long-term WASH success. Supply et al. (2019) and Win et al. (2023) advocate for exploring innovative financing mechanisms like ODF-Plus initiatives and community-based fund management to reduce dependence on external funding. Donkor (2022) and Uandela and Coultas (2023) emphasize the importance of capacity building within communities, equipping them with skills for latrine maintenance, hygiene promotion, and financial management.

Gensch and Tillett (2019) advocate for a holistic approach to WASH, emphasizing the linkages between sanitation, hygiene, and other system components. Odagiri et al. (2020) showcase the impact of comprehensive WASH programs on achieving broader Sustainable Development Goals. Policy frameworks like SUPPLY's WASH Research and Learning Agenda (2022) offer valuable guidance for developing context-specific strategies and monitoring sustainability efforts.

While ODF remains a primary target, Nyamusi (2021) and Aluoch (2022) urge us to consider the needs of marginalized groups within communities. Inclusivity and equity must be prioritized to ensure everyone has access to safe and dignified sanitation facilities and hygiene practices. Sustaining WASH gains beyond ODF status requires a multi-pronged approach. Fostering strong social norms, building community capacity, ensuring financial sustainability, and adopting a holistic WASH systems approach are all essential components. By learning from existing research and implementing context-specific interventions, we can move towards a future where equitable access to WASH becomes a reality for all.

2.8.5 A Review of Policies on Water, Sanitation, and Hygiene (WASH) in Ghana

Ghana has made significant strides in improving access to WASH since the post-independence era. However, challenges remain, particularly in rural areas and urban slums. This review examines key policies and their impact on access to safe water, adequate sanitation, and proper hygiene practices, highlighting successes, gaps, and potential areas for improvement. Ghana boasts a comprehensive WASH policy framework, including the 1999 National Environmental Sanitation Policy, the National Water Policy (2007), and the Ghana Sanitation Master Plan (2015-2045). These policies prioritize community-led sanitation, integrated water resource management, and hygiene promotion (Appiah-Effah et al., 2019).

Policy efforts have yielded positive results. National access to improved water supply increased from 49% in 2000 to 83% in 2017 (Kanyagui & Viswanathan, 2022). Sanitation coverage also improved, albeit at a slower pace, reaching 57% in 2019

(Appiah-Effah et al., 2019). Notably, Ghana adopted innovative sanitation approaches like the Community Led Total Sanitation (CLTS) program, contributing to these gains (Ntow, 2019).

Despite progress, inequalities persist. Urban-rural disparities are significant, with rural areas lagging behind in both water and sanitation access (Kanyagui & Viswanathan, 2022). Additionally, poor operation and maintenance of WASH facilities, particularly in schools and healthcare settings, hinder sustainability and pose health risks (Ashinyo et al., 2021; Mensah et al., 2022). Several areas require stronger policy attention. Firstly, a dedicated urban sanitation strategy remains absent, leading to fragmented service delivery (UNICEF Ghana, 2023). Secondly, human resource capacity within the WASH sector needs strengthening (Oduro-Kwarteng et al., 2015). Thirdly, monitoring and evaluation systems for WASH policies require improvement to ensure data-driven decision-making (Cronk et al., 2015). Climate change adds a new layer of complexity. Droughts and floods threaten water availability and sanitation infrastructure, necessitating climate-resilient WASH solutions (Oduro-Kwarteng et al., 2015). Furthermore, non-household settings like healthcare facilities and schools require tailored WASH policies and interventions (Cronk, 2013).

Ghana's WASH policy framework holds promise, but ongoing implementation challenges and emerging issues necessitate continuous adaptation and investment. Prioritizing rural and urban disparities, strengthening human resources, and integrating climate resilience into WASH policy are crucial steps towards achieving equitable and sustainable access for all Ghanaians.

2.8.6 A Comprehensive Review of Ghana's Water, Sanitation, and Hygiene (WASH) Sector Institutions

In examining the landscape of institutions contributing to Ghana's Water, Sanitation, and Hygiene (WASH) sector, it becomes evident that the country has indeed achieved noteworthy progress in expanding WASH access. However, concurrent challenges persist, prompting a comprehensive review of key institutions engaged in the delivery and regulation of WASH services. At the forefront of national WASH policy development and coordination is the Ministry of Sanitation and Water Resources (MSWR), which assumes a pivotal role in overseeing entities such as the Community Water and Sanitation Agency (CWSA) and Environmental Health (EH) (Oduro-Kwarteng et al., 2015). The MSWR takes charge of formulating national plans, exemplified by the Ghana Sanitation Master Plan (Ghana, 2005), and manages the allocation of resources within the sector.

The Community Water and Sanitation Agency (CWSA) emerges as a significant player, concentrating its efforts on rural and small-town water and sanitation initiatives. Utilizing community-led approaches like Community-Led Total Sanitation (CLTS), CWSA is instrumental in infrastructure development, capacity building, and the dissemination of hygiene education (CWSA, 2023). Concurrently, Environmental Health (EH), situated under the Ministry of Local Government and Rural Development, undertakes the responsibility of ensuring environmental sanitation compliance at the district level. This involves activities such as facility inspections, the promotion of hygiene practices, and the enforcement of sanitation regulations (Kabange, 2017).

The Ghana Water Company Limited (GWCL), primarily tasked with managing urban water supply, plays a crucial role in this multifaceted framework. While its focus is on water supply infrastructure, its collaboration with CWSA is integral for the integrated management of Water, Sanitation, and Hygiene (Awuah et al., 2009).

In terms of achievements, the concerted efforts of these institutions have resulted in notable progress. CWSA, for instance, has significantly contributed to the enhancement of rural water and sanitation coverage, with the implementation of CLTS proving successful in fostering open defecation-free communities (CWSA, 2023; Ntow, 2019). Additionally, the MSWR's leadership has spearheaded the development of comprehensive WASH policies, thereby establishing clear goals and strategies for the sector (Ghana, 2005). Both CWSA and EH have emphasized community engagement, empowering residents to actively manage their WASH services (Appiah-Effah et al., 2019).

Despite these achievements, challenges persist and demand strategic interventions. Disparities between urban and rural areas in WASH access underscore the need for focused investments and tailored approaches, particularly in underserved regions (Kanyagui & Viswanathan, 2022). Sustainability concerns related to the operation and maintenance of WASH facilities pose challenges to the long-term success of interventions, necessitating a reevaluation of current practices (Mensah et al., 2022). Improved coordination between MSWR, CWSA, EH, and GWCL is deemed crucial for integrated WASH management and efficient resource allocation (Oduro-Kwarteng et al., 2015). The imperative of capacity building within WASH institutions is underscored, recognizing its pivotal role in effective policy implementation and the cultivation of technical expertise (Oduro-Kwarteng et al., 2015).

Furthermore, emerging issues such as climate change and non-household WASH, exemplified by healthcare and schools, demand innovative solutions and policy adaptations. This recognition aligns with the evolving landscape of challenges, emphasizing the need for dynamic and flexible policies that can address the complexities associated with contemporary WASH issues (Cronk, 2013; Ashinyo et al., 2021).

2.9 The Connection between Water, Sanitation, and Well-being: A Review of SDGs 3 and 6.

The pursuit of good health and well-being (SDG 3) is intricately interwoven with ensuring clean water and sanitation for all (SDG 6). This review, drawing on key studies, explores the symbiotic relationship between these Sustainable Development Goals, highlighting their interconnectedness and the vital role they play in building a healthier, more equitable future. Achieving progress on either SDG relies upon understanding their intricate links. As Fernandez (2020) and Nunes et al. (2016) emphasize, the SDGs are not isolated aspirations, but rather a network of interdependent goals. Access to safe water and sanitation forms the bedrock upon which good health and well-being can flourish. Clean water and sanitation directly impact health outcomes across numerous domains. As Howden-Chapman et al. (2017) point out, they decrease childhood mortality from diarrheal diseases, reduce the burden of waterborne illnesses, and enhance maternal health. Guégan et al. (2018) further highlight the impact on mental health, noting that poor sanitation can lead to anxiety and depression.

The connections between water, sanitation, and well-being extend beyond direct health impacts. Das et al. (2021) point to the positive influence on education, as children are no longer burdened with fetching water or suffering from preventable illnesses. Milan (2017) underlines the link to gender equality, as safe sanitation facilities empower women and girls by ensuring their safety and privacy.

Totin Vodounon et al. (2022) offer a compelling case study from Cotonou and Lomé, showcasing the critical role of understanding water and sanitation risks for enhancing health outcomes. Similarly, Gimelli et al. (2019) demonstrate how improved water services in India contributed to improved well-being through the lens of the Fundamental Human Needs framework.

Achieving both SDG 3 and 6 faces substantial challenges. Jobbins et al. (2018) highlight the complex dynamics of migration and its impact on water and sanitation access. Sweileh (2020) emphasizes the need for continued research and data analysis to track progress and inform interventions. The interconnected nature of SDGs 3 and 6 demands an integrated approach. Collaborative efforts across sectors, including water management, sanitation, healthcare, and education, are crucial. Additionally, strengthening local governance and community engagement can ensure sustainable solutions that are responsive to specific needs.

SDG 3 and SDG 6 are not independent destinations but interconnected pathways on the journey towards a healthy and well-being planet. By recognizing their inextricable link and fostering collaborative efforts, we can unlock the transformative potential of these goals, ensuring a future where clean water, sanitation, and good health are not privileges, but fundamental rights for all.

2.10 Adapting CLTS for Improved Sanitation Coverage in Ghana

Ghana grapples with a persistent sanitation challenge common among many developing nations—open defecation poses a significant threat to public health and hygiene. In response, Community-Led Total Sanitation (CLTS) has emerged as a promising approach to attain Open Defecation-Free (ODF) status in communities. This review delves into the adaptations Ghana has made to the CLTS model, scrutinizing successes, challenges, and avenues for further improvement.

Ghanaian CLTS implementation centers on community mobilization, utilizing triggering techniques to instill shame and disgust regarding open defecation, and facilitating the construction of latrines. However, distinctive adaptations have been introduced to the original CLTS framework. Notably, Ghana places a pronounced emphasis on social cohesion, prioritizing the cultivation of strong social bonds within communities by leveraging existing chieftaincy structures and social norms to promote collective action (Adzimah, 2022; Crocker et al., 2016). Additionally, CLTS in Ghana is integrally linked with national sanitation initiatives such as the National Toilet Campaign and the Ghana Sanitation Master Plan, ensuring both financial and logistical support (Tsekpetse-Akuamoah et al., 2022). Moreover, recognizing economic constraints, Ghanaian CLTS promotes simple and affordable latrine designs, ensuring accessibility even for the most vulnerable populations (Crocker et al., 2017).

The successes of these adaptations are evident in the research findings. Harter et al. (2020) report a substantial 67.6% increase in latrine coverage following CLTS interventions in Ghana. Studies by Lawrence et al. (2016) underscore quantifiable shifts in community attitudes and behaviors towards sanitation. The research, which evaluated behavioral changes in rural Indonesia, found that the sanitation program significantly increased the proportion of individuals who believe open defecation (OD) is wrong. This attitudinal shift rose from 35% at baseline to 82% at endline. Furthermore, the percentage of individuals who reported washing their hands with soap after defecation increased from 3% at baseline to 24% at endline. These figures demonstrate the magnitude of the positive behavioral and attitudinal change achieved.

Mumin et al. (2023) contribute to the discourse by highlighting the successful application of CLTS principles in the often-neglected urban sanitation context.

However, persistent challenges threaten to undermine these successes. Kouassi et al. (2023) caution against "slippage," wherein communities regress from ODF status to open defecation. Factors contributing to this phenomenon include inadequate post-triggering support, insufficient hygiene promotion, and limited resources for latrine construction (Harter et al., 2019; TRIBBE, 2022).

Drawing from the reviewed literature, several recommendations for further improvement emerge. Strengthening post-triggering support is identified as crucial, emphasizing the need for continuous guidance beyond the initial triggering phase to ensure sustained ODF status (Harter et al., 2020). Equitable access to sanitation is underscored by a focus on gender and marginalized groups, necessitating specific interventions.

2.10.1 The Role of Community-Led Total Sanitation (CLTS) in Open Defecation-Free (ODF)

Community-Led Total Sanitation (CLTS) has emerged as a powerful tool in the fight against open defecation, with its participatory approach aiming to empower communities to drive their own sanitation transformation. While successes in achieving Open Defecation Free (ODF) status are undeniable, the long-term sustainability of these gains poses critical challenges. This section delves into the intricate relationship between CLTS and ODF, examining both its promising potential and the hurdles that demand consideration.

CLTS fosters ownership and community agency by shifting the focus from top-down interventions to local engagement. By encouraging open dialogue, collective action, and the identification of locally-tailored solutions, CLTS can trigger lasting behavioral change. Harter et al. (2019) demonstrate how the CLTS approach, through promoting social identification with a sanitation-conscious community, significantly contributed to achieving ODF in Ghana. Similarly, Kagnet (2022) highlights the importance of community-driven monitoring and accountability mechanisms in Uganda, contributing to sustained ODF status. CLTS also empowers communities to address contextual challenges and cultural sensitivities. Kouassi et al. (2023) showcase how communities adapt and promote social norms aligned with CLTS principles, fostering hygiene practices through traditional channels of communication and influence. This contextual adaptability allows CLTS to resonate with diverse communities and their unique values, increasing the likelihood of sustained change.

Despite its successes, CLTS implementation and ODF maintenance face various hurdles. Kouassi et al. (2023) and Harter et al. (2019) identify factors like weak facilitation, inadequate follow-up support, and limited resource mobilization as hindering long-term sustainability. In Burkina Faso, Kouassi et al. (2023) found instances of CLTS abandonment before achieving ODF due to these issues, highlighting the need for robust and tailored support structures. Furthermore, entrenched social norms and power dynamics within communities can impede sustained progress. Aluoch et al. (2022) emphasize the importance of addressing gender inequalities and targeting marginalized groups to ensure equitable access to sanitation and hygiene. Simply achieving ODF may not suffice; building a truly inclusive and sustainable environment requires tackling underlying disparities and promoting equitable ownership of sanitation practices.

Recognizing both the strengths and limitations of CLTS is crucial for maximizing its potential. Zuin et al. (2019) advocate for fostering knowledge sharing and peer-to-peer learning between communities, allowing them to learn from each other's successes and challenges. Wasonga et al. (2023) suggest incorporating CLTS "boosting" activities, such as hygiene promotion campaigns and microfinance initiatives, to further incentivize and support continued sanitation efforts. Additionally, research like Saprudin and Syahrul's (2021) highlights the potential of linking CLTS with healthcare services like diarrhea treatment, demonstrating the broader positive impacts of improved sanitation on community health. Integrating CLTS with broader development goals can create a synergistic effect, strengthening its long-term impact.

CLTS remains a valuable tool in the fight against open defecation, yet its effectiveness hinges on acknowledging and addressing its limitations. By strengthening facilitation, tailoring interventions to local contexts, promoting inclusivity, and fostering knowledge exchange, we can unlock the full potential of CLTS and ensure communities not only achieve ODF status but also maintain it for generations to come. Building robust partnerships, integrating with broader development frameworks, and continuously investing in research and learning are essential for advancing this transformative approach towards a future where sustainable sanitation and hygiene are a reality for all.

2.10.2 Adapting CLTS for Improved Sanitation Coverage in Ghana

Ghana grapples with a persistent sanitation challenge common among many developing nations—open defecation poses a significant threat to public health and hygiene. In response, Community-Led Total Sanitation (CLTS) has emerged as a promising approach to attain Open Defecation-Free (ODF) status in communities. This review delves into the adaptations Ghana has made to the CLTS model, scrutinizing successes, challenges, and avenues for further improvement.

Ghanaian CLTS implementation centers on community mobilization, utilizing triggering techniques to instill shame and disgust regarding open defecation, and facilitating the construction of latrines. However, distinctive adaptations have been introduced to the original CLTS framework. Notably, Ghana places a pronounced emphasis on social cohesion, prioritizing the cultivation of strong social bonds within communities by leveraging existing chieftaincy structures and social norms to promote collective action (Adzimah, 2022; Crocker et al., 2016).

Ghana's adaptation of CLTS has undeniably enhanced sanitation coverage and transformed community attitudes towards hygiene. Addressing remaining challenges through targeted interventions, ongoing support, and knowledge sharing can further solidify Ghana's progress towards a universally ODF future. By drawing lessons from Ghana's successes and challenges, other countries can optimize CLTS for their specific contexts, fostering improved sanitation and public health on a global scale.

2.11 Conceptual Framework

The Social Ecological Model (SEM) provides a comprehensive framework for comprehending the complex interaction of human, interpersonal, community, and environmental factors that influence WASH-related behaviors and results. Individual factors (e.g., knowledge, attitudes, beliefs, and behaviors), interpersonal factors (e.g., social norms and networks), community factors (e.g., access to infrastructure, community engagement, and social capital), and environmental factors interact to shape behavior and outcomes, according to the SEM (e.g., availability and quality of water sources, climate change, and land use).

The specific objectives of the study, which are to ascertain the availability and accessibility of WASH facilities, identify and map out households with improved sanitation and hygiene, examine the extent of the consistent use of WASH facilities and its impacts on households, especially women and girls and investigate Open Defecation Free (ODF) relapse, are directly tied to the SEM framework. This is because they seek to examine the numerous factors that contribute to WASH-related behaviors and outcomes at various levels of impact. In particular, the objectives seek to comprehend the influence of individual factors (e.g., knowledge, attitudes, and behaviors), interpersonal factors (e.g., social norms and networks), community factors (e.g., access to infrastructure, community engagement, and social capital), and environmental factors (e.g., availability and quality of water sources, climate change, and land use) on WASH behaviors and outcomes.

Individual, interpersonal, community, and environmental factors that influence WASH-related behaviors and outcomes are the independent variables of this study. These include information, attitudes, beliefs, social norms, social networks, access to infrastructure, community involvement, and environmental factors including the availability and quality of water supplies, climate change, and land use.

The dependent variable is the use of WASH facilities consistently. This variable is influenced at various levels by the independent variables, including individual, interpersonal, community, and environmental influences. The SEM posits that comprehending the intricate interplay of these elements that influence WASH-related behaviors and outcomes requires an appreciation of their interaction.

Moderating variables are variables that affect the intensity or direction of the association between independent variables and dependent variable. For instance, communities with high levels of social capital may be more susceptible to the influence of social norms on the continuous use of WASH facilities than groups with low levels of social capital.

The mediating variables are variables that explain the influence of the independent variables on the dependent variable. Knowledge and attitudes, for instance, may moderate the relationship between community engagement and consistent use of WASH facilities.

The SEM framework provides a comprehensive approach for comprehending the intricate interaction of factors that influence WASH-related behaviors and results. The paradigm emphasizes the significance of taking into account several levels of influence, such as individual, interpersonal, community, and environmental factors, and their interaction in determining WASH behaviors and outcomes. The precise objectives of the study are directly tied to the SEM framework, since they seek to examine the numerous factors that contribute to WASH-related behaviors and outcomes at various levels of impact. This approach enables a more thorough understanding of the numerous elements that contribute to WASH-related behaviors and outcomes and can inform the design of successful interventions to promote the regular use of WASH facilities.

2.12 Conclusions from the Literature Analysis

Water, Sanitation, and Hygiene (WASH) initiatives, including the availability and accessibility of water facilities, the adoption of better sanitation and hygiene facilities, the continuous use of WASH facilities, and the factors contributing to ODF relapse. Through a survey of relevant literature, the review uncovered a few insights and literature gaps pertaining to these objectives.

Regarding the availability and accessibility of water facilities, the literature indicates that while access to water sources has improved in many regions, the quality of water sources continues to be a major concern. In some locations, the degree of water infrastructure coverage remains a challenge. Also noted as a key barrier to the implementation of improved sanitation and hygiene facilities is their cost.

To fully realize the benefits of WASH programs, consistent usage of WASH facilities is required. Literature emphasizes the need to address the behavioral, social, and economic aspects that impact continuous usage. Accessing and utilizing WASH facilities can have major effects on the health outcomes, economic productivity, and social wellbeing of women and girls.

In many regions, ODF relapse is a significant worry. Literature indicates that community dynamics, infrastructure upkeep, and behavioral variables are major causes of ODF relapse. Relapse can be prevented by addressing these factors through ongoing community engagement and good monitoring and evaluation.

Table 2.1 Table of Identified Gaps:

Objective	Identified Gaps
1	Lack of data on water quality in some regions.
2	Limited research on the role of cultural practices in the adoption of improved sanitation and hygiene facilities.
3	Limited research on the economic impacts of consistent use of WASH facilities.
4	Limited research on the effectiveness of strategies to address behavioural factors contributing to ODF relapse.

This review emphasizes the significance of continuing research and evaluation of WASH initiatives to ensure that they are effective in enhancing access to and use of WASH facilities. In addition, persistent community engagement and monitoring and evaluation are essential for preventing ODF relapse and ensuring the longevity of WASH programs.

CHAPTER THREE

3.0. METHODOLOGY

3.1 Introduction

The study area and the methodology used in this study are described in this chapter. The research region includes information on its geographic location, climate, vegetation, geology, demographics, and socioeconomic conditions. Secondly, the chapter describes the methodology and tools applied to this research. A description of the research sampling, data gathering techniques, and tools is also provided. The final section of the chapter explains the collection, processing, analysis, and presentation of the data.

Empirical evidence from the Volta Regional Health Management Team (VRHMT) indicates the dominance of faecal-oral/waterborne (cholera, typhoid, dysentery, etc.) in reported hospital attendance cases across all health facilities in the region. This indicates a clear case of the consequences of poor waste management, as the region is noted to be among the leaders in Open Defecation (OD), where over 50% of the residents engage in the practice. Undoubtedly, achieving sustainable WASH will considerably contribute to the decline in waterborne and water-related diseases and improve overall health outcomes leading to a reduction in the financial burden associated with managing these diseases, which have become seasonal.

Despite the foregoing, it is also noted that research on critical aspects of sanitation and its sustainability in the region has been limited. This study thus fills in the gap by examining the factors that serve as barriers or enablers to the effective implementation of Ghana's Water, Sanitation, and Hygiene (WASH) intervention programmes, with a specific emphasis on the Community-led Total Sanitation programme (CLTS), using three districts (Ho West, Agotime Ziope and Adaklu) in the Volta Region.

Some communities in these districts have reached the Open Defecation Free (ODF) status; as such, the objective of the current research was to investigate the current levels of open defecation (OD) rates (if any) and any factors that might have contributed to ODF slippages.

3.2 Description of The Study Sites

The three districts, namely Adaklu, Agotime-Ziope, and Ho West, are peripheral to the Ho Municipality, which hosts the capital of the Volta Region of Ghana (Figure 3.1).

3.2.1 Adaklu District

The Adaklu District is a relatively young administrative region, established in 2012 after being carved out of the former Adaklu-Anyigbe District. The administrative capital of the district is Adaklu-Waya. The geographical coordinates are approximately 06° 41′ 1″N latitude and 00° 20′ 1″E longitude. The district covers a land area of 810.8 square kilometers, featuring a diverse terrain with extensive hills, mountains, and lowlands (Wikipedia, 2021). The Adaklu District shares boundaries with Agotime-Ziope District to the east, Ho Municipal to the north, Central Tongu District to the south, and Ho West to the West. The district's population was estimated at 86,649, predominantly living in rural areas. The major vegetation type is savannah woodland, and the drainage system includes several significant rivers such as the Awator, Tordze, Todzoto, Dawa, Kalakpa, and Kplikpa, along with various streamlets (Bormann, 2023).

The climate in the Adaklu District features a bimodal rainfall pattern with the major rainy season from mid-March to July and the minor season from August to November. Temperatures range between 22°C and 32°C, with the wettest month being June, averaging 192mm of rainfall, and the driest month being December with about 20.1mm (Adaklu District Assembly, 2021). Agriculture is the dominant economic activity, engaging 78% of the active labor force in the district. The main agricultural products include cereals, legumes, tubers, and vegetables. Additionally, the district has significant tourism potential with sites like Adaklu Mountain and the Kalakpa Forest, which are notable for their biodiversity (Adaklu District Assembly, 2021).

Water and sanitation infrastructure in the district is limited, with many communities lacking access to potable water. Health services are provided through various health centers and Community-based Health Planning and Services (CHPS) zones, although there is no hospital in the district. Common health issues include insect and waterborne diseases such as malaria, worms, and diarrhea (Adaklu District Assembly, 2021).

3.2.2 Agotime-Ziope District

Agotime-Ziope District was established in 2012 when the former Adaklu-Anyigbe District was divided into two separate districts. The capital of Agotime-Ziope District is Agotime Kpetoe. The district has a population of approximately 28,013, with 48.2% males and 51.8% females. A significant majority of the population, about 75.7%, resides in rural areas (Wikipedia, 2021; Ghana Districts, 2021). Geographically, the district shares borders with the Republic of Togo along its eastern and north eastern boundary, Ho Municipal to the north – western boundary, Central Tongu to the south, and Ho West to the west. It spans a total land area of 315.7 square kilometers. The vegetation of Agotime-Ziope is characterized by savannah woodlands, part of the Forest-Savanna Transitional Ecological Zone, with occasional forest areas along riverbanks (Ghana Districts, 2021).

The district's climate is similar to that of the Adaklu District, featuring a bimodal rainfall pattern. Agriculture is the predominant economic activity, with 72% of households engaged in farming, primarily focused on crop production, which accounts for 96.4% of agricultural activities (Agotime-Ziope District Assembly, 2021). The most common household solid waste disposal method is public dumps in the open space (39.5%). The district is largely composed of flat and poorly drained lowlands that experience frequent floods and is drained by several rivers that are partly ephemeral, leading to severe water access situations in the dry seasons.

3.2.3 Ho West District

The Ho West District, established in 2012, was carved out of the Ho Municipality. The capital of the district is Dzolo-Kpuita. It is geographically positioned between latitudes 6.33°32"N and 6.93°63"N, and longitudes 0.17°45"E and 0.53°39"E. The district shares boundaries with North Tongu District to the south, Afadjato South District to the north, Ho Municipality and the Republic of Togo to the east, and South Dayi District to the west. Covering a total land area of 1,002.79 square kilometers, the district had an estimated population of 112,086 in 2017, consisting of 54,989 males (49%) and 57,097 females (51%) (Ho West District Assembly, 2020).

The district's population structure is characterized by a relatively young demographic, which influences planning and the provision of social amenities such as schools and healthcare facilities. The population is predominantly rural, with major settlements including Tsito and Kpedze. The area is known for its fertile land, which supports agriculture, particularly the production of food crops and cocoa (Ho West District Assembly, 2012). The annual mean temperature for the district ranges from 16.50 °C to 37.80 °C. The district has two main vegetation types, and these include the moist semideciduous forest (on hills) and savannah woodland. Nearly three-quarters of the population (73.5%) are engaged in agricultural activities, involved in the cultivation of commercial crops (cocoa, oil palm, coffee), and staples (plantain, maize, cassava, yams, groundnuts), and vegetables.

Water for drinking and domestic use are largely obtained from sources such as bore-holes, communal standpipes, rivers or streams, and pipe borne water (inside and outside dwelling units). Open dumping of wastes dominates (56.5%) the means of waste disposal in the district. On the other hand, there health facilities of various categories across the district.

3.2.4 Justification of the Three Study Districts

Three different districts were chosen because of their different socio-economic and infrastructural contexts within the same region and its importance for comparative analysis, and ensuring the findings are robust, generalizable across diverse contexts and for identifying how different local conditions influence WASH outcomes. It also allows for an in-depth data collection and provides comprehensive understanding than a single – site study would offer.

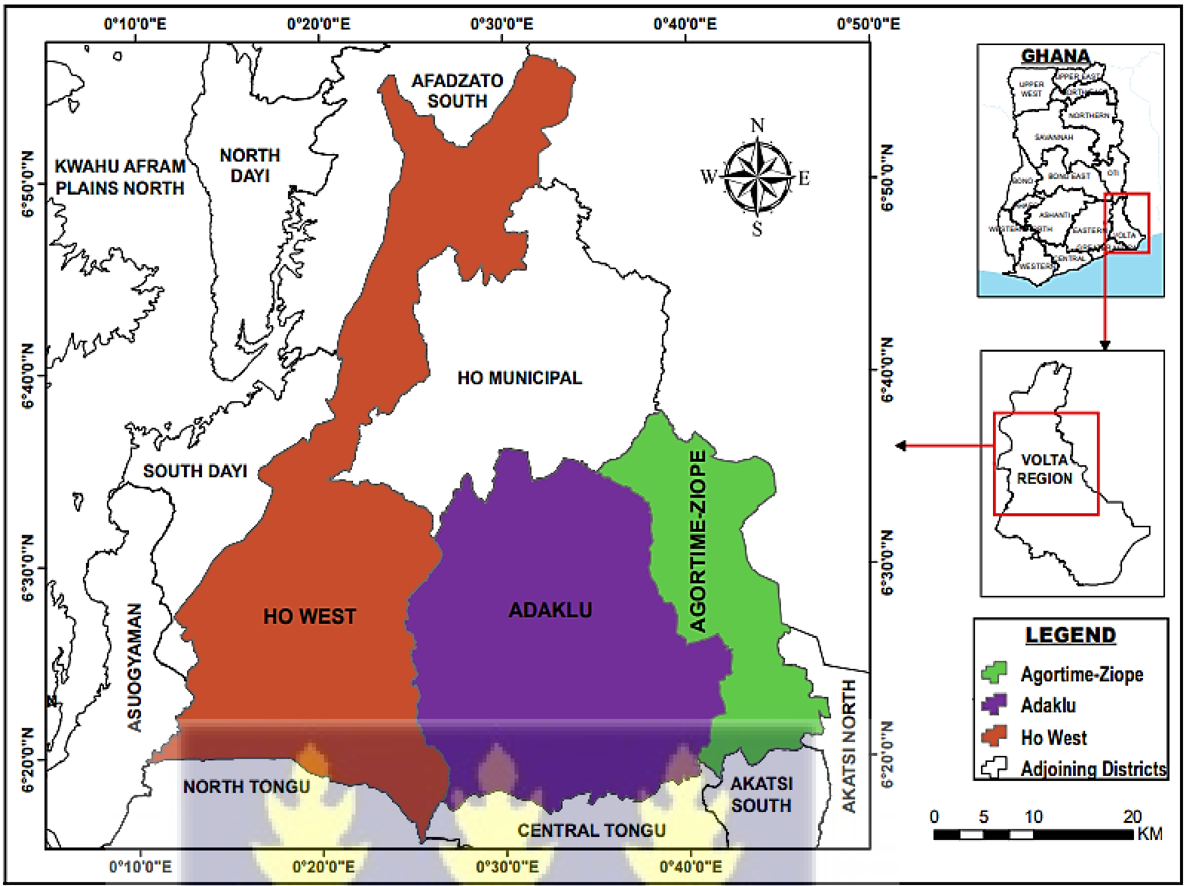


Figure 3.1: Map of the study districts

3.3 Research Design

This study utilized a descriptive mixed method design, primarily employing questionnaires to gather data from participants in the three districts of the Volta Region. A descriptive mixed method approach was chosen to enable the systematic collection and analysis of numerical data, allowing the researcher to assess the status of water access, sanitation, and hygiene (WASH) interventions and their outcomes in the study areas. This method is particularly suited for understanding the prevalence and distribution of open defecation and related WASH practices across the different districts, providing insights into the scope of the issues being investigated.

The key data collection tool for this study was structured questionnaires, designed to capture quantitative data on water access, sanitation, and hygiene behaviors among respondents. This approach allowed for a detailed description of the current situation without attempting to explore causal relationships. Additionally, a limited number of key informant interviews were conducted with WASH program implementers and local authorities to gather expert insights on the interventions, and field observations were made to validate some of the data collected through the questionnaires. However, these qualitative elements were used to complement the descriptive quantitative findings, not to establish a mixed-methods design. The data collected was processed, analyzed, and presented using descriptive statistical techniques, including frequency distributions and percentage comparisons across the study districts.

The focus group discussion (FGD) is a qualitative research method and data collection technique that enabled the researcher to select a group of people having things in common to discuss a given topic or issue in-depth, facilitated by a professional, external moderator. The approach also allows for detailed interrogation of factors under investigation (Chen & Lo, 2015; El-Seesy et al., 2020; Siksnelyte-Butkiene et al., 2021).

3.4 Target Population

This study focused on diverse target groups within the community. It comprises any member of the communities (normal household), schoolteachers and pupils in school; administrators at health facilities, and at governmental institutions involved in sanitation such as: Community Water and Sanitation Agency, District Health Directorate, Regional Health Directorate, District Environmental Health Department, Regional Environmental Health Department.

3.4.1 Justification for Choosing the Respondents

Households: This group is the primary unit of the WASH intervention and the ultimate beneficiaries. Evaluating households provides direct evidence on:

Health Outcomes: Assessing changes in the prevalence of waterborne diseases (e.g., diarrhea) at the household level.

Behavioral Change: Understanding the adoption and sustainability of key hygiene behaviors like handwashing with soap and the use of household latrines, which is central to CLTS success.

Access and Equity: Gathering data on access to and functionality of WASH facilities in the home across different socioeconomic statuses, identifying inequalities (e.g., between the rich and the poor, or urban and rural areas).

Vulnerable Populations: Capturing the specific experiences and challenges of vulnerable household members, such as children, women, and persons with disabilities.

Schools: Schools are crucial settings for promoting long-term hygiene practices and offer a unique data point because they:

Influence Future Generations: Children can act as "agents of change," transferring health and hygiene information learned at school to their families and communities.

Impact Education Outcomes: Adequate WASH facilities in schools, especially gender-specific and private latrines, are vital for improved school attendance and retention, particularly for menstruating girls.

Assess Institutional Capacity: Evaluating schools reveals the status of WASH infrastructure operation and maintenance, funding, and the effectiveness of school-based WASH committees and student clubs, which is critical for sustainability.

Health Staff: Health workers are essential stakeholders because they link WASH to public health and the formal healthcare system. Their inclusion provides insights into:

Disease Prevention and Management: Health staff observe firsthand the burden of WASH-related diseases in the community and facilities, and they can provide data on the effects of WASH interventions on public health indicators.

Infection Prevention and Control (IPC): They ensure quality of care within health facilities where robust WASH systems are critical for preventing secondary infections.

Community Linkages: They are involved in health promotion activities and can offer a professional perspective on community behavior change and the integration of WASH into broader health planning and programming.

CLTS Implementers: As the frontline personnel for the CLTS approach, their perspective is invaluable for evaluating program design and execution, specifically:

Implementation Process: They provide insights into the effectiveness of "triggering" approaches, follow-up visits, and capacity-building efforts for local latrine artisans and natural leaders.

Challenges and Success Factors: They can articulate the operational challenges, potential success factors, and attitudes encountered during the process of achieving Open Defecation Free (ODF) status in communities.

Policy and Advocacy: Implementers can shed light on the synergy (or lack thereof) between CLTS implementation and existing sanitation laws or policies, which is essential for advocating for an enabling environment.

By gathering data from these diverse groups, the evaluation can provide a holistic understanding of the WASH program's impact, ranging from high-level policy and implementation processes to household-level behavioral change and health outcomes.

3.5 Sample and Sampling Techniques

The number of respondents (sample size) was calculated using the Yamane (1967) sample determination formula (Equation 1) and the total number of beneficiaries of the Community-Led Total Sanitation (CLTS) implementation in the three districts. A total of 1,500 individuals benefited from the CLTS implementation, which was instituted in the year 2015 across the three districts.

Thus, the number of respondents to be interviewed from the three districts is as follows:

$n = \frac{N}{1+N(e)^2}$ = **Equation 1**

Where n = required sample size; N = Accessible population and e = significance level (0.05).

From the formula:

$n = \frac{1500}{1+1500(0.05)^2} = 316$

The above formula produced a sample size of 316 respondents. A 10% of the computed sample size was added to cater for non-response, thus producing a total of 348 respondents across the three districts. The number of respondents to be interviewed in each district was then proportionally allocated among the three institutions based on the population of beneficiaries in each district.

Table 3.1: Number of Respondents (Households) Per District (proportional allocation based on figures above)

#	District Name	Beneficiaries	Proportion	Number of Respondents
1	Adaklu District	500	33.3%	116
2	Agotime-Ziope District	400	26.7%	93
3	Ho West District	600	40.0%	139
TOTAL		**1500**	**100%**	**348**

Table 3.2: Respondents (Households) by locality (within district)

#	District Name	Respondents	Locality Distribution	Number of Respondents
	Adaklu District	116	Rural 70%	81
			Small Town 30%	35
	Agotime-Ziope District	93	Rural 80%	74
			Small Town 20%	19
	Ho West District	139	Rural 75%	104
			Small Town 25%	35
TOTAL		**348**		**348**

In the beneficiary communities of the districts, a simple random sampling approach was adopted in recruiting the study participants (respondents).

3.6 Data Collection Tools and Procedure

This study employed both quantitative and qualitative data collection methods, though the primary focus was on quantitative data. The quantitative data were collected using structured questionnaires distributed to participants across the three districts. These questionnaires were designed to capture numerical data on water access, sanitation, and hygiene (WASH) practices. The questionnaires allowed for the collection of data that could be statistically analyzed, providing a broad understanding of the WASH issues across the study areas.

In addition to the quantitative data, a limited number of key informant interviews were conducted to gather qualitative insights. These interviews were conducted with WASH program implementers, local authorities, and other relevant stakeholders. The purpose of collecting qualitative data was to complement and provide context to the quantitative findings. By incorporating qualitative data, the study aimed to capture more nuanced insights into the implementation and challenges of WASH interventions that might not be fully reflected in the quantitative results. This complementary approach enabled the researcher to provide a more holistic analysis of the WASH interventions in the Volta Region.

The quantitative and qualitative data were collected separately, but they were analyzed together in a complementary manner. The quantitative data from the questionnaires were analyzed using descriptive statistics, such as frequencies and percentages, to present a clear picture of the WASH situation in each district. Meanwhile, the qualitative data from the key informant interviews were analyzed to identify themes and patterns that could help explain or add depth to the quantitative findings.

The qualitative data were collected through audio-recorded interviews, which were transcribed using transcription software. The transcriptions were carefully reviewed and coded using Microsoft Excel to organize the data for thematic analysis. The analysis followed the guidelines of Nowell et al. (2017), beginning with multiple readings of the transcribed data to familiarize the research team with the content. Common themes were identified through discussions among the research team, and discrepancies were resolved collaboratively. Each response was assigned to relevant themes, ensuring the data were consistently and appropriately categorized.

The final analysis combined the quantitative statistical results with the qualitative themes, allowing the researcher to provide a comprehensive interpretation of the WASH interventions. The qualitative insights helped to contextualize the quantitative data, especially in understanding the challenges faced in implementing the interventions. The findings are presented with concrete examples to illustrate key points and enhance the understanding of the WASH landscape in the Volta Region.

3.6.1 Surveys/Questionnaire Administration

In all, 348 participants were interviewed in 12 communities across the three districts. The communities in which the interviews were conducted include Adaklu-Waya, Adaklu-Anfoe, Agotime-Kpetoe, Ziope, Dzolo-Kpuita, Kissiflui and other selected rural and urban areas. The survey comprised open and close-ended questions, with some responses in the form of a Likert scale. The questionnaires were divided into four sections:

1. **Demographic Information**: This section gathered basic information about the respondents, such as age, gender, education level, and occupation.
2. **WASH Facilities Availability**: This section focused on the availability of Water, Sanitation, and Hygiene (WASH) facilities in the households.
3. **Access and Use of WASH Facilities**: This section examined how accessible the WASH facilities were and the consistency of their use by household members.
4. **Impacts and ODF Relapse**: This section investigated the impacts of WASH facilities on the community and the issue of Open Defecation Free (ODF) status relapse among the households.

The questionnaires were administered to examine the extent of availability, access to, and consistent use of WASH facilities, as well as ODF relapse among the households. Copies of the questionnaires or interview guides are presented in the appendix.

The survey instruments were pretested with a small number of respondents selected from a different beneficiary community that was not part of this study before being used for the main study. Although the instruments were written in English, they were administered in the local dialect, Ewe, to ensure better comprehension and accurate responses from the participants.

3.6.2 Key Informant Interviews (KIIs) and Focused Group Discussions

In-depth interviews were conducted with District Health Officials and key implementers of the CLTS in the districts to ascertain the challenges or barriers faced at the districts institutionally with regard to the implementation of WASH interventions. The KIIs were also to help obtain relevant data and information including records and data related to the subject matter for review.

Focus Group Discussions (FGDs) were also carried out; the FGDs were carried out in cohort groups of men, women, young men and young women (youth). The segregation into various groups was to encourage interactions during the discussions through effective participation. The focus groups discussions helped discover new aspects and information of the research, as the participants owned and contributed together much more and more diverse perspectives on the topic under study.

Figure 1: Researcher with healthcare workers during focused group discussion in Adaklu District.

3.6.3 Direct Observations - Spot-Checks

Rapid observations were employed to study the status of the WASH infrastructure, access, functionality and use in communities in the study districts. There were brief, unannounced visits to the households and facilities to observe pre-determined, easily verifiable conditions at a single point in time.

Checklists were used to quickly assess proxy measures of behavior and access, such as the presence of soap and water at a designated hand washing places, conditions of household latrines, and general environmental cleanliness.

The results of the observations, particularly of the WASH facilities were noted and recorded for further comparative analyses.

3.7 Data Management and Analysis

The data management process for this study involved a series of structured steps aimed at ensuring the accurate and efficient handling of the data collected to address the specific objectives of the research. The following outlines the detailed steps undertaken for each specific objective:

3.7.1 Specific Objective 1: To Ascertain the Availability and Accessibility of WASH Facilities

1. **Data Entry in Excel:**
    - A new spreadsheet was created in Excel.
    - Columns were set up for each relevant variable, such as District, Facility Type (e.g., toilet, handwashing station), Availability (Yes/No), and Accessibility (Easy/Difficult/Not Accessible).
    - The collected data from the questionnaires were entered into the respective columns.

2. **Descriptive Statistics in SPSS:**
   - The data were imported into SPSS by selecting the Excel file.
   - Descriptive statistics were generated by navigating to Analyze > Descriptive Statistics > Frequencies, selecting variables like Facility Type, Availability, and Accessibility, and generating frequency tables and summary statistics.
   - The output tables were reviewed to understand the distribution and availability of WASH facilities.
3. **Cross-tabulation in SPSS:**
   - Cross-tabulation was performed by going to Analyze > Descriptive Statistics > Crosstabs, selecting "Facility Type" for rows and "Accessibility" for columns, and selecting Chi-square to test for associations.
   - The crosstabs and chi-square test results were reviewed to understand how accessibility varied by facility type.

3.7.2 Specific Objective 2: The State of Water, Sanitation and Hygiene Facilities.

1. **Data Entry and Cleaning in Excel:**
   - A new spreadsheet was created in Excel.
   - Columns were set up for District, Household ID, GPS Coordinates (Latitude, Longitude), Sanitation Facility Type, and Hygiene Facility Type.
   - The collected data, including accurate GPS coordinates for each household, were entered into the respective columns.
2. **Descriptive Statistics in SPSS:**
   - The data were imported into SPSS.

- Descriptive statistics were generated by navigating to Analyze > Descriptive Statistics > Frequencies, selecting variables like Sanitation Facility Type and Hygiene Facility Type, and generating frequency tables and summary statistics.
- The output tables were reviewed to understand the distribution of improved sanitation and hygiene facilities.

3.7.3 Specific Objective 3: To Examine the Petronage Level of WASH Facilities in Households, Schools and Healthcare Facilities.

1. **Data Entry in Excel:**
   - A new spreadsheet was created in Excel.
   - Columns were set up for District, Household ID, Facility Type, Frequency of Use, Impacts (e.g., health benefits, time saved), Gender, and Age.
   - The collected data were entered into the respective columns.
2. **Descriptive and Inferential Analysis in SPSS:**
   - The data were imported into SPSS.
   - Descriptive statistics were generated by navigating to Analyze > Descriptive Statistics > Frequencies, selecting variables like Frequency of Use and Impacts, and generating frequency tables and summary statistics.
   - T-tests or ANOVA were performed by navigating to Analyze > Compare Means > Independent-Samples T Test (or One-Way ANOVA for more than two groups), selecting Impacts as the Test Variable and Gender (or other demographic variables) as the Grouping Variable, and specifying the groups (e.g., Male and Female).

- The analysis was performed and the results were interpreted.

3.7.4 Specific Objective 4: To Investigate Open Defecation Free (ODF) Relapse

1. **Data Entry and Cleaning in Excel:**
    - A new spreadsheet was created in Excel.
    - Columns were set up for District, Community ID, ODF Status (Yes/No), Relapse Status (Yes/No), Date of ODF Declaration, and Date of Relapse.
    - The collected data were entered into the respective columns.
2. **Descriptive Analysis in SPSS:**
    - The data were imported into SPSS.
    - Descriptive statistics were generated by navigating to Analyze > Descriptive Statistics > Frequencies, selecting variables like ODF Status and Relapse Status, and generating frequency tables and summary statistics.
    - Cross-tabulation was performed by navigating to Analyze > Descriptive Statistics > Crosstabs, selecting ODF Status for rows and Relapse Status for columns, and selecting Chi-square.
    - The crosstabs and chi-square test results were reviewed and interpreted.

This structured approach to data management ensured the accuracy, reliability, and comprehensiveness of the data analysis, facilitating a robust examination of the research objectives.

3.8 Ethical Consideration

In conducting this study, several ethical considerations were meticulously addressed to ensure the protection of participants' rights and the integrity of the research process. The following ethical guidelines were adhered to:

1. **Informed Consent:**

Participants were provided with detailed information about the purpose of the study, the procedures involved, and their rights as participants.

Written informed consent was obtained from all participants before data collection commenced. This consent included permission to use the collected data for research purposes.

2. **Confidentiality and Anonymity:**

The confidentiality of participants' information was strictly maintained. Data were anonymized by assigning unique identification codes to participants instead of using personal identifiers.

All data were securely stored and only accessible to the research team to prevent unauthorized access.

3. **Voluntary Participation:**

Participation in the study was entirely voluntary. Participants were informed that they could withdraw from the study at any point without any consequences.

No incentives or coercion were used to influence participation.

4. **Minimizing Harm:**

The study was designed to minimize any potential harm or discomfort to participants. Questions were framed sensitively to avoid causing distress.

Any identified needs or issues that arose during the study were addressed promptly, including providing participants with resources or referrals if necessary.

5. **Ethical Approval:**

The research proposal was submitted for review and approval by the relevant ethical review board to ensure that all ethical standards were met.

Ongoing monitoring was conducted to ensure compliance with ethical guidelines throughout the research process.

6. **Transparency and Honesty:**

Transparency in data collection, analysis, and reporting was maintained to uphold the integrity of the research.

Participants were informed about the results of the study upon completion, ensuring that they were aware of the study's outcomes and any potential implications.

By adhering to these ethical principles, the study ensured the respectful and ethical treatment of all participants, maintaining the credibility and reliability of the research findings.

CHAPTER FOUR

4.0 RESULTS

4.1. Introduction

This chapter presents the results and analysis of the data collected to achieve the objectives of the study, which focused on evaluating water access, sanitation, and hygiene (WASH) intervention programs in three districts within the Volta Region of Ghana. The key objectives of the study were to: (1) ascertain the availability and accessibility of WASH facilities, (2) To assess the state of WASH facilities in households, schools, and healthcare facilities, (3) To examine the patronage level of WASH facilities in households, schools, and healthcare facilities. and (4) investigate Open Defecation-Free (ODF) sustainability in the study districts.

The data was collected through a descriptive quantitative approach using structured questionnaires administered to households, school heads and pupils and healthcare facility heads in the districts. Additionally, a limited number of key informant interviews and direct observations were used to supplement the quantitative findings and provide context to the WASH interventions' effectiveness. This chapter integrates quantitative data with a little qualitative data to complement the former to provide a comprehensive overview of the current state of WASH facilities and their utilization in the selected districts.

4.1 Specific Objective 1: To ascertain the availability and accessibility of WASH facilities.

4.1.1 Analysis of the Source of Drinking Water and Frequency of Access to Clean Water in Adaklu District

Tables 4.1 and 4.2 presents the outcome of the examination of the source of drinking water and the frequency of access to clean water among households in Adaklu district. The analysis used data from 85 households.

Table 4.1: Source of Drinking Water by Frequency of Access to Clean Water in Adaklu District

Source of Drinking Water	Never	Sometimes	Often	Always	Total
Pipe (n = 24)	5 (20.8%)	2 (8.3%)	0 (0.0%)	17 (70.8%)	24
Rain (n = 9)	1 (11.1%)	2 (22.2%)	0 (0.0%)	6 (66.7%)	9
Stream/River (n = 41)	0 (0.0%)	36 (87.8%)	0 (0.0%)	5 (12.2%)	41
Other (n = 11)	0 (0.0%)	1 (9.1%)	2 (18.2%)	8 (72.7%)	11
Total (N = 85)	6 (7.1%)	41 (48.2%)	2 (2.4%)	36 (42.4%)	85

Pipe users showed the highest consistency in access, with 70.8% indicating they always had clean water, while 20.8% reported never having clean water and 8.3% reported sometimes having clean water. For households relying on rainwater, 66.7% always had clean water, 22.2% sometimes had clean water, and 11.1% never had clean water. Among stream or river users, 87.8% reported sometimes having clean water, whereas only 12.2% always had clean water. Users of other sources reported relatively stable access, with 72.7% always having clean water, 18.2% often having clean water, and 9.1% sometimes having clean water. Across all sources, 48.2% of respondents sometimes had clean water, 42.4% always had access, 7.1% never had access, and 2.4% often had access.

Table 4.2: Access to Clean Water by Source of Drinking Water in Adaklu District

Source of Drinking Water	% Never	% Sometimes	% Often	% Always	Observation
Pipe	20.8%	8.3%	0.0%	70.8%	Majority report always having clean water

Rain	11.1%	22.2%	0.0%	66.7%	Access generally good but small number rely on it
Stream/River	0.0%	87.8%	0.0%	12.2%	Mostly inconsistent access to clean water
Other	0.0%	9.1%	18.2%	72.7%	Users mostly report stable clean water access

Table 4.2 shows that pipe users reported the highest consistency, with 70.8% always accessing clean water and only 20.8% reporting no access at all. Rainwater users also experienced favourable access, with 66.7% always obtaining clean water and 22.2% sometimes experiencing fluctuations. Households depending on streams or rivers displayed a markedly different pattern, as 87.8% stated they only sometimes accessed clean water, and only 12.2% reported always having clean water. For those using other water sources, 72.7% always had clean water, while a smaller share, 18.2%, reported often having clean water.

4.1.2 Chi-Square Tests

The Chi-Square tests were conducted to determine the statistical significance of the association between the source of drinking water and the frequency of access to clean water for Adaklu District. The results are presented in Table 4.2.

Table 4.3: Chi-square test to determine the statistical significance of the association between the source of drinking water and the frequency of access to clean water

Test	**Value**	**Df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	66.827	9	$P < .001$
Likelihood Ratio	68.709	9	$P < .001$
Linear-by-Linear Association	0.160	1	$P = .689$

Number of Valid Cases	85

The Pearson Chi-Square value is 66.827 with a p-value < .001, indicating a statistically significant association between the source of drinking water and the frequency of access to clean water.

Directional measures provide additional insights into the strength and direction of the association which are shown in Table 4.4.

Table 4.4: Directional measures of drinking water sources and frequency access.

Measure	Value	Asymp. Std. Error	Approx. Tb	Approx. Sig.
Nominal by Nominal Lambda				
Symmetric	0.511	0.072	5.190	*P* <.001
Source of drinking water Dependent	0.432	0.092	3.819	*P* <.001
Frequency of access to clean water Dependent	0.591	0.087	4.909	*P* <.001
Goodman and Kruskal tau				
Source of drinking water Dependent	0.370	0.061		*P* <.001
Frequency of access to clean water Dependent	0.420	0.082		*P* <.001
Uncertainty Coefficient				
Symmetric	0.367	0.064	5.471	*P* <.001
Source of drinking water Dependent	0.334	0.063	5.471	*P* <.001
Frequency of access to clean water Dependent	0.408	0.068	5.471	*P* <.001
Ordinal by Ordinal Somers' d				
Symmetric	-0.081	0.123	-0.663	*P* = .507
Source of drinking water Dependent	-0.086	0.132	-0.663	*P* = .507
Frequency of access to clean water Dependent	-0.076	0.115	-0.663	*P* = .507

The Lambda value of 0.511 ($p < .001$) indicates a moderate-to-strong association between the source of drinking water and the frequency of access to clean water. The Lambda coefficient ranges from 0.0 (no predictive help) to 1.0 (perfect prediction). Specifically, a value of 0.511 signifies that knowing the source of drinking water reduces the error in predicting the frequency of clean water access by approximately 51.1%. Goodman and Kruskal tau and Uncertainty Coefficient values further support this significant association.

Symmetric measures such as Phi, Cramer's V, and Kendall's tau provide additional information about the association.

Table 1.5: Symmetric measures

Measure	**Value**	**Asymp. Std. Error**	**Approx. Tb**	**Approx. Sig.**
Nominal by Nominal Phi	0.887			*P* < .001
Cramer's V	0.512			*P* < .001
Contingency Coefficient	0.663			*P* < .001
Ordinal by Ordinal Kendall's tau-b	-0.081	0.123	-0.663	*P* = .507
Kendall's tau-c	-0.067	0.101	-0.663	*P* = .507
Gamma	-0.103	0.158	-0.663	*P* = .507
Spearman Correlation	-0.109	0.133	-1.003	*P* = .319
Interval by Interval Pearson's R	-0.044	0.121	-0.398	*P* = .692
Measure of Agreement Kappa	0.000	0.029	0.000	*P* = 1.000
Number of Valid Cases	85			

Phi and Cramer's V values (.887 and .512, respectively, $p < .001$) suggest a strong association between the variables. Both coefficients range from 0 (no association) to 1.0 (perfect association). For tables larger than 2x2, Cramer's V (*V*=.512$) is the preferred measure of effect size, indicating a substantial relationship. Kendall's tau and Gamma values are not significant, indicating that the ordinal association is weak.

4.1.3 Analysis of Household Toilet Types and Their Functional Status in Adaklu District

This section presents the results of the analysis to examine the type of household toilet and whether the household toilet is functional or usable among households in Adaklu district. The analysis used data from 85 households.

4.1.3.1 Descriptive Results

Results on the type of household toilet and whether the household toilet is functional or usable is presented in Tables 4.6 and 4.7 below:

Table 4.6: Type of Household Toilet by Functional Status in Adaklu District

Toilet Type	Functional (Yes)	Not Functional (No)	Don't Know	Total
Flushed Toilet (n=72)	17 (23.6%)	30 (41.7%)	25 (34.7%)	72
Unlined Ventilated (n=2)	1 (50.0%)	1 (50.0%)	0 (0.0%)	2
Mozambique (n=1)	1 (100.0%)	0 (0.0%)	0 (0.0%)	1
KVIP (n=9)	6 (66.7%)	3 (33.3%)	0 (0.0%)	9
Pit Latrine (No Slab) (n=1)	1 (100.0%)	0 (0.0%)	0 (0.0%)	1
Total (N=85)	**26 (30.6%)**	**34 (40.0%)**	**25 (29.4%)**	**85**

Table 4.6 presents the distribution of toilet functionality across the different types of household toilets reported in the Adaklu District. The results show that flushed toilets were by far the most

common, by 72 out of the 85 households surveyed. However, their functionality varied considerably: only 23.6% of flushed toilets were reported as functional, while 41.7% were considered not functional and 34.7% of respondents were unsure of their condition. This indicates that, although flushed toilets are widely adopted, a substantial proportion may face challenges related to maintenance, water availability, or structural reliability.

Table 4.7: Toilet Functionality by Type in Adaklu District

Toilet Type	% Functional	% Not Functional	Observation
Flushed Toilet	23.6%	41.7%	Most common but large proportion not functional
KVIP	66.7%	33.3%	More reliable than flushed toilets
Mozambique	100%	0%	Rare but fully functional
Unlined Ventilated	50%	50%	Functionality evenly split; small sample
Pit Latrine (No Slab)	100%	0%	Only one user reported

Households using KVIP facilities reported better performance, with two-thirds (66.7%) indicating that their toilets were functional. The Mozambique and pit latrine types, though used by very few respondents, were each reported as fully functional. The unlined ventilated toilet type showed an even split between functional and non-functional status, although the small number of users limits interpretation.

Tables 4.6 and 4.7 shows that toilet type alone does not guarantee usability. Even improved or modern toilets such as flushed toilets may not consistently provide reliable sanitation if the necessary supporting systems (e.g., water supply, maintenance) are inadequate. These findings highlight the need to strengthen not only the provision of improved toilets but also the systems required to keep them functional.

4.1.3.2 Chi-Square Tests

The Chi-Square tests were conducted to determine the statistical significance of the association between the type of household toilet and whether the household toilet is functional or usable.

Table 4.8: Chisquare test

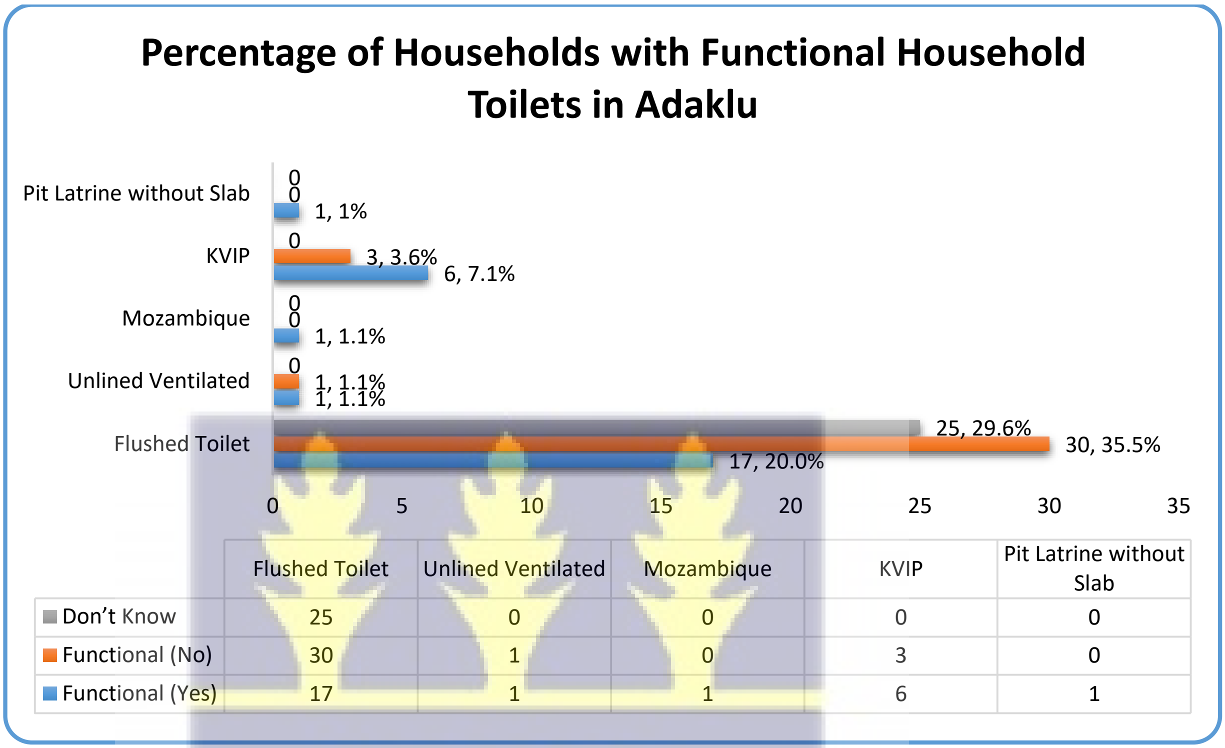
Test	Value	Df	P –value
Pearson Chi-Square	13.886	8	*P* = .085
Likelihood Ratio	16.369	8	*P* = .037
Linear-by-Linear Association	11.138	1	*P* = .001
Number of Valid Cases	85		

The Pearson Chi-Square value is 13.886 with a *P* = .085, which is above the conventional threshold of 0.05, indicating that the association between the type of household toilet and its functionality is not statistically significant at the 5% level. The Likelihood Ratio test indicates a significant association with a p-value of .037.

While the Pearson Chi-Square test did not indicate a significant association at the 5% level, the Likelihood Ratio test and other measures suggest that there is a relationship worth considering. Households with flushed toilets are less likely to report their toilets as functional compared to those with simpler toilet types such as KVIP or pit latrines without slabs within the Daklu District.

4.1.3.3 Percentage of Households with Functional Household Toilets in Adaklu District

The percentage of households with household toilets is presented in Figure 1 and Figure 2.



	Flushed Toilet	Unlined Ventilated	Mozambique	KVIP	Pit Latrine without Slab
Don't Know	25	0	0	0	0
Functional (No)	30	1	0	3	0
Functional (Yes)	17	1	1	6	1

Figure 4.1: Percentage of households with functional household toilets in Adaklu

4.1.3.4 Percentage of households with Access to Clean Water

Figure 4.3 below relates to the percentage of households with access to clean water.

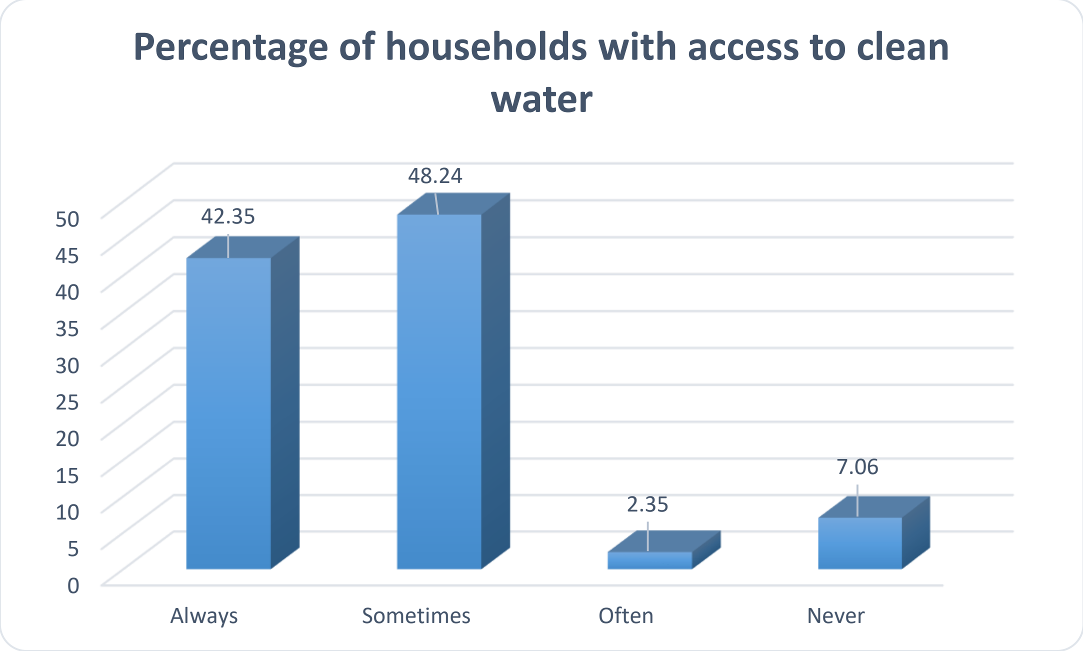


Figure 4.2: percentage of households with access to clean water in Adaklu

The study revealed that about 42.35% of households always have access to clean water. This significant portion indicates that existing infrastructure and resources are effectively providing clean water to these households, highlighting the importance of maintaining and possibly expanding these successful water supply systems to ensure they continue to function effectively.

Almost half of the households (48.24%) reported sometimes having access to clean water. This inconsistency can lead to potential health risks and affect daily activities. Identifying and addressing the causes of intermittent water supply, such as infrastructure issues, seasonal variations, or management practices, is crucial. Implementing backup systems or storage solutions could ensure a more reliable water supply.

A small percentage of households (2.35%) often have access to clean water, but not always. Although this group is better off than those with intermittent access, they still face some challenges. Investigating the barriers preventing these households from having continuous access and implementing targeted interventions to move them to the "always" category is essential.

A notable minority of households (7.06%) lack access to clean water entirely, posing serious health risks and impacting quality of life. These households should be prioritized for immediate intervention, such as providing emergency water supply, developing new infrastructure, or improving existing systems. Ensuring these households are included in future WASH planning and resources is vital.

4.1.1.2 WASH Facilities in Schools across Adaklu District

A survey was conducted involving 37 pupils across different schools to gather data on the availability and condition of these facilities. This section presents a detailed analysis of the findings, along with their implications for improving WASH conditions in the surveyed schools.

Water Access

Most of the pupils (67.6%) reported having access to a drinking water source in their schools, while 32.4% indicated they did not have such access. The sources of water varied, with 24.3% of the schools using mechanized boreholes, 21.6% harvesting rainwater, 18.9% relying on traditional boreholes and 29.7% of the respondents mentioned other sources of water (Table 4.1). Interestingly, 5.4% of the respondents did not respond to the question.

Table 4.2: Water Access across schools in Adaklu District

Water Access Parameter	N	Pupils (%)
Pupils with access to drinking water	25	67.6%
Pupils without access to drinking water	12	32.4%
Water sources		
Mechanized boreholes	9	24.3%

Rainwater harvesting	8	21.6%
Traditional boreholes	7	18.9%
Other sources of water	11	29.7%
No response	2	5.4%
When drinking water not available		
Buying sachet water	20	54.1%
Bringing water from home	10	27.0%
Drink from a food seller	5	13.5%
Drink from a nearby house	1	2.7%
Other	1	2.7%
Schools with containers for water	26	70.3%
Schools without containers	11	29.7%
Types of containers:		
Poly/Sitex tanks	19	51.4%
Veronica buckets	7	18.9%
Plastic bucket	1	2.7%
Other	8	21.6%
No response	2	5.4%

When drinking water was not available at school, 54.1% of the pupils resorted to buying sachet water, and 27% brought water from home. A significant 70.3% of schools had containers for storing drinking water, predominantly poly/sitex tanks (51.4%) and Veronica buckets (18.9%).

Sanitation and Hygiene

Table 4.3: Sanitation and health across schools in Adaklu District

Sanitation and Hygiene Parameter	N	Pupils (%)
Pupils with access to toilets	34	91.9%
Pupils without access to toilets	3	8.1%
Functional toilets	22	59.5%
Non functional toilets	12	32.4%
No response	3	8.1%
Non-functional toilets due to:		
Broken down	16	43.2%
Locked	7	18.9%
No idea	6	16.2%
Not applicable	8	21.6%
Types of toilets		
KVIP latrines	20	54.1%
Water closets	7	18.9%
Other	10	27.0%
Signs of open defecation	19	51.4%
No sign of open defecation	13	35.1%
No idea	5	13.5%
Signs of feces/urine in toilet areas	21	56.8%
No signs of feces/urine in toilet areas	16	43.2%
Scattered anal cleansing materials	21	56.8%
Anal cleaning materials not scattered	16	43.2%
Offensive odor from latrines	27	73.0%
No offensive odor from latrines	10	27.0%

Sanitation facilities were present in most schools, with 91.9% of pupils confirming the availability of toilets. However, only 59.5% of these toilets were functional. The primary reasons for non-functionality included being broken down (43.2%) and being locked (18.9%). The types of toilets varied, with 54.1% using KVIP (Kumasi Ventilated Improved Pit) latrines, and 18.9% having water closets.

In terms of hygiene practices, 78.4% of pupils used personal water drinking cups or flasks. Despite the presence of toilets, 51.4% of respondents noted signs of open defecation within the school environment, and 56.8% observed visible signs of feces and urine on the squat slab or walls. Moreover, 56.8% of pupils reported that anal cleansing materials were scattered on the latrine floor, and 73% indicated that the latrines produced offensive odors.

Waste Management

Table 4.4: Waste Management in schools across Adaklu District

Waste Management Parameter	**N**	**Pupils (%)**
Schools with daily waste collection	33	89.2%
Every 3 days	2	5.4%
Weekly	2	5.4%
Schools with waste bins	19	51.4%
Schools without waste bins	18	48.6%
Waste stored in:		
Closed containers	12	32.4%
Open containers	6	16.2%
Polythene bags/sacks	9	24.3%
Other	10	27%
Common waste items found:		
Food waste	5	13.5%
Paper and other materials		43.2%

Waste Management Parameter	N	Pupils (%)
Animal waste	2	5.4%
All types of waste	14	37.8%
Waste disposal methods:		
Burned	23	62.2%
Backyard disposal	6	16.2%
Buried	4	10.8%
Bush/roadside/drain	4	10.8%
Reason for waste disposal methods		
Lack of waste collection services	20	54.1%
No refuse dump	10	27%
No waste container	2	5.4%
Other	5	13.5%

Waste management practices varied significantly across the schools. While 89.2% of pupils reported daily waste collection, 51.4% of schools had waste bins. Most waste was stored in closed containers (32.4%) or polythene bags/sacks (24.3%) before disposal. Commonly found items in school waste included paper and other materials (43.2%), and 37.8% reported a mix of all types of waste.

Waste disposal methods also differed, with 62.2% of pupils stating that waste was burned, 16.2% used the backyard, and 10.8% buried the waste. Additionally, 54.1% mentioned the lack of waste collection services as the primary reason for their chosen disposal method.

Implications

The findings indicate that while a significant number of schools have access to water and sanitation facilities, the functionality and hygiene conditions of these facilities are concerning. The presence of open defecation, scattered anal cleansing materials, and offensive odors highlights the need for regular maintenance and education on proper hygiene practices.

4.1.1.3 Water, Sanitation, and Hygiene (WASH) Facilities among Health Staff in Adaklu District

The survey aimed to assess the state of clinical waste management, sanitation facilities, and water access in these facilities. Data was collected from 11 healthcare staff members across different facilities.

Facility Information and Demographics

Table 4.5: WASH Facility Information and Demographics in Adaklu

Facility Information and Demographics	N	Percentage (%)
CHPS compounds	8	72.7%
Health centers	3	27.3%
Female staff	8	72.7%
Male staff	3	27.3%
Nurses	9	81.8%
Doctor/physician assistant	2	18.2
Staff under 30	3	27.3%
Staff aged 30-44	5	45.5%
Staff aged 45-54	3	27.3%

The healthcare facilities surveyed included a mix of CHPS compounds (72.7%) and health centers (27.3%). Among the respondents, 72.7% were female, and the majority were nurses (81.8%). The age distribution showed that 45.5% of the staff were aged 30-44, with equal proportions (27.3%) being under 30 or between 45-54 years.

Clinical Waste Management

Table 4.6: Clinical Waste Management across health facilities in Adaklu

Clinical Waste Management Parameter	N	Percentage (%)
Facilities segregating clinical waste		90.9%
Facilities not segregating waste	1	9.1%
Quality of segregation:		
Poor	5	45.5%
Good	4	36.4%
Very good	2	18.2%
Clinical waste stored in open spaces	7	63.6%
Clinical waste not stored in garage	3	27.3%
Special room	1	9.1%
Secured storage available	6	54.5%
Unsecured storage	5	45.5%

The segregation of clinical waste was reported by 90.9% of the facilities. However, the quality of segregation varied, with 45.5% rating it as poor, 36.4% as good, and 18.2% as very good. Clinical waste was predominantly stored in open spaces (63.6%) and secured storage was only available in 54.5% of the facilities.

Sanitation Facilities

Table 4.13: Sanitation facilities in health facilities across Adaklu

Sanitation Facilities Parameter	N	Percentage (%)
Facilities with toilet access	7	63.6%
Facilities without toilet access	4	36.4%
Type of toilets (WCs)	7	100% (of facilities with toilets)
Handwashing facilities available	7	100%
Waste bins available	7	100%
Facilities with separate bins for waste	4	36.4%
Facilities without separatebins for waste	7	63.6%
Separate waste bins with covers	4	36.4%
Separate waste bins without cover	7	63.6%
Domestic wasteis disposed when:		
Everyday	3	27.3%
When full	8	72.7%
Waste disposal by burning	7	63.6%
Communal refuse dump	4	36.4%

Toilet facilities were available in 63.6% of the healthcare facilities, all of which were water closets (WCs). Hand washing facilities and waste bins were present in all the facilities surveyed. However, only 36.4% had separate waste bins for domestic and clinical waste, and of these, only 36.4% had fitting covers. Domestic waste was disposed of when full in 72.7% of the facilities, and burning was the common disposal method (63.6%).

Water Access

Table 7: Water Access across health facilities

Water Access Parameter	N	Percentage (%)
Facilities with water access	4	36.4%
Facilities without water access	7	63.6%
Sources of water:		
Boreholes/ Mechanized boreholes	4	36.4%
Streams, rivers, ponds, rain (no access)	5	45.5%
Pipe borne	2	18.1%
Facilities with water storage	11	100%
Water provided to patients	7	100%
Water not provided to patients	4	36.4%

Water facilities were available in only 36.4% of the healthcare facilities. These included boreholes and mechanized boreholes. For those without reliable water sources, staff fetched water from streams, rivers, ponds or harvested rainwater (45.5%). Despite the availability of water storage containers in all facilities, only 63.6% provided water accessible to patients.

***Plate 2:** Water vendor supplying water to one of the health facilities with tricycle motor in Agotime-Ziofe healthcare facilities.*

<u>WASH-Related Health Issues</u>

Table 4.8: WASH-related issues across health facilities in Adaklu

WASH-Related Health Issues	N	Percentage (%)
Facilities reporting water and sanitation-related diseases		100%
Common diseases:		
Typhoid	6	54.5%
Hepatitis B	3	27.3%
Dysentery	1	9.1%
Malaria	1	9.1%
WASH related mortality rate (0.9%)	11	100%

All respondents indicated that their facilities dealt with water and sanitation-related diseases. The most common diseases reported were typhoid (54.5%) and malaria (27.3%). The WASH-related mortality rate in the last year was reported as 0-9% across all facilities.

Implications

The survey highlights significant gaps in the management of clinical waste and the provision of WASH facilities in healthcare settings within the Adaklu District. The lack of protective clothing (81.8%), inadequate training in clinical waste management (81.8%), and the absence of Environmental Health and Safety officers are critical issues that need addressing.

4.1.1.4 WASH Facilities in Schools in Adaklu District

This section reports the findings from a survey conducted on head of schools in various educational institutions within the Adaklu District. The survey aimed to assess the state of sanitation facilities, waste management, and water access in these schools. Data was collected from 9 school heads across different institutions.

School Information and Demographics on heads of schools in the study area

Table 4.9: School information and demographics

School	N	Percentage (%)
Primary schools	8	88.9%
Junior high schools (JHS)	1	11.1%
Respondent positions:		
SHEP coordinators	4	44.4%
Headmasters/mistresses	1	11.1%

Table 4.1710 continued: School information and demographics

School	N	Percentage (%)
Assistant heads	3	33.3%
Teachers	1	11.1%
Schools with 1-10 staff	3	33.3%
Schools with 11-20 staff	6	66.7%

The schools surveyed included a mix of primary (88.9%) and junior high schools (JHS) (11.1%). Positions held by respondents were varied, including SHEP coordinators (44.4%), headmasters/mistresses (11.1%), assistant heads (33.3%), and teachers (11.1%). The number of staff in the schools ranged from 1-20, with 66.7% having 11-20 staff members.

<u>Sanitation Facilities</u>

All surveyed schools had toilet facilities. The types of toilets included KVIP/VIP (77.8%), WC (11.1%), and traditional pit latrines (11.1%). The accessibility of toilets to all levels was available in 66.7% of the schools. The number of toilet seats varied, with the majority having 4-seat toilets (66.7%). However, only 44.4% reported that their toilets were cleaned every day, mostly by students (88.9%).

Table 4.8: Toilet facilities

Sanitation Facilities Parameter	N	Percentage (%)
Schools with toilet facilities	9	100%
Types of toilets:		
KVIP/VIP		77.8%
Water closets (WC)		11.1%
Traditional pit latrines		11.1%
Toilets accessible to all levels		66.7%
Schools with 4-seat toilets		66.7%
Toilets cleaned daily		44.4%
Cleaning done by students		88.9%
Toilet condition:		
Good		44.4%
Bad		55.6%
Offensive odors present		77.8%
No offensive odors present		22.2%
Issues with flies		11.1%
No issue with flies		88.9%
Handwashing facilities:		
Schools with handwashing facilities		55.6%
Schools without handwashing facilities		44.4%
Schools with soap/detergent available		22.2%
Schools without soap/detergent available		77.8%

The condition of the toilets was reported as good by 44.4% and bad by 55.6%. Offensive odors were reported in 77.8% of the schools, while flies were not a common issue

(88.9% reported no flies). Hand washing facilities were available in 55.6% of the schools, but only 22.2% had soap or detergent available.

Plate 3: ***An example of sanitation situation in some Schools in Adaklu District.***

Waste Management

Table 11: Waste management

Waste Management Parameter	Percentage (%)
Schools with waste bins	33.3%
Schools without waste bins	66.7%
Poor waste segregation	66.7%
Good segregation	33.3%
Daily waste disposal	66.7%

Waste Management Parameter	Percentage (%)
Weekly waste disposal	33.3%
Waste managed by pupils	100%
Unsecured waste storage	88.9%
Secured waste storage	11.1%
Waste handling rated as good	77.8%
Waste handling rated as poor	22.2%
Environmental Health Officer visits	55.6%
No visits from environmental health officers	44.4%

Waste bins were available in 33.3% of the schools, and the segregation of waste was poor in 66.7%. Waste was mostly disposed of every day (66.7%) and often managed by pupils (100%). The temporary storage of waste was unsecured in 88.9% of the schools. The handling of waste was rated as good by 77.8% and poor by 22.2%. Environmental Health Officers visited 55.6% of the schools.

Plate 4: Waste segregation at source in Adaklu Wumenu LA Basic School.

Access to water in schools

Table 12: Access to water in schools

Water Access Parameter	Percentage (%)
Schools with water facilities	88.9%
Schools without water facilities	11.1%
Types of water sources:	
Boreholes	22.2%
mechanized boreholes	33.4%
piped water	22.2%
Stream	22.2%
Schools with water connected to the canteen	33.3%
Scools withour water connected to canteen	66.7%
Schools with potable water	88.9%
Schools without portable water	11.1%
Schools with water storage containers	100%
Schools where water is accessible to pupils	88.9%
Schools where water is inaccessible to pupils	11.1%

Water facilities were available in 88.9% of the schools, with sources including boreholes, mechanized boreholes, and piped water. However, only 33.3% had water connected to the canteen. Potable water was available in 88.9% of the schools, and water storage containers were present in all schools. Water was accessible to pupils in 88.9% of the schools.

WASH-Related Health Issues

Table 4.13: WASH-related health issues

WASH-Related Health Issues Parameter	Percentage (%)
Schools not participating in WASH Programs	66.7%
Schools not participating in WASH programs	33.3%
Schools with School Health Club/Committee	33.3%
Schools without School Health Club/Committee	66.7%
Staff trained in waste management	33.3%
Staff with no training in waste management	66.7%
Staff skilled in waste management according to WHO standards	0%

Majority of schools (66.7%) reported that they did not participate in any Water, Sanitation, and Hygiene Programs, and only 33.3% had a School Health Club/Committee. Training on waste management was received by 33.3%, but none felt adequately skilled to manage waste according to WHO standards.

Implications

The survey highlights significant gaps in the provision and management of WASH facilities in schools within the Adaklu District. The lack of proper waste management, insufficient sanitation facilities, and inadequate training are critical issues that need addressing.

4.1.1.5 Water, Sanitation, and Hygiene (WASH) Committee in Adaklu District

This section summarizes the findings from a survey conducted among WASH committee members in various communities within the Adaklu District. The survey aimed to assess the status of water systems, catchment areas, storage, treatment, distribution, committee operations, finance, meetings, and sustainability. Data was collected from 9 WASH committee members across different communities.

<u>Demographics</u>

Table 4.14: Demographics

Demographics	Percentage (%)
Male committee members	88.9%
Female committee members	11.1%
Age 30-40	44.4%
Age 41-49	33.4%
50 and above	22.2%
Occupation – Farmers	55.6%
Occupation – Teachers	44.4%

The WASH committee members surveyed were predominantly male (88.9%) with a few females (11.1%). The ages ranged from 30 to over 60 years, with the majority falling within the 30-40 (44.4%) and 41-49 (33.3%) age brackets. The members held various positions, including chairpersons, secretaries, opinion leaders, assemblymen, and chiefs. Occupations were divided between farmers (55.6%) and teachers (44.4%).

<u>Water Systems and Catchment Areas</u>

Table 4.15: Water systems and catchment areas

Water Systems & Catchment Areas	Percentage (%)
Communities with water systems	33.3%
Communities without water systems	66.7%
Awareness of catchment areas	
No idea of catchment areas	88.9%
Idea of catchment areas	11.1%

33.3% of the members reported the presence of water systems in their communities, while 66.7% reported the absence of such systems. The awareness and existence of catchment areas varied, with the majority (88.9%) reporting no catchment areas. Only a few members acknowledged the existence of catchment areas, and many had no idea about their presence.

Water Storage and Treatment

Table 4.16: Water storage and treatment

Storage and Treatment	Percentage (%)
Communities with storage facilities	33.3%
Communities without storage facilities	66.7%
Communities with water treatment	11.1%
Communities without water treatment	88.9%

The availability of storage facilities was mixed, with some communities having storage systems for water, while others did not. Specifically, 66.7% reported having no storage systems. Water treatment was notably lacking, with 88.9% reporting no treatment facilities, and the remaining members having no idea about water treatment.

Community Water Distribution

Table 4.17: Distribution systems

Distribution Systems	Percentage (%)
Communities with distribution systems	33.3%
Communities without distribution systems	66.7%

Most of the communities (66.7%) lacked water distribution systems, further complicating the accessibility of clean water. Only 33.3% reported having distribution systems in place, reflecting an area that requires urgent attention for equitable water access.

Committee Operations

Table 4.18: Committee operations

Committee Operations	Percentage (%)
Communities with active WASH committees	77.8%
Appointment of committee members by chairman	88.9%
Committees holding regular meetings	66.7%
Committees focused on WASH maintenance	55.6%
Committees focused on financing	11.1%

The majority of communities (77.8%) had active WASH committees, with 88.9% of the members being appointed by the committee chairman. Regular meetings were held by 66.7% of the committees, primarily focusing on WASH maintenance (55.6%) and, to a lesser extent, financing (11.1%).

WASH Financing

Table 4.19: Financing

Sources of Funding	Percentage (%)
Donor support	11.1%
Community contributions	44.4%
Village government/committee support	11.1%

Sources of Funding	Percentage (%)
Funding managed by chiefs, headmen, elders	77.8%

Funding for WASH activities came from various sources, including community contributions (44.4%) and donor support (11.1%). In most cases (77.8%), the funds were managed by chiefs, headmen, and elders, while project leaders managed the remaining 22.2%.

Water Infrastructure Sustainability

Table 4.20: Sustainability measures

Sustainability Measures	Percentage (%)
Communities with sustainability measures	100%
Members relying on government support	88.9%
Communities taking local initiatives	11.1%

All communities had sustainability measures in place, with various stakeholders, including the community, WASH committee, and district assembly, being responsible for these measures. Many members (88.9%) preferred waiting for government support, while others took initiatives at the community level.

4.1.3 Results And Analysis of Agortime Ziope Household Data

4.1.3.1 Access to Clean Water

A cross-tabulation analysis was conducted to examine the relationship between the source of drinking water and the frequency of access to clean water among households in Agotime Ziope district. The analysis used data from 102 households, and the results are summarized in Table 4.30.

Table 4.21: Percentage of households with access to clean water in Agortime District

Frequency of Access to Clean Water	Number of Households	Percentage (%)
Always	41	40.2
Sometimes	45	44.1
Often	4	3.9
Never	12	11.8
Total	102	100

The analysis revealed that 40.2% of households reported always having access to clean water. This indicates that existing infrastructure and resources are effectively providing clean water to these households. A significant portion of households (44.1%) reported sometimes having access to clean water, suggesting that they experience intermittent access. This inconsistency can lead to potential health risks and affect daily activities. A small percentage (3.9%) often have access to clean water but not always, indicating some challenges that need to be addressed. Lastly, 11.8% of households reported never having access to clean water, posing serious health risks and impacting their quality of life.

Table 4.22: Chi-Square Tests

	Value	df	P – value
Pearson Chi-Square	103.906[a]	9	$P < .001$
Likelihood Ratio	96.304	9	$P < .001$
Linear-by-Linear Association	.020	1	$P = .889$
N of Valid Cases	102		

The Pearson Chi-Square value was 103.906 with a p-value of .000, which is statistically significant at alpha =0.05, indicating a statistically significant association between the source of drinking water and the frequency of access to clean water. Additional tests, including the Likelihood Ratio (96.304, p = .000) and Linear-by-Linear Association (0.020, p = .889), further support the significance of this association.

The cross-tabulation analysis reveals a significant association between the source of drinking water and the frequency of access to clean water among households in Agotime Ziope. Households using pipe-borne water are more likely to always have access to clean water compared to those using other sources such as rainwater or streams/rivers. The analysis shows that nearly half of the households experience intermittent access to clean water, which can lead to potential health risks and affect daily activities. These findings highlight the need for targeted interventions to improve water supply reliability and ensure consistent access to clean water for all households in the district.

4.1.4 Functional Household Toilets in Agotime Ziope

A cross-tabulation analysis was conducted to examine the relationship between the type of household toilet and whether the household toilet is functional or usable among households in Agotime Ziope district. The analysis used data from 102 households, and the results are summarized in Table 4.32.

The analysis revealed that 32.4% of households had functional household toilets, while 40.2% reported their toilets were non-functional. Additionally, 27.5% of respondents did not know the functional status of their household toilets. This highlights a significant gap in sanitation infrastructure and awareness among households.

Table 4.23: Percentage of Households with Functional Household Toilets in Agotime Ziope District

Type of Household Toilet	Yes	No	Don't Know	Total
Flushed Toilet (n = 83)	21 (25.3%)	34 (41.0%)	28 (33.7%)	83
Unlined Ventilated (n = 6)	4 (66.7%)	2 (33.3%)	0 (0.0%)	6
KVIP (n = 12)	7 (58.3%)	5 (41.7%)	0 (0.0%)	12
Pit Latrine Without Slab (n = 1)	1 (100.0%)	0 (0.0%)	0 (0.0%)	1
Total (N = 102)	32.4%	40.2%	27.5%	100%

Flushed toilets formed the largest category, accounting for 83 households, with 25.3% reported as functional, 41.0% not functional, and 33.7% where respondents were unsure. Among households with unlined ventilated toilets, 66.7% indicated their facilities were functional while 33.3% stated they were not functional. For KVIP users, 58.3% reported their toilets were functional and 41.7% indicated they were not functional. The single household using a pit latrine without a slab reported the facility as functional. In general, 32.4% of all toilets were functional, 40.2% were not functional, and 27.5% were reported as "don't know."

Table 4.33: Toilet Functionality by Type in Agotime Ziope District

Toilet Type	% Functional	% Not Functional	% Don't Know	Key Observation
Flushed Toilet	25.3%	41.0%	33.7%	Lowest functionality among the toilet types
Unlined Ventilated	66.7%	33.3%	0.0%	Majority report functional toilets
KVIP	58.3%	41.7%	0.0%	Mixed performance but more than half functional
Pit Latrine Without Slab	100%	0.0%	0.0%	Only one respondent reported, but functional

Flushed toilets had the lowest functional rate at 25.3%, with 41.0% reported as not functional and 33.7% as unknown. Unlined ventilated toilets showed a higher functional rate of 66.7%, with the remaining 33.3% reported as not functional. KVIPs recorded 58.3% functional status and 41.7% not functional. The pit latrine without a slab was reported as functional by its only user. The distribution shows wide variation in functionality across the different toilet types.

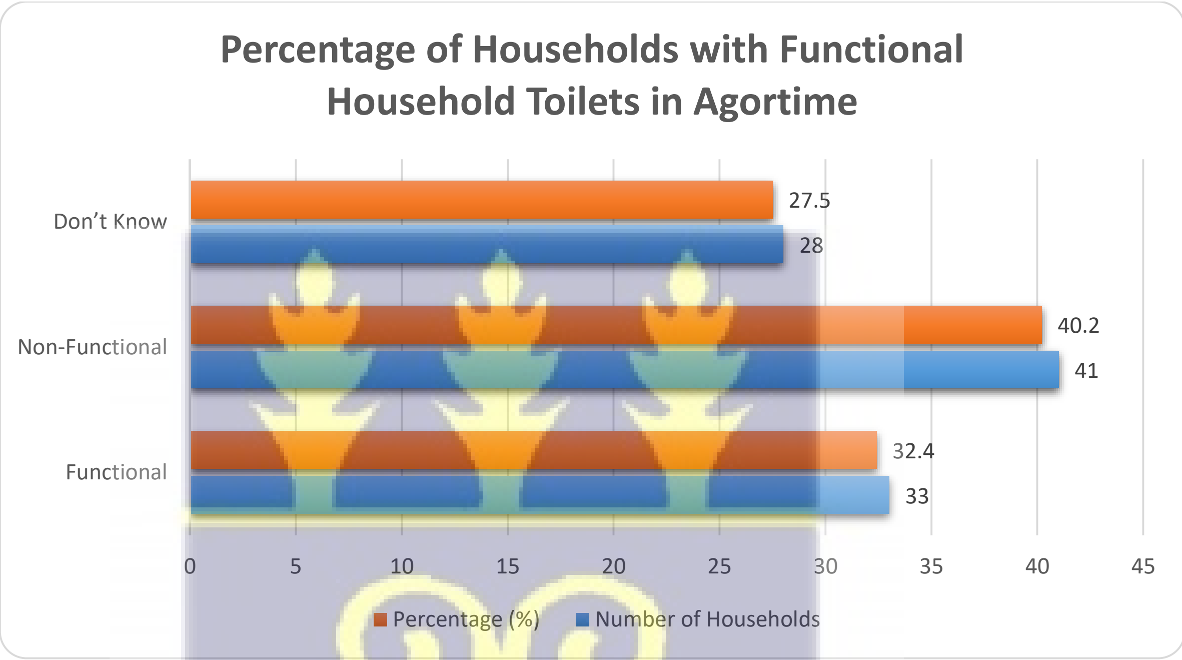


Figure 4.3: Percentage of households with functional household toilets in Agortime

The cross-tabulation results show that among households with flushed toilets, 25.3% reported their toilets were functional, while 41.0% reported non-functional toilets, and 33.7% did not know. Households with KVIP toilets had 58.3% reporting functional toilets and 41.7% reporting non-functional toilets.

Table 4.244: chi-square analysis

	Value	df	p-value
Pearson Chi-Square	14.278[a]	6	.027
Likelihood Ratio	18.408	6	.005
Linear-by-Linear Association	10.867	1	.001
N of Valid Cases	102		

The Pearson Chi-Square value was 14.278 with a p-value of .027, indicating a statistically significant association between the type of household toilet and its functionality. Additional tests, including the Likelihood Ratio (18.408, p = .005) and Linear-by-Linear Association (10.867, p = .001), further support the significance of this association.

The cross-tabulation analysis reveals a significant association between the type of household toilet and its functionality among households in Agotime Ziope. Households with simpler toilet types, such as KVIP or pit latrines without slabs, are more likely to report their toilets as functional compared to those with more complex systems like flushed toilets. The analysis shows that a significant portion of households either have non-functional toilets or are unaware of their functionality, which can lead to potential health hazards due to open defecation or improper sanitation.

4.1.1.5 WASH Status of Pupils in Agortime District Schools

This section summarizes the findings from a survey conducted among pupils from various schools within the Agortime District. The survey aimed to assess access to water, sanitation, hygiene practices, and waste disposal among the pupils. Data was collected from 32 pupils across different schools.

Demographics

The pupils surveyed were from various schools including Wodome Basic School, Takuve D/A, Ziope D/A JHS, Kpetoe R/C JHS, EP Primary, and Akwettey D/A. The majority of the pupils were in form 2 (56.3%) and upper primary (21.9%), with 62.5% being female and 37.5% male. Most pupils were under the age of 15 (71.9%).

Table 4.35: Demographics

Demographics	**Percentage (%)**
Form 2 pupils	56.3%
Upper primary pupils	21.9%
Female pupils	62.5%
Male pupils	37.5%
Pupils under 15 years of age	71.9%

Water Access

Table 4.36: Water access in school across Agortime Ziope District

Water Access	**Percentage (%)**
Pupils with access to drinking water	93.8%
Main water sources:	
Boreholes	31.3%
Rainwater harvest systems	18.8%
Wells	9.4%
Other water sources	40.6%
Pupils buying sachet water (if water unavailable)	71.9%
Pupils drinking from food sellers (if water unavailable)	15.6%

Water Access	Percentage (%)
Pupils accessing water from other sources	12.5%

The majority of pupils (93.8%) reported access to drinking water in their schools. The main water sources were boreholes (31.3%) and rainwater harvest systems (18.8%). When water was unavailable, most pupils (71.9%) bought sachet water, while others (15.6%) drank from food sellers. The remaing 12.5% sourced water from other sources like drinking from nearby houses.

Water Storage and Usage in Schools

Table 4.3725: Water storage and usage in schools across Agortime

Water Storage and Usage	Percentage (%)
Schools with water storage containers	90.6%
Common storage types:	
Poly/Syntex tanks	34.4%
Plastic buckets	31.3%
Veronica buckets	34.3%
Personal drinking cups/flasks among pupils	
Pupils using personal drinking cups	71.9%
Pupils not using personal drinking cups	28.1%
Schools with daily tap water flow	34.4%
Schools without daily tap flow	65.6%

Water storage containers were present in 90.6% of the schools, with poly/Syntex tanks (34.4%) and plastic buckets (31.3%) being the most common. Most pupils (71.9%) used personal drinking cups or flasks. However, only 34.4% of schools had tap water flowing every day.

Sanitation and Hygiene in Schools

Table 4.3826: Sanitation and hygiene in schools across Agortime

Sanitation and Hygiene	**Percentage (%)**
Schools with toilet facilities	87.5%
Schools without toilet facilities	12.5%
Functional toilets	65.6%
Schools without functional toilets	34.4%
Common toilet types:	
KVIP latrines	65.6%
Water closet	9.4%
Others	25.0%
Access to toilet facilities	
Pupils reporting toilet accessibility	68.8%
Pupils reporting toilets not being accessible	31.2%
Toilets within 100 meters of classroom	65.6%
Toilets within more than 100 meters of classroom	34.4%
Signs of open defecation	
Observed open defecation	46.9%
No signs of open defecation	53.1%
Visible signs of faeces/urine in latrines	56.3%
No visible sign sof faeces/uring in latrines	43.7%
Offensive latrine odours	78.1%
No offensive odour latrines	21.9%

Most schools (87.5%) had toilet facilities, with 65.6% being functional. KVIP latrines were the most common (65.6%), and 68.8% of pupils reported that toilets were accessible. However, open defecation was observed by 46.9% of the pupils, and 78.1% noted offensive odours from latrines.

Hygiene Practices in Schools

Table 4.39: Hygiene practices in schools across Agortime

Hygiene Practices	Percentage (%)
Schools with a School Health Club	28.1%
Schools without a School Health Club	71.9%
Pupils knowing the roles of the club	34.4%
Pupils not knowing the roles of the club	65.6%
Pupils receiving hygiene messages outside of school	84.4%
Pupils not receiving hygiene messages outside of school	15.6%
Hygiene messages received from:	
Home	71.9%
Church	12.5%
Radio	15.6%
Pupils believing hygiene messages impacted latrine use	75.0%
Pupils not believing hygiene messages impacted latrine use	25.0%

Only 28.1% of schools had a School Health Club, and of those, 34.4% of pupils were aware of the club's roles. Most pupils (84.4%) received hygiene messages outside of school, primarily from home (71.9%), and 75% believed these messages positively impacted latrine use and sustainability.

Waste Disposal in Schools

Daily waste collection occurred in 90.6% of the schools, though 37.5% of pupils reported the absence of waste bins. The most common waste items were paper and other materials (50%), and burning was the primary method of waste disposal (68.8%).

Table 4.40: Waste disposal in schools across Agortime

Waste Disposal	Percentage (%)
Pupils reporting daily waste collection	90.6%
Pupils reporting weekly waste collection	6.3%
Pupils reporting waste collection every three days	3.1%
Schools without waste bins	37.5%
Schools with waste bins	62.5%
Common waste items:	
Paper and other materials	50.0%
Food waste	9.4%
All the above	40.6%
Primary waste disposal method	
Burning	68.8%
Bush/roadside/drain	12.5%1
Backyard	12.5%
Burying	6.2%

4.1.1.6 WASH Status of Health Staff in Agortime District

This section provides an analysis of the survey conducted among health staff in various healthcare facilities within the Agortime District. The aim was to assess the Water, Sanitation, and Hygiene (WASH) practices, clinical waste management, and associated challenges in these facilities. Data was collected from 9 health staff members.

Demographics

The surveyed health staff were from different healthcare facilities, including Agortime Health Centre, Akpokope CHPS, Akwetey CHPS, St. Anthony Clinic, Agbesia CHPS, Kpetoe Health Centre, and Ziope Health Centre. Most of the respondents were female (88.9%) and nurses (100%). The majority of the respondents were aged 30-44 years (55.6%).

Waste Management in Healthcare Facilities

Table 4.41: Clinical waste management

Clinical Waste Management	Percentage (%)
Facilities segregating clinical waste	66.7%
Facilities not segregating clinical waste	33.3%
Quality of segregation:	
Very good	11.1%
Good	55.6%
Poor	33.3%
Temporary storage of waste:	
Open spaces	44.4%
Garages	22.2%
Special rooms	33.3%
Secured storage for waste	77.8%
Unsecured storage for waste	22.2%
Facilities with Environmental Health & Safety unit	22.2%
Facilities without Environmental Health & Safety unit	77.8%
Staff trained on clinical waste management	0%

Clinical Waste Management	Percentage (%)
Staff not trained on clinical waste management	100%
Staff provided protective clothing	77.8%
Staff not provided protective clothing	22.2%

The segregation of clinical waste was reported by 66.7% of the facilities, with 55.6% rating the quality as good and 33.3% as poor. Temporary waste storage methods varied, with 44.4% using open spaces. Secured storage for clinical waste awaiting transport to the incinerator was reported by 77.8%. However, only 22.2% of the facilities had an Environmental Health and Safety unit, and no staff received formal training on clinical waste management. Protective clothing was provided to 77.8% of the staff handling clinical waste.

Sanitation Facilities in Healthcare

Table 4.272: Sanitation facilities

Sanitation Facilities	Percentage (%)
Facilities with toilet facilities	66.7%
Facilities without toilet facilities	33.3%
Common toilet types:	
Water Closets	33.3%
KVIP latrines	22.2%
Pit latrine with slab	22.2%
Ventilated improved pit	22.2%
Facilities with hand washing facilities	100%
Facilities with waste bins	77.8%
Facilities without waste bins	22.2%

Sanitation Facilities	Percentage (%)
Facilities with separate waste bins	44.4%
Facilities with separate waste bins	55.6%

Toilet facilities were available in 66.7% of the healthcare facilities, with Water Closets (33.3%) and KVIP latrines (22.2%) being the most common. All facilities (100%) had hand washing facilities, but only 44.4% had separate waste bins for domestic and clinical waste.

Water Access in Healthcare Facilities

Table 28: Water access

Water Access	Percentage (%)
Facilities with water access	44.4%
Facilities without water access	55.6%
Facilities with water storage containers	100%
Facilities providing water to patients	55.6%
Facilities relying on rainwater harvesting	55.6%
Facilities fetching water from streams	33.3%

Only 44.4% of the healthcare facilities had water access, while 55.6% lacked a reliable water source. However, all facilities had water storage containers, and 55.6% reported making water accessible to patients. In the absence of reliable water sources, 55.6% of the staff relied on rainwater harvesting, and 33.3% fetched water from streams or rivers.

Plate 5: ***Water situation in Agortime-Ziope and Adaklu districts healthcare facilities.***

WASH-related Health Issues in Healthcare Facilities

Table 4.44: WASH-related health issues

WASH-related Health Issues	Percentage (%)
Facilities reporting WASH-related diseases	88.9%
Common diseases:	

WASH-related Health Issues	Percentage (%)
Malaria	88.9%
Typhoid	55.6%
Facilities reporting WASH-related mortality rate (0-19%)	66.7%
Facilities seeing 0-5 weekly WASH cases among school children	66.7%

WASH-related diseases, such as malaria (88.9%) and typhoid (55.6%), were commonly reported by patients in these facilities. The WASH-related mortality rate ranged between 0-19%, with 66.7% of the facilities reporting a mortality rate between 0-9%. WASH-related cases among school children were frequent, with 66.7% of facilities seeing 0-5 cases per week.

4.1.1.7 WASH Status of School Heads in Agotime District

This section provides an analysis of the survey conducted among school heads in various educational institutions within the Agortime District. The aim was to assess the Water, Sanitation, and Hygiene (WASH) practices, waste management, and associated challenges in these schools. Data was collected from 10 school heads.

Demographics

The surveyed school heads were from different schools, including Ziope DA Basic, Akuetteh DA Basic, Kpetoe EP Primary, among others. The majority of the schools surveyed were primary schools (80%), with the rest being junior high schools (20%). The positions held by the respondents included headmaster/mistress (50%), SHEP coordinator (20%), assistant head (10%), and teacher (20%).

Sanitation Facilities in Schools

Table 4.45: Sanitation facilities

Sanitation Facilities	Percentage (%)
Schools with toilet facilities	100%
KVIP/VIP toilets	80%
Toilets accessible to all levels	70%
Schools with 10-seater toilets	60%
Schools with 4-seater toilets	40%
Toilets cleaned daily	70%
Toilets cleaned by students	70%
Toilet condition rated as good	80%

All schools had toilet facilities, with KVIP/VIP being the most common (80%). However, only 70% of the schools reported that the toilets were accessible to all levels. The majority (60%) had 10-seater toilets, while 40% had 4-seaters. Toilets were cleaned daily in 70% of the schools, primarily by students, and the general condition of the toilets was rated as good by 80% of the respondents.

Hand Washing Facilities in Schools

Table 4.46: Hand-washing facilities

Hand Washing Facilities	Percentage (%)
Schools with hand washing facilities	50%
Schools with soap/detergent available	40%
Schools with separate facilities for physically challenged pupils	0%

About 50% of the schools had hand washing facilities, and among these, only 40% had soap or detergent attached. None of the schools had separate toilets for physically challenged pupils. The cleanliness of the toilets was reported as good in 80% of the schools.

Waste Management

Table 4.47: Waste management

Waste Management	Percentage (%)
Schools with waste bins	40%
Waste segregation rated as good	60%
Schools storing waste in open spaces	70%
Schools with secured waste storage	50%
Waste management rated as good	60%

Waste management practices were generally lacking. Only 40% of the schools had waste bins, and 60% of the respondents rated waste segregation as good. Waste was temporarily stored in open spaces in 70% of the schools, with 50% reporting secured storage. Waste management was considered effective in 60% of the schools.

Water Access in Schools

Table 4.48: Water access

Water Access	Percentage (%)
Schools with water facilities	80%
Water provided by the district assembly	20%
Water provided by other organizations	70%
Schools with water storage containers	100%
Schools where water is accessible to pupils	50%

Water facilities were available in 80% of the schools, provided either by the district assembly (20%) or other organizations (70%). All schools had water storage containers, but water was accessible to pupils in only 50% of the schools.

Plate 6: Water storage system in Adaklu Kpodzi basic school in Adaklu District.

WASH-Related Health Issues

Table 4.49: WASH-related issues

WASH-Related Health Issues	Percentage (%)
Schools with health clubs	60%
Schools receiving external regulatory monitoring (EPA, Municipal Assembly)	60%
Schools with no training in waste management	60%

Health clubs were present in 60% of the schools, and these clubs engaged in hygiene campaigns and related activities. External regulatory bodies such as the EPA and Municipal Assembly monitored the waste management process in 60% of the schools. However, 60% of the respondents reported that no training on waste management had been received.

4.1.1.8 WASH Committee in Agotime District

This report provides an analysis of the survey conducted among the WASH committee members in various communities within the Agortime District. The aim was to assess the Water, Sanitation, and Hygiene (WASH) practices, management, and associated challenges in these communities. Data was collected from 10 committee members.

Demographics

The surveyed committee members were from different communities including Vedome (40%), Dohia (30%), Tumor (10%), and Ahiagbakope (20%). The positions held by the respondents included Chairman (50%), Secretary (40%), and Organizer (10%). The majority of the members were farmers (90%) with the rest being artisans (10%). The gender distribution was 60% male and 40% female. The age distribution showed that 40% were between 30-40 years old, another 40% were between 41-49 years old, and the rest were below 30 or between 50-59 years old.

Community Water Systems

Table 4.50: Water systems

Water Systems	**Percentage (%)**
Communities with water systems	70%
Water systems operating 16-24 hours/day	70%
Communities lacking catchment area 4 (catchment area or well structures fenced in)	100%
Communities lacking catchment area 5 (are there latrines or livestock within 100 feet of the catchment area pr well)	90%

Water systems were present in 70% of the communities, and most of these systems operated for 16-24 hours a day. However, catchment areas 4 and 5 were absent in most communities, with 100% reporting the absence of catchment area 4, implying catchment area or well structures are not fenced in. Also, 90% indicated the lack of catchment 5, an indication that there are latrines and other sources of contamination like livestock and cesspools within 100 feet of the catchment or well.

Water Storage and Treatment

Table 4.51: Storage and Treatment

Storage and Treatment	Percentage (%)
Communities with water storage facilities	60%
Withour water storage treatment	40%
Communities regularly checking storage facilities	90%
Communities not regularly checking storage facilities	10%
Communities with no storage type 6 (Are tanks fenced in)	100%
Communities lacking water treatment facilities	100%
Presence of water treatment systems (sedimentation tank, chlorination, or others)	30%

Storage facilities were available in 60% of the communities, with 90% reporting regular checks on these facilities. However, there was no presence of storage type 6 across all communities. Water treatment was severely lacking, as 100% of the communities reported no treatment facilities, and only 30% indicated the presence of minimal water treatment systems such as sedimentation tanks or chlorination.

Distribution and Committee Structure

Table 4.52: Distribution and committee structure

Distribution and Committee Structure	Percentage (%)
Communities with water distribution systems	0%
Committees appointed	70%
Committees elected through democratic elections	30%
Committees holding regular meetings	80%
Financing sources:	
Chiefs	50%
Community contributions	40%
Donors	10%
Use of banking facilities	70%

No water distribution systems were reported in any of the communities. Most committees (70%) were appointed, while 30% were democratically elected. Regular meetings were held by 80% of the committees, with financing primarily coming from chiefs (50%) and community contributions (40%). Donors provided limited financial support (10%), and banking facilities were used by 70% of the committees for financial management.

WASH Sustainability and Challenges in Communities

Table 4.53: Sustainability and challenges

Sustainability and Challenges	Percentage (%)
Communities with sustainability measures	100%
Sustainability attributed to WASH committee	90%
Communities relying on individual contributions for funding	100%

Sustainability and Challenges	Percentage (%)
Communities indicating lack of trained waste managers as a challenge	80%

All communities reported having sustainability measures in place, with 90% attributing these to the WASH committee. Funding was primarily sourced from individual contributions (100%) and the community (90%). The absence of trained waste managers was identified as a significant challenge by 80% of the respondents.

4.1.3 Ho West District Results and Interpretation

4.1.3.1 Access to Clean Water in Ho West District

A cross-tabulation analysis was conducted to examine the relationship between the source of drinking water and the frequency of access to clean water among households in Ho West district. The analysis used data from 83 households, and the results are summarized in Table 4.54.

The analysis revealed that 39.8% of households reported always having access to clean water. This indicates that existing infrastructure and resources are effectively providing clean water to these households. A significant portion of households (37.3%) reported sometimes having access to clean water, suggesting that they experience intermittent access. This inconsistency can lead to potential health risks and affect daily activities. A small percentage (3.6%) often have access to clean water but not always, indicating some challenges that need to be addressed. Lastly, 19.3% of households reported never having access to clean water, posing serious health risks and impacting their quality of life.

Table 4.54: Source of Drinking Water by Frequency of Access to Clean Water in Ho West District

Source of Drinking Water	Never	Sometimes	Often	Always	Total
Pipe (n = 24)	5 (20.8%)	3 (12.5%)	0 (0.0%)	16 (66.7%)	24
Rain (n = 19)	9 (47.4%)	4 (21.1%)	0 (0.0%)	6 (31.6%)	19
Stream/River (n = 26)	0 (0.0%)	23 (88.5%)	0 (0.0%)	3 (11.5%)	26
Other (n = 14)	2 (14.3%)	1 (7.1%)	3 (21.4%)	8 (57.1%)	14
Total (N = 83)	16 (19.3%)	31 (37.3%)	3 (3.6%)	33 (39.8%)	83

Pipe users reported the highest level of consistent access, with 66.7% stating they always had clean water, while 20.8% said they never had clean water and 12.5% sometimes had clean water. Rainwater users showed a different pattern, as 47.4% reported never having clean water and only 31.6% always had access. Among stream or river users, 88.5% sometimes had clean water and only 11.5% always had clean water. Households using other water sources showed relatively better access, with 57.1% always having clean water, 21.4% often having clean water, and 14.3% never having clean water. Generally, 39.8% of all respondents always had clean water, 37.3% sometimes had access, 19.3% never had access, and 3.6% often had access.

Table 4.55: Access to Clean Water by Source of Drinking Water in Ho West District

Source of Drinking Water	% Never	% Sometimes	% Often	% Always	Key Observation
Pipe	20.8%	12.5%	0.0%	66.7%	Most users report consistent access
Rain	47.4%	21.1%	0.0%	31.6%	Nearly half report no clean water
Stream/River	0.0%	88.5%	0.0%	11.5%	Highly inconsistent access
Other	14.3%	7.1%	21.4%	57.1%	Majority report steady access

Pipe users had the highest rate of consistent access, with 66.7% always accessing clean water. Rainwater users presented more limited access, as 47.4% reported never having clean water. Stream or river users mostly experienced irregular access, with 88.5% falling under the "sometimes" category and only 11.5% always accessing clean water. Users of other water sources showed relatively better access, with 57.1% always accessing clean water and 21.4% often having clean water.

The cross-tabulation results show that among households using pipe-borne water, 66.7% reported always having access to clean water, while among households relying on rainwater, only 31.6% always had access. For households using stream/river water, 88.5% reported sometimes having access to clean water.

Table 4.5629: Chisquare tests

	Value	df	p-value
Pearson Chi-Square	65.674[a]	9	.000
Likelihood Ratio	63.797	9	.000
Linear-by-Linear Association	.017	1	.897
N of Valid Cases	83		

The Pearson Chi-Square value was 65.674 with a p-value of .000, indicating a statistically significant association between the source of drinking water and the frequency of access to clean water. Additional tests, including the Likelihood Ratio (63.797, p = .000) and Linear-by-Linear Association (0.017, p = .897), further support the significance of this association.

The cross-tabulation analysis reveals a significant association between the source of drinking water and the frequency of access to clean water among households in Ho

West. Households using pipe-borne water are more likely to always have access to clean water compared to those using other sources such as rainwater or streams/rivers. The analysis shows that a significant portion of households experience intermittent access to clean water, which can lead to potential health risks and affect daily activities. These findings highlight the need for targeted interventions to improve water supply reliability and ensure consistent access to clean water for all households in the district.

4.1.3.1 Functional Household Toilets in Ho West District

A cross-tabulation analysis was conducted to examine the relationship between the type of household toilet and whether the household toilet is functional or usable among households in Ho West district. The analysis used data from 83 households, and the results are summarized in Table 4.57 and Figure 4.58.

The analysis revealed that 49.4% of households had functional household toilets, while 36.1% reported their toilets were non-functional. Additionally, 14.5% of respondents did not know the functional status of their household toilets. This highlights a significant gap in sanitation infrastructure and awareness among households.

Table 4.57: Type of Household Toilet by Functional Status in Ho West

Type of Household Toilet	**Yes**	**No**	**Don't Know**	**Total**
Flushed Toilet (n = 52)	20 (38.5%)	20 (38.5%)	12 (23.1%)	52
Unlined Ventilated (n = 8)	5 (62.5%)	3 (37.5%)	0 (0.0%)	8
Mozambique (n = 1)	1 (100.0%)	0 (0.0%)	0 (0.0%)	1
KVIP (n = 20)	13 (65.0%)	7 (35.0%)	0 (0.0%)	20
Pit Latrine Without Slab (n = 2)	2 (100.0%)	0 (0.0%)	0 (0.0%)	2
Total (N = 83)	49.4%	36.1%	14.5%	100.0%

Flushed toilets formed the largest group of facilities (n = 52), with 38.5% reported as functional and an equal proportion, 38.5%, reported as not functional. Additionally, 23.1% of users were unsure of the condition of their flushed toilets. For unlined ventilated toilets, 62.5% were functional and 37.5% were not functional. The single Mozambique toilet recorded a functional rate of 100%. KVIP facilities showed a functional rate of 65.0% and a non-functional rate of 35.0%. All pit latrines without slabs (100%) were reported as functional. Across all toilet types, 49.4% were functional, 36.1% were not functional, and 14.5% of respondents were uncertain.

Table 4.58: Summary of Household Toilet Functionality by Type in Ho West

Toilet Type	% Functional	% Not Functional	% Don't Know	Key Observation
Flushed Toilet	38.5%	38.5%	23.1%	Lowest functional rate among all types
Unlined Ventilated	62.5%	37.5%	0.0%	Majority functional
Mozambique	100%	0.0%	0.0%	Only one reported
KVIP	65.0%	35.0%	0.0%	More than half functional
Pit Latrine Without Slab	100%	0.0%	0.0%	Fully functional but very small group

Flushed toilets had the lowest functional rate at 38.5%, with an equal proportion reported as not functional and 23.1% of respondents unsure of their condition. The unlined ventilated toilet type recorded a functional rate of 62.5%, while KVIP facilities showed a similar pattern with 65.0% functional and 35.0% not functional. The Mozambique toilet and pit latrine without slab were each reported as fully functional. These percentages show clear differences in functionality across the toilet types.

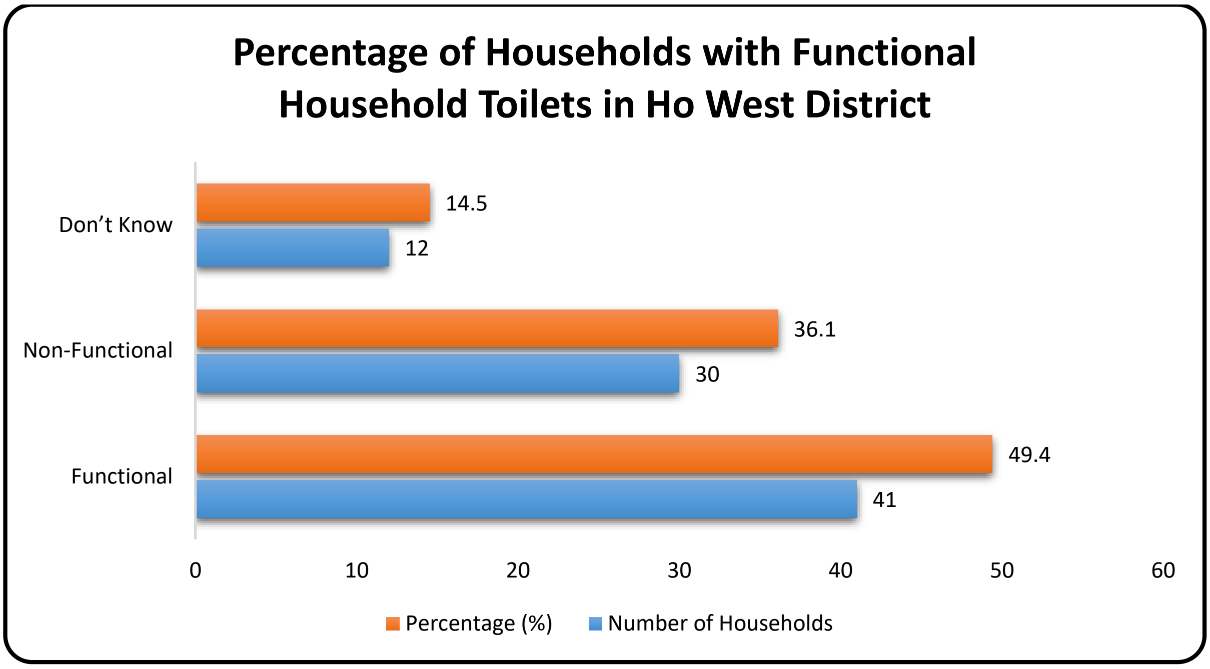


Figure 4.4: Percentage of Households with Functional Household Toilets in Ho West

The cross-tabulation results show that among households with flushed toilets, 38.5% reported their toilets were functional, while 38.5% reported non-functional toilets, and 23.1% did not know. Households with KVIP toilets had 65.0% reporting functional toilets and 35.0% reporting non-functional toilets.

Table 4.309: Chi-Square Tests

	Value	df	p-value
Pearson Chi-Square	12.404[a]	8	.134
Likelihood Ratio	17.189	8	.028
Linear-by-Linear Association	9.126	1	.003
N of Valid Cases	83		

The Pearson Chi-Square value was 12.404 with a p-value of .134, indicating that the association between the type of household toilet and its functionality is not statistically significant at the 5% level. However, the Likelihood Ratio test indicated a significant association with a p-value of .028, and the Linear-by-Linear Association test also indicated a significant association with a p-value of .003.

The cross-tabulation analysis reveals a moderate association between the type of household toilet and its functionality among households in Ho West. Households with simpler toilet types, such as KVIP or pit latrines without slabs, are more likely to report their toilets as functional compared to those with more complex systems like flushed toilets. The analysis shows that a significant portion of households either have non-functional toilets or are unaware of their functionality, which can lead to potential health hazards due to open defecation or improper sanitation. These findings highlight the need for targeted interventions to improve the functionality and maintenance of household toilets, as well as increasing community awareness and engagement with sanitation issues in the district.

4.1.1.9 Ho West Pupils' Water, Sanitation, and Hygiene (WASH) Survey

This section provides an analysis of the survey conducted among pupils in various schools within Ho West District. The aim was to assess the Water, Sanitation, and Hygiene (WASH) practices, facilities, and associated challenges in these schools. Data was collected from 49 pupils across different schools.

Demographics

The pupils surveyed were from various schools including Tsito Old Basic School (28.6%), St. Michael R/C Primary School (12.2%), Kpedze D.A J.S.S (10.2%), Abutia Teti E.P. Primary School (8.2%), Akome E.P. Basic School (20.4%), and others

(20.4%). The class distribution included Form 1 (16.3%), Form 2 (38.8%), Form 3 (2.0%), and Upper Primary (42.9%). The gender distribution was 46.9% male and 53.1% female. The majority of pupils (83.7%) were less than 15 years old, with the rest being between 15-18 years old.

Table 4.60: Demographics schools

Demographics	**Percentage (%)**
Pupils from Tsito Old Basic School	28.6%
Pupils from St. Michael R/C Primary School	12.2%
Pupils from Kpedze D.A J.S.S	10.2%
Pupils from Abutia Teti E.P. Primary School	8.2%
Pupils from Akome E.P. Basic School	20.4%
Class Distribution:	
Form 1	16.3%
Form 2	38.8%
Form 3	2.0%
Upper Primary	42.9%
Male pupils	46.9%
Female pupils	53.1%
Pupils under 15 years old	83.7%

Water Access and Storage Schools

Table 4.61: Water access and storage

Water Access and Storage	**Percentage (%)**
Pupils with access to drinking water	81.6%

Water Access and Storage	Percentage (%)
Sources of drinking water:	
Boreholes	14.3%
Rainwater harvest systems	18.4%
Wells	6.1%
Other sources	59.2%
Schools with drinking water storage containers	93.9%
Schools with poly/sitex tanks	61.2%
Storage containers with fitting covers	85.7%

A significant portion of pupils (81.6%) reported access to drinking water in their schools, with the most common sources being boreholes (14.3%) and rainwater harvest systems (18.4%). Nearly all schools (93.9%) had drinking water storage containers, with poly/sitex tanks being the most common (61.2%). Most storage containers had fitting covers (85.7%).

Sanitation and Hygiene In Schools

Table 4.62: Sanitation and hygiene

Sanitation and Hygiene	Percentage (%)
Pupils with access to toilet facilities	95.9%
Functional toilets	57.1%
Common toilet issues:	
Broken-down toilets	57.1%
Locked toilets	10.2%
Types of toilets:	

Sanitation and Hygiene	Percentage (%)
KVIP latrines	40.8%
Water closets	26.5%
Toilet accessibility reported by pupils	75.5%
Toilets less than 100 meters from classrooms	71.4%
Pupils reporting open defecation	30.6%
Pupils reporting visible signs of feces/urine	32.7%
Pupils reporting offensive toilet odors	79.6%
Pupils reporting fly breeding in toilet areas	71.4%

While most pupils (95.9%) reported having access to toilet facilities, only 57.1% indicated that these toilets were functional. The most common toilet issues were broken-down facilities (57.1%) and locked toilets (10.2%). KVIP latrines were the most common type (40.8%). Sanitation challenges were prevalent, with reports of open defecation (30.6%), offensive odors (79.6%), visible signs of feces (32.7%) and fly breeding (71.4%).

Plate 7: A broken-down toilet and visible feces in schools in Agotime-Ziope and Adaklu Districts respectively.

Waste Management

Table 4.63: Waste management

Waste Management	Percentage (%)
Pupils reporting daily waste collection	93.9%
Methods of waste disposal:	
Burning	73.5%
Dumping in bush/roadside/drain	12.2%
Backyard disposal	8.2%
Burying	6.1%
Schools with waste bins	73.5%
Waste stored in closed containers	30.6%
Waste stored in open containers	38.8%
Waste stored in polythene bags	18.4%
Common waste types:	
Paper	63.3%
Food waste	6.1%

Waste was collected daily in most schools (93.9%), with burning being the most common disposal method (73.5%). Waste bins were available in 73.5% of the schools, and waste was often stored in open containers (38.8%) or closed containers (30.6%). Paper waste was the most frequently reported item (63.3%).

Table 4.64: Hygiene Practices and Education in schools

Hygiene Practices and Education	Percentage (%)
Pupils receiving hygiene messages	91.8%
Sources of hygiene messages:	
Home	71.4%
Radio	16.3%
Pupils not practicing hygiene messages	32.7%
Schools with a School Health Club (SHC)	36.7%
Pupils aware of SHC roles	32.7%
Pupils attending latrine user training workshops	34.7%
Workshops organized by:	
District assembly	30.6%
NGOs	16.3%

Most pupils (91.8%) reported receiving hygiene messages, primarily from home (71.4%). However, 32.7% of pupils did not practice the hygiene messages due to unclear instructions or forgetfulness. School Health Clubs (SHC) were present in 36.7% of schools, but only 32.7% of pupils were aware of the roles of these clubs. A third of pupils (34.7%) had attended latrine user training workshops, primarily organized by the district assembly (30.6%).

4.1.1.10 Health Staff's Waste Management and WASH Practices Survey

This report presents an analysis of the survey conducted among health staff in various healthcare facilities within the Ho West District. The survey aimed to assess clinical waste management practices, facility conditions, and the overall Water, Sanitation, and Hygiene (WASH) situation.

Table 4.65: Demographics of healthcare facilities

Demographics	Percentage (%)
Clinics	25%
CHPS Compounds	25%
Health Centres	50%
Male staff	37.5%
Female staff	62.5%
Age Distribution:	
Less than 30 years	37.5%
30-44 years	50%
45-54 years	12.5%
Occupations:	
Doctor/Physician Assistants	50%
Nurses	50%

The survey included 8 health staff members from various healthcare facilities, primarily from health centres (50%) and CHPS compounds (25%). The respondents were mainly female (62.5%), with half (50%) aged between 30-44 years.

Clinical Waste Management in Healthcare facilities

Table 4.66: Clinical waste management

Clinical Waste Management	Percentage (%)
Facilities segregating clinical waste	50%
Segregation quality rated as good	50%
Segregation quality rated as poor	50%

Clinical Waste Management	Percentage (%)
Clinical waste temporarily stored in open spaces	50%
Secured clinical waste storage	50%
Handling of clinical waste rated as good	75%
Facilities with an Environmental Health and Safety officer	12.5%
Facilities providing protective clothing	25%
Staff receiving clinical waste management training	25%
Facilities disposing of clinical waste in open pits	87.5%

Only half of the facilities segregated clinical waste, and segregation was rated as poor in 50% of the cases. Most clinical waste was stored in open spaces (50%), and only 50% had secured storage. Training on clinical waste management was lacking, with only 25% of respondents having received training.

Plate 8: Common clinical waste management practices (Open Pit) in healthcare facilities in the study areas.

Sanitation and Hygiene Facilities in Schools

Table 4.67: Sanitation and hygiene

Sanitation and Hygiene	Percentage (%)
Facilities with toilet facilities	75%
Types of toilets:	
KVIP latrines	37.5%
Water closets	37.5%
Facilities with hand washing facilities	100%
Facilities with separate bins for domestic and clinical waste	37.5%

Most healthcare facilities (75%) had toilet facilities, with KVIP latrines (37.5%) and water closets (37.5%) being the most common types. Hand washing facilities were available in all surveyed facilities. However, only 37.5% had separate bins for domestic and clinical waste.

Water Access and Storage in Healthcare Facilities

Table 4.68: Water access and storage

Water Access and Storage	Percentage (%)
Facilities with water facilities	50%
Water connected to delivery rooms/wards	25%
Facilities relying on rainwater harvesting	50%
Facilities relying on streams/rivers	25%
Facilities with water storage containers	100%
Facilities providing patient access to water	62.5%

Water access was available in only 50% of the facilities, and only 25% had water connected to delivery rooms and wards. In the absence of reliable water sources, 50% of the facilities relied on rainwater harvesting.

WASH-Related Diseases

Table 4.69: WASH-related diseases

WASH-Related Diseases	Percentage (%)
Most common diseases (malaria and typhoid)	62.5%
Facilities reporting a WASH-related mortality rate of 0-9%	100%
Facilities seeing 0-5 WASH cases among school children weekly	50%
Facilities seeing 6-10 WASH cases among school children weekly	50%

Malaria and typhoid were the most common WASH-related diseases reported by 62.5% of the facilities. The WASH-related mortality rate was reported as 0-9% across all facilities, with 50% of the facilities seeing 0-5 cases of WASH-related diseases among school children weekly.

4.1.1.11 Ho West School Heads' Waste Management and WASH Practices Survey

This section presents an analysis of the survey conducted among school heads in various educational institutions within the Ho West District. The survey aimed to assess waste management practices, sanitation facilities, and the overall Water, Sanitation, and Hygiene (WASH) situation in schools.

Table 4.70: Demographics

Demographics	**Percentage (%)**
Schools surveyed:	
Akome E.P. Primary	20%
Abutia DA	40%
Dzologborgame	10%
Other schools	30%
Junior High Schools (JHS)	60%
Primary Schools	40%
Respondent positions:	
Headmasters/mistresses	60%
Assistant heads	30%
SHEP coordinators	10%

The survey included 10 school heads from different schools, comprising Akome E.P. Primary (20%), Abutia DA (40%), Dzologborgame (10%), and others (30%). The schools were divided into Junior High Schools (JHS) (60%) and Primary Schools (40%). The positions of the respondents included SHEP coordinators (10%), headmasters/mistresses (60%), and assistant heads (30%).

Staff and Pupils

Table 4.71: Staff and pupils

Staff and Pupil Numbers	Percentage (%)
Staff:	
1-10 staff members	30%
11-20 staff members	30%
21-30 staff members	40%
Pupils:	
Less than 100 pupils	20%
100-200 pupils	30%
201-300 pupils	20%
301 and above pupils	30%

Regarding staff and pupils, the number of staff ranged from 1-10 (30%), 11-20 (30%), and 21-30 (40%). Male staff were predominantly in the range of 1-10 (70%), followed by 11-20 (20%) and 21-30 (10%). Female staff were also primarily in the range of 1-10 (60%) and 11-20 (40%). The number of pupils varied, with less than 100 (20%), 100-200 (30%), 201-300 (20%), and 301 and above (30%). The number of girls and boys was distributed similarly, with 1-50 (50%), 51-100 (30%), and 201 and above (20%) for both genders.

Sanitation Facilities in Schools

Table 4.72: Sanitation facilities

Sanitation Facilities	Percentage (%)
Schools with toilet facilities	100%
Types of toilets:	
KVIP/VIP	90%
Water closets	10%
Toilets accessible to all levels	80%
Daily toilet cleaning	80%
Toilets in good condition	90%
Schools with separate toilets for boys and girls	80%
Schools with toilets for physically challenged pupils	10%
Schools reporting offensive toilet odors	70%

Plate 9: Schools with separate toilet for boys and girls in Adaklu and Ho West Districts.

All surveyed schools (100%) had toilet facilities, with 90% using KVIP/VIP and 10% using WC. These facilities were accessible to all levels in 80% of the schools. The distribution of toilet seaters was 10-seater (40%), 8-seater (30%), 4-seater (10%), and other (20%). For boys, the seaters were 4-seater (70%), 2-seater (20%), and other

(10%), while for girls, they were 6-seater (10%), 4-seater (60%), and 2-seater (30%). In terms of cleanliness, 80% of schools cleaned their toilets every day, primarily by students, and 90% of the toilets were in good condition.

Hygiene Practices in Schools

Table 4.73: Hygiene practices

Hygiene Practices	Percentage (%)
Schools with hand washing facilities	40%
Schools without hand washing facilities	60%
Schools with soap or detergent attached	20%
Schools without soap or detergent attached	80%

Hygiene practices revealed that only 40% of schools had hand washing facilities, and just 20% of these had soap or detergent attached. Separate toilets for boys and girls were present in 80% of the schools, but only 10% had facilities for physically challenged pupils. All schools reported that their toilets were clean, though 70% admitted to offensive odors, and 30% attracted flies.

Waste Management in Schools

Table 4.74: Waste management

Waste Management	**Percentage (%)**
Schools with waste bins	10%
Schools segregating waste	70%
Waste temporarily stored in open spaces	90%
Waste collected daily	40%
Methods of waste disposal:	
Backyard disposal	60%
Communal refuse dumps	20%
Burning/burying	20%

Regarding waste management, only 10% of schools had waste bins, but 70% of schools segregated waste, with segregation rated as good by 70% and very good by 20%. Most waste was temporarily stored in open spaces (90%) or garages (10%), and 60% of waste storage was unsecured. Waste was collected daily in 40% of schools, weekly in 20%, and when full in 40%. Disposal methods included communal refuse dumps (20%), backyard (60%), and burying/burning (20%). Liquid waste was predominantly disposed of by pouring it on the ground outside (90%).

WASH Programs and Training in Schools

Table 4.75: WASH programs and training

WASH Programs and Training	**Percentage (%)**
Schools with health clubs	100%
Schools receiving waste management training	50%
Frequency of training:	
Once a month	60%
Twice a year	40%
Schools visited by environmental health officers	40%

WASH programs and training were present in all schools, with 100% having health clubs that conducted hygiene campaigns. Fifty percent of schools had WASH programs initiated by various entities. Maintenance activities were conducted by 80% of schools, funded primarily by PTA. Environmental health officers visited 40% of the schools. Waste management training was provided to 50% of schools, with frequencies ranging from once a month to twice a year. The training was rated as good by 60% and very good by 40%.

Water Access in Schools

Table 4.76: Water access

Water Access	Percentage (%)
Schools with water facilities	90%
Schools with potable water	80%
Schools with water storage containers	70%
Schools with water accessible to pupils	90%

Regarding water access, 90% of schools had water facilities sourced from boreholes, mechanized boreholes, or piped water, with 80% confirming the water was potable. Seventy percent of schools had water storage containers, and water was accessible to pupils in 90% of schools.

This report highlights key findings from the WASH survey among school heads in Ho West District, emphasizing the need for improved waste management and hygiene practices in schools.

4.1.1.12 Ho West WASH Committee Survey

This report provides an analysis of the Water, Sanitation, and Hygiene (WASH) committee survey conducted in various communities within the Ho West District. The survey included responses from committee members on various aspects of WASH practices, facilities, and sustainability efforts.

Demographics

Table 4.77: Demographics

Demographics	**Percentage (%)**
Communities surveyed:	
Kpedze	20%
Dzolokpuita	10%
Kpoeta Ashanti	10%
Anfoeta Tsyome	20%
Kpale	10%
Anfoeta Gborgame	10%
Saviefe	10%
Akorujefe	10%
Positions held by respondents:	
Chairman	20%
Secretary	10%
Unit Committee Chairman	10%
Assembly Member	60%
Occupations:	
Farmers	30%
Businessmen	30%
Teachers	40%
Gender Distribution:	
Male	80%
Female	20%
Age Distribution:	
30-40 years	30%
41-49 years	40%
50-59 years	30%

The survey included 10 WASH committee members from different communities: Kpedze (20%), Dzolokpuita (10%), Kpoeta Ashanti (10%), Anfoeta Tsyome (20%), Kpale (10%), Anfoeta Gborgame (10%), Saviefe (10%), and Akorujefe (10%). The positions held by the respondents included Chairman (20%), Secretary (10%), Unit Committee Chairman (10%), and Assembly Member (60%). The occupations of the respondents were Farmers (30%), Businessmen (30%), and Teachers (40%). The gender distribution was predominantly male (80%) with females making up 20%. The age distribution was 30-40 years (30%), 41-49 years (40%), and 50-59 years (30%).

Community Water Systems

Table 4.78: Water systems

Water Systems	**Percentage (%)**
Communities with existing water systems	100%
Communities aware of catchment areas	50%
Communities unaware of catchment areas	40%
Communities with catchment area 3	20%
Communities with catchment area 6	80%
Communities with catchment area 8	10%

All surveyed members confirmed the existence of water systems in their communities. Regarding the catchment areas, 50% acknowledged their existence, 40% said no, and 10% had no idea. When asked about specific catchment areas, responses varied: 20% confirmed their existence for "Water Catchment Area 3", 80% for "Water Catchment Area 6", and 10% for "Water Catchment Area 8". Storage facilities were present in 80%

of the communities for "Storage Tank 1", and 90% for "Storage Tank 4", but "Storage Tank 2" had no facilities.

Water Storage and Treatment

Table 4.79: Storage and treatment

Storage and Treatment	Percentage (%)
Communities with storage facilities for "Storage Tank 1"	80%
Communities with storage facilities for "Storage Tank 4"	90%
Communities with no storage for "Storage Tank 2"	100%
Communities practicing water treatment	30%
Communities using sedimentation tanks	20%

Treatment of water was practiced by 30% of the communities, and sedimentation tanks were used by 20%. Distribution systems were acknowledged by 50% of the respondents for "Distribution System 1", while 50% were unaware. Financial support came from various sources: 50% from village government/community committees, 40% from the community, and 10% from donors.

Distribution and Committee Structure

Table 4.80: Distribution and committee structure

Distribution and Committee Structure	Percentage (%)
Communities with known distribution systems	50%
Communities unaware of distribution systems	50%
Committees holding regular meetings	100%
Leaders of WASH committee meetings:	
Chief/Headman	50%
Committee Chairmen	50%
Financial support sources:	
Village government/community committees	50%
Community contributions	40%
Donors	10%

Meetings on WASH maintenance and sustainability were held regularly, with 100% attendance reported for "Meeting Type 1", "Meeting Type 3", and "Meeting Type 5". Chief/headman or committee chairmen led 50% of the meetings each. Sustainability efforts showed that 90% of the committees had sustainability plans in place, but only 20% actively practiced them. Funding for these efforts came mainly from individual contributions (50%).

The survey indicates that while there is a strong framework for WASH committees in the Ho West District, there are areas needing improvement, particularly in water treatment, storage facilities, and active sustainability practices. The data reveals a robust community involvement and a commitment to maintaining and improving WASH standards, but further education and resources may be required to address gaps and ensure the long-term success of these initiatives.

WASH Sustainability and Challenges

Table 4.81: Sustainability and challenges

Sustainability and Challenges	**Percentage (%)**
Committees with sustainability plans	90%
Committees actively practicing sustainability	20%
Committees funded by individual contributions	50%

Although 90% of committees had sustainability plans in place, only 20% were actively practicing sustainability measures. Funding for WASH-related activities primarily came from individual contributions (50%).

4.1.4 Analysis of Access to Clean Water Across Districts

The analysis was conducted on 270 valid cases with no missing data. The data set comprised households from three districts: Adaklu, Agotime Ziope, and Ho West.

4.1.4.1 Crosstabulation of Results

The crosstabulation of the District by Frequency of Access to Clean Water provides the observed and expected counts for each category:

Table 4.82: Cross tabulation of access across Districts

District * Access Crosstabulation							
			ACCESS				Total
			NEVER	SOMETIMES	OFTEN	ALWAYS	
District	Adaklu	Count	6	41	2	36	85
		Expected Count	10.7	36.8	2.8	34.6	85.0
	Agotime Ziope	Count	12	45	4	41	102
		Expected Count	12.8	44.2	3.4	41.6	102.0
	Ho West	Count	16	31	3	33	83
		Expected Count	10.5	36.0	2.8	33.8	83.0
Total		Count	34	117	9	110	270
		Expected Count	34.0	117.0	9.0	110.0	270.0

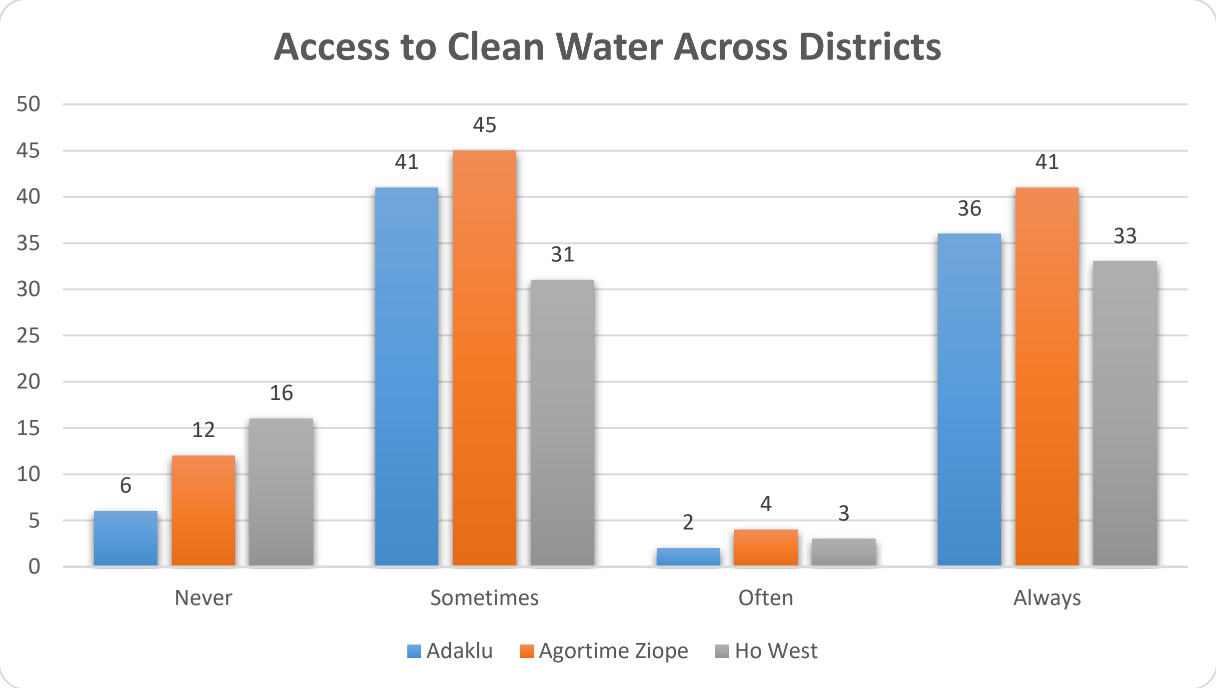


Figure 4.5: access to clean water across districts

The bar chart titled "Access to Clean Water Across Districts" provides a visual representation of the frequency of access to clean water among households in three districts: Adaklu, Agotime Ziope, and Ho West. The data is categorized into four levels of access: Never, Sometimes, Often, and Always.

In terms of households that never have access to clean water, Ho West has the highest number (n = 16), followed by Agotime Ziope (n = 12) and Adaklu (n = 6). This indicates that Ho West faces the most significant challenge in providing consistent access to clean water.

For households that sometimes have access to clean water, Agotime Ziope leads with 45 households, closely followed by Adaklu with 41 households. Ho West has a lower count of 31 households in this category, suggesting variability in water access within this district as well.

The number of households that often have access to clean water is relatively low across all districts. Agotime Ziope has the highest count with 4 households, followed by Ho West with 3 households, and Adaklu with 2 households. This low frequency across districts indicates that having often access is not a common scenario.

Regarding households that always have access to clean water, Agotime Ziope has the highest number (n = 41), followed by Adaklu (n = 36) and Ho West (n = 33). This suggests that, while some areas have a reliable water supply, there is still room for improvement in ensuring consistent access across all districts.

The data reveals noticeable variations in access to clean water across the three districts. Agotime Ziope generally shows higher counts in both the "Sometimes" and "Always" categories, indicating a relatively better overall access to clean water. Conversely, Ho West has the highest number of households that never have access to clean water, highlighting a critical area for intervention.

These findings suggest that, while some districts have relatively better access to clean water, there are substantial numbers of households facing intermittent or no access at all. Targeted interventions are needed to address the specific needs of each district, with particular attention to improving access in areas like Ho West, where the lack of access is more pronounced. Additionally, efforts to stabilize and enhance the reliability of water supply systems are crucial to ensure consistent access across all districts.

The Chi-Square test for independence was conducted to determine if there is a significant association between the district and the frequency of access to clean water. The results are as follows:

Table 4.83: Chisquare Test

	Value	df	p-value
Pearson Chi-Square	6.691[a]	6	.350
Likelihood Ratio	6.710	6	.348
Linear-by-Linear Association	.860	1	.354
N of Valid Cases	270		

The p-value for the Pearson Chi-Square test is 0.350, which is greater than the significance level of 0.05. This indicates that there is no statistically significant association between the district and the frequency of access to clean water. In other words, the differences observed in the frequency of access to clean water across the three districts are not significant enough to conclude that they are dependent on the district.

The lack of significant association suggests that the access to clean water is relatively uniform across the districts of Adaklu, Agotime Ziope, and Ho West. This uniformity indicates that efforts to provide access to clean water may be similarly effective or facing similar challenges across these regions. However, the variations in the counts do highlight areas where certain districts, like Ho West with higher 'Never' counts, may require targeted interventions to improve access.

The analysis indicates no significant differences in access to clean water across the districts of Adaklu, Agotime Ziope, and Ho West. While some districts may have higher or lower counts in specific categories, these variations are not statistically significant. Efforts to improve access to clean water should continue uniformly across these districts, with attention to areas where access is less frequent.

4.1.4.2 Functionality of Household Toilets Across Districts

The analysis was conducted on 270 valid cases with no missing data. The dataset comprised households from three districts: Adaklu, Agotime Ziope, and Ho West.

4.1.4.2.1 Crosstabulation Results

The crosstabulation of the District by Functionality of Household Toilets provides the observed and expected counts for each category:

Table 4.314: Functionality of household toilets crosstabulation by districts

			Functionality			Total
			YES	NO	DON'T KNOW	
District	Adaklu	Count	26	34	25	85
		Expected Count	31.5	33.1	20.5	85.0
	Agortime Ziope	Count	33	41	28	102
		Expected Count	37.8	39.7	24.6	102.0
	Ho West	Count	41	30	12	83
		Expected Count	30.7	32.3	20.0	83.0
Total		Count	100	105	65	270
		Expected Count	100.0	105.0	65.0	270.0

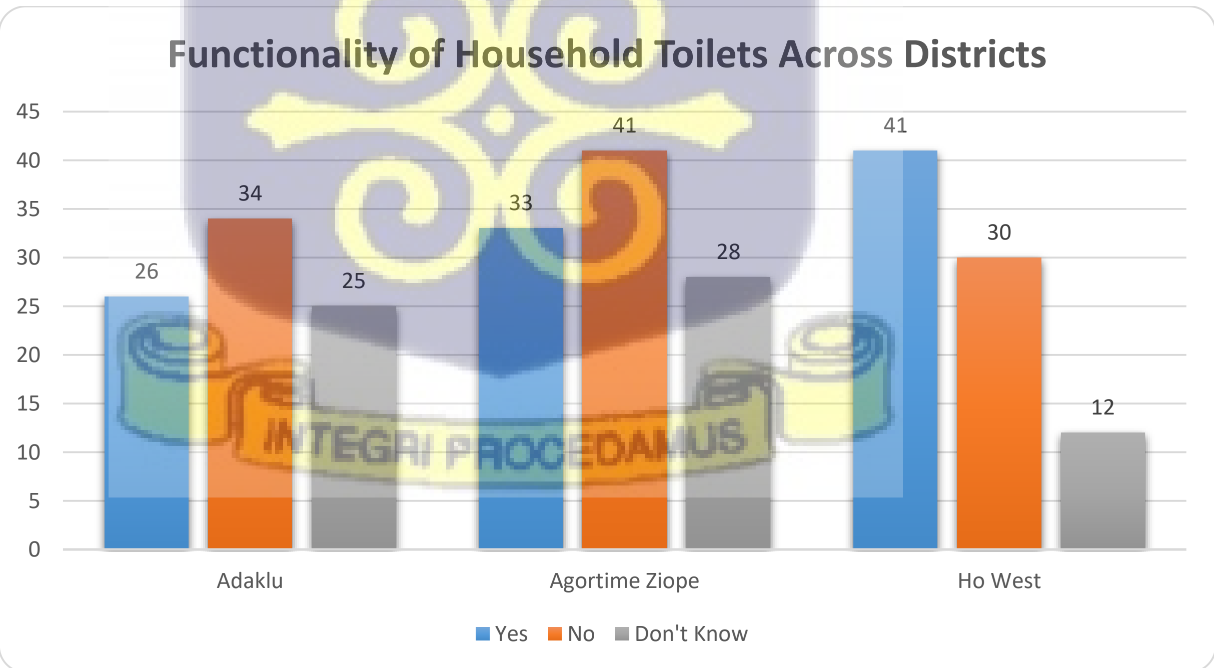


Figure 4.6: functionality of household toilets across districts

The data is divided into three categories: Yes (functional), No (non-functional), and Don't Know (unknown functionality).

In Adaklu, 26 households reported having functional toilets, 34 households reported non-functional toilets, and 25 households were unsure about the functionality of their toilets. Agortime Ziope had 33 households with functional toilets, 41 households with non-functional toilets, and 28 households that did not know the status of their toilets. Ho West reported the highest number of functional toilets with 41 households, while 30 households had non-functional toilets, and 12 households were unsure of their toilet's functionality.

The Chi-Square test for independence was conducted to determine if there is a significant association between the district and the functionality of household toilets. The results are as follows:

Table 4.8532: Chisquare tests

	Value	df	p-value
Pearson Chi-Square	9.892[a]	4	.042
Likelihood Ratio	10.105	4	.039
Linear-by-Linear Association	7.969	1	.005
N of Valid Cases	270		

The p-value for the Pearson Chi-Square test is .042, which is less than the significance level of .05. This indicates that there is a statistically significant association between the district and the functionality of household toilets. In other words, the differences observed in the functionality of household toilets across the three districts are significant enough to conclude that they are dependent on the district.

These findings suggest that the functionality of household toilets varies significantly across the districts of Adaklu, Agortime Ziope, and Ho West. Ho West shows the highest number of functional toilets, indicating potentially better maintenance practices or infrastructure. Conversely, Adaklu and Agotime Ziope have a higher number of non-functional toilets, highlighting the need for targeted interventions to improve toilet functionality in these districts. The significant proportion of households that are unsure about the functionality of their toilets in all districts suggests a need for increased awareness and education regarding toilet maintenance and functionality.

Efforts to improve the functionality of household toilets should consider the specific needs and conditions of each district to ensure effective and sustainable improvements. Targeted interventions, community education, and infrastructure improvements are essential to address the issues identified in this analysis.

The analysis indicates significant differences in the functionality of household toilets across the districts of Adaklu, Agotime Ziope, and Ho West. Ho West shows a higher number of functional toilets, suggesting that this district may have more effective maintenance practices or better infrastructure. Efforts to improve the functionality of household toilets should consider the specific needs and conditions of each district to ensure effective and sustainable improvements.

4.1.5 Qualitative Report on the Availability and Accessibility of WASH Facilities

4.1.5.1 Adaklu District

In the Adaklu District, one of the most significant changes reported by participants was the improved proximity to water sources. This change has notably impacted both the daily routines and safety of women and children. The burden of water collection, which previously fell on men due to the long distances to water sources, has now shifted to children. This shift is indicative of how proximity to WASH facilities can influence household dynamics, redistributing tasks that were once considered laborious to younger family members.

Theme 1: Reduction in Safety Risks for Women and Children

One of the most prominent improvements mentioned by participants was the reduction in safety risks. Previously, women expressed fear of going to fetch water at night, with risks of sexual assault or injury. A woman from Adaklu shared, *"The proximity of the water source allows us to get water at any time, including during the night. Before, we were afraid of being sexually assaulted or wounded."* This reflects how WASH interventions not only improve access but also contribute to a broader sense of security for women and children.

Theme 2: School Attendance Impact

Children, especially girls, have benefited greatly from the reduced distance to water sources, which has translated into better school attendance. This correlation between improved water access and education demonstrates that WASH interventions have far-reaching socio-economic impacts. A participant shared, *"Now that the water is close, my children can go to school on time without having to miss class because they had to fetch water early in the morning."* This indicates that the intervention directly contributed to enhancing the educational opportunities for children in the district.

Theme 3: Improvement in Daily Living

The presence of boreholes has made water access more convenient for all households, though challenges persist in larger settlements, where distance to wells remains a concern. Larger communities, such as Adaklu Ablornu, still struggle with having distant water sources, forcing some to rely on privately-owned boreholes where water must be purchased. One community member expressed, *"We still have to walk a long distance* *to fetch water, and sometimes we buy from private boreholes, but not everyone can afford it."* This highlights an area where the intervention has had limited success and suggests a need for more equitable access in larger settlements.

4.1.5.2 Agotime Ziope District

The Agotime Ziope District experienced a notable increase in water sources due to the installation of boreholes, which has improved water availability. However, as the community grew and demand for water increased, the pressure on the boreholes revealed infrastructural weaknesses, particularly during peak usage times.

Theme 1: Water Access Challenges

Many participants noted that while water sources had increased, sustainability concerns were raised due to the high demand. A male respondent from Agotime Ziope mentioned, *"The boreholes sometimes run dry because there are too many people fetching water at the same time."* This highlights the importance of not only providing infrastructure but ensuring that it can meet the demand of growing populations, especially during high-use periods.

Theme 2: Sustainability of Borehole Systems

Sustainability remains a significant challenge, particularly in maintaining water pressure and ensuring long-term functionality. The depletion of borehole water due to overuse underscores the need for better resource management and planning to avoid over-dependence on single water points. The community recognized the need for additional boreholes or alternative water sources to alleviate pressure on existing infrastructure.

4.1.5.3 Ho West District

In Ho West, boreholes have also improved water accessibility, though some communities still rely on streams during dry periods, leading to concerns about water quality. This reliance on non-treated, natural water sources points to the vulnerability of water supply systems in the face of environmental variability.

Theme 1: Reliance on Seasonal Water Sources

Participants from Ho West frequently cited their reliance on streams during the dry season, which compromises the quality of water they consume. A community member commented, *"During the dry season, we go back to using the stream, and the water isn't always safe to drink."* This reliance on untreated water suggests that the intervention, while successful in improving access, has not completely addressed the seasonal vulnerabilities inherent in water supply systems.

Theme 2: Water Quality and Health Implications

The issue of water quality is further emphasized in Ho West, where participants noted that the improved access to boreholes is countered by the poor quality of water from streams. As one participant stated, *"The water from the streams is not good, but we have no choice when the boreholes run dry."* This raises concerns about the sustainability of these systems during environmental stresses, such as droughts, and highlights the need for more resilient infrastructure that can provide clean, safe water year-round.

Theme 3: Need for More Resilient Infrastructure

While the presence of boreholes has been largely beneficial, Ho West participants highlighted the necessity for infrastructural upgrades to ensure water access during drought periods. The current reliance on streams during dry seasons presents a serious public health concern and calls for investment in more sustainable water management systems.

4.2 Specific Objective 2: The State of WASH facilities in households, schools and healtcare facilites.

4.2.1 Descriptive Statistics

To understand the distribution of sanitation and hygiene facilities among households in the three districts, descriptive statistics were calculated for the key variables ACCESS2 (Type of Toilet Facility) and AVAIL1 (Availability of Water Sources).

Table 4.33: Descriptive Statistics for ACCESS2 and AVAIL1

Statistic	ACCESS2	AVAIL1
Mean	1.6037	2.5778
Std. Error of Mean	0.07371	0.07905
Median	1.0000	3.0000
Mode	1.00	3.00
Std. Deviation	1.21116	1.29894
Variance	1.467	1.687
Skewness	1.823	0.474
Kurtosis	2.057	-0.571
Range	5.00	4.00
Minimum	1.00	1.00
Maximum	6.00	5.00

Table 4.347: Frequency Distribution of Toilet Facility (ACCESS2)

Toilet Facility	Frequency	Percent
Flushed Toilet	207	76.7
KVIP	41	15.2
Unlined Ventilated	16	5.9

Pit Latrine without Slab	4	1.5
Mozambique	2	0.7
Total	270	100.0

Table 4.35: Frequency Distribution of Water Sources (AVAIL1)

Water Source	Frequency	Percent
Stream/River	110	40.7
Pipe	74	27.4
Rain	46	17.0
Other	40	14.8
Total	270	100.0

The descriptive statistics reveal that the majority of households (76.7%) have access to flushed toilets, indicating a high level of improved sanitation. Other types of toilets such as KVIP and unlined ventilated are also present but less prevalent. For water sources, a significant portion of households relies on streams or rivers (40.7%) and pipes (27.4%), with other sources such as rain and miscellaneous accounting for the remainder.

4.2.2 *Factor Analysis*

To further understand the underlying structure of the sanitation and hygiene facilities data, a Principal Component Analysis (PCA) was performed. PCA helps in reducing the dimensionality of the data while retaining most of the variance present in the dataset.

Table 4.36: Total Variance Explained by PCA

Component	Initial Eigenvalues	Extraction Sums of Squared Loadings
	Total	% of Variance
1	10.765	14.164
2	5.357	7.049
3	4.962	6.529
...	...	...
22	1.000	1.316

The PCA extracted 22 components, accounting for 81.52% of the total variance. This indicates that these components capture the majority of the information present in the dataset.

Table 4.9037: Communalities of Selected Variables

Variable	Initial	Extraction
AVAIL1	1.000	0.796
AVAIL2	1.000	0.842
AVAIL3	1.000	0.629
ACCESS1	1.000	0.857
ACCESS2	1.000	0.793
ACCESS3	1.000	0.856
...	...	...

The high communalities (> 0.7) for many variables indicate that these variables are well represented by the factors extracted.

Most households have improved sanitation facilities, primarily in the form of flushed toilets. This indicates a relatively high standard of sanitation in the surveyed districts. A significant portion of households relies on natural water sources like streams and rivers, highlighting areas that may need improved water supply infrastructure. The PCA results indicate that a few key components explain a large portion of the variance, suggesting that the sanitation and hygiene data are well-structured and can be summarized effectively by the extracted components.

4.2.3 The State of WASH Facilities in Households, Schools and Healcare Facilities.

4.2.3.1 Adaklu District

The WASH intervention has brought about significant improvements in sanitation practices, particularly in the construction and use of latrines, as well as in handwashing practices. These changes have led to a notable reduction in water-related diseases across the district, benefiting both the general population and vulnerable groups like children.

Theme 1: Adoption of Handwashing and Hygiene Practices

Participants from Adaklu noted a substantial shift in hygiene behavior, particularly regarding handwashing. The intervention introduced social and behavioral change communication (SBCC) strategies that have successfully ingrained better hygiene habits into everyday life. A community member mentioned, *"Before, we didn't know much about the importance of washing hands, but now everyone washes their hands, and you can see the difference in how healthy people are."*

This transformation was particularly visible in schools where children, through School Health Clubs (SHCs), played a critical role in disseminating information about hygiene. Children proudly reported improvements in cleanliness practices, noting that the reduced incidence of water-related diseases in their households was directly linked to their education on proper handwashing. One student said, *"We used to get sick a lot from drinking dirty water, but now we wash our hands before eating and after using the toilet. It has made a big difference."*

Theme 2: Improved Sanitation Infrastructure

The construction of latrines has significantly increased throughout Adaklu, with households adopting reinforced latrine designs that have helped mitigate the collapse of structures during heavy rains. This is particularly important in rural areas where traditional pit latrines used to collapse during the rainy season, leading to poor sanitation and health risks. As one participant put it, *"We used to lose our latrines every rainy season, but now they last longer because we use cement and blocks."*

However, while the majority of households in the district now have access to latrines, some marginalized groups continue to rely on relatives' or neighbors' facilities, revealing an ongoing challenge in achieving full sanitation coverage. This gap, particularly in impoverished households, indicates that while the intervention has made significant strides, it has not yet fully reached the most vulnerable populations.

Theme 3: Health Benefits of Improved Sanitation

The health benefits of improved sanitation were widely acknowledged by participants. Reduced cases of diseases such as diarrhoea, typhoid, and cholera were commonly cited, with many attributing this reduction to both the use of latrines and better hand hygiene. A male participant from the Focus Group Discussion (FGD) in Adaklu Wumenu said, *"Before, we had problems with diarrhoea and typhoid. These diseases were common because we didn't have enough latrines, and people didn't wash their hands. But since the WASH programme, we see fewer illnesses, and we save money on hospital bills."*

4.2.3.2 Agotime Ziope District

In Agotime Ziope, the WASH intervention focused heavily on increasing access to improved sanitation facilities and promoting better hygiene practices. The construction of reinforced latrines has been an essential part of the intervention, particularly in areas where soil instability posed a significant challenge.

Theme 1: Structural Improvements in Latrine Construction

In regions with loose soil, the intervention introduced reinforced latrines to prevent collapse. Community members reported that the new designs, which include the use of cement, stones, and blocks, have significantly improved the durability of latrines. *"The reinforced latrines last longer, and we don't have to rebuild them every few months like before,"* remarked a community member. This has provided a sense of security, particularly during the rainy season, when latrine collapses were common, contributing to the spread of diseases.

Theme 2: Gaps in Inclusive Sanitation Coverage

Despite these improvements, challenges in inclusivity remain. Marginalized groups, particularly low-income households, often lack the resources to construct their own latrines and are forced to rely on shared facilities. A participant explained, *"We don't have the money to build a latrine for ourselves, so we use our neighbor's. But it's not always easy because sometimes there's a long queue."* This highlights the need for additional support and tailored interventions that focus on the most vulnerable households to ensure comprehensive sanitation coverage.

Theme 3: Community Participation in Sanitation Solutions

The community-driven nature of the WASH intervention was a key element of its success. Through training and capacity-building sessions, local artisans were taught how to build reinforced latrines, and community members were actively involved in the maintenance of these facilities. This participatory approach not only ensured the sustainability of the interventions but also empowered the community to take ownership of their sanitation infrastructure. A local artisan commented, *"We learned how to build latrines ourselves, so now we can help others in the community build theirs too."*

4.2.3.3 Ho West District

The Ho West District has made notable strides in improving sanitation practices and hygiene behavior, thanks to the intervention's focus on reinforcing latrine construction and promoting consistent handwashing. However, challenges remain, particularly in areas where water quality issues hinder overall hygiene improvement.

Theme 1: Health Impact of Improved Sanitation

Participants in Ho West reported significant health improvements because of the WASH intervention. The construction of latrines, combined with better hygiene practices, has led to a reduction in waterborne diseases. As one community leader observed, *"We used to have many cases of cholera and typhoid, but since people started using latrines and washing their hands, these diseases have reduced a lot."*

Theme 2: Water Quality and Its Effect on Hygiene

While sanitation has improved, participants expressed concerns about water quality, particularly during the dry season when the community is forced to rely on streams. Poor water quality compromises the overall hygiene benefits of the WASH intervention. *"We have latrines, and people are washing their hands, but the water from the stream is dirty. It makes it hard to keep clean,"* noted a participant from Ho West. This highlights the interdependency of water quality and sanitation, underscoring the need for improved water infrastructure to fully realize the health benefits of WASH interventions.

Theme 3: Economic and Health Benefits

The consistent use of latrines and the adoption of better hygiene practices have also brought economic benefits to the district. Reduced healthcare costs associated with waterborne diseases were frequently mentioned by participants. *"Before, we were spending a lot of money on hospital bills for diseases like diarrhoea and typhoid. Now, we don't have to go to the hospital as often, and we can use that money for other things,"* shared a respondent. This economic relief is an important secondary benefit of the WASH intervention and one that strengthens the sustainability of improved hygiene practices.

4.3 Specific Objective 3: to examine the patronage level of WASH facilities in households, schools and healthcare facilities.

1. **Adaklu district**

4.3.1 Descriptive statistics

Descriptive statistics were computed for the composite scores of availability, accessibility, refuse disposal, hygiene knowledge and practices, and community participation, as well as for monthly income among households in the Adaklu district. The descriptive statistics are summarized in Table 4.24.

Table 4.91: Descriptive Statistics for Composite Scores and Monthly Income (N = 85)

Variable	Min.	Max.	M	SD	Variance	Skewness	Std. Error (Skewness)	Kurtosis	Std. Error (Kurtosis)
Availability Score	1.05	2.73	2.17	0.32	0.10	-1.06	0.26	1.53	0.52
Accessibility Score	1.06	2.22	1.59	0.21	0.05	0.23	0.26	1.14	0.52
Refuse Disposal Score	1.32	2.53	1.81	0.25	0.07	0.48	0.26	0.31	0.52
Hygiene Knowledge & Practices	1.17	2.33	1.68	0.27	0.07	0.37	0.26	-0.18	0.52

Community Participation Score	1.00	2.60	1.60	0.34	0.12	0.98	0.26	0.90	0.52
Monthly Income	1.00	4.00	2.16	1.08	1.16	0.31	0.26	-1.26	0.52

4.3.2 Correlation Results

The correlations between the composite scores for availability, accessibility, refuse disposal, hygiene knowledge and practices, community participation, and the perceived impacts of WASH interventions were computed. The descriptive statistics for these variables are summarized in Table 1, and the Pearson correlation coefficients are presented in Table 2.

Table 4.92: Descriptive Statistics for Composite Scores and Perceived Impacts (N = 85)

Variable	Mean	Std. Deviation
Availability Score	2.17	0.32
Accessibility Score	1.59	0.21
Refuse Disposal Score	1.81	0.25
Hygiene Knowledge & Practices	1.68	0.27
Community Participation Score	1.60	0.34
Impacts	2.96	1.09

Table 4.93: Pearson Correlations Between Composite Scores and Perceived Impacts

Variable	**1**	**2**	**3**	**4**	**5**	**6**
1. Availability Score	1					
2. Accessibility Score	.243* (.025)	1				
3. Refuse Disposal Score	.237* (.029)	.261* (.016)	1			
4. Hygiene Knowledge & Practices	.188 (.085)	.315** (.003)	.392** (.000)	1		
5. Community Participation Score	.069 (.528)	.246* (.023)	.091 (.408)	.533** (.000)	1	
6. Impacts	.466** (.000)	.094 (.393)	.017 (.878)	.186 (.088)	.187 (.087)	1

Note: *p < .05, **p < .01 (two-tailed).

Availability Score and Perceived Impacts:

The availability score is significantly positively correlated with perceived impacts ($r = .466$, $p < .01$). This indicates that higher availability of WASH facilities is associated with greater perceived positive impacts on households.

Accessibility Score:

The accessibility score shows a significant positive correlation with the refuse disposal score ($r = .261$, $p < .05$) and hygiene knowledge and practices score ($r = .315$, $p < .01$). However, it is not significantly correlated with perceived impacts ($r = .094$, $p > .05$).

Refuse Disposal Score:

The refuse disposal score is significantly positively correlated with the hygiene knowledge and practices score ($r = .392$, $p < .01$) and accessibility score ($r = .261$, $p <$

.05). However, it does not show a significant correlation with perceived impacts (r = .017, p > .05).

Hygiene Knowledge and Practices Score:

This score is significantly positively correlated with community participation score (r = .533, p < .01), refuse disposal score (r = .392, p < .01), and accessibility score (r = .315, p < .01). While it shows a positive but non-significant correlation with perceived impacts (r = .186, p > .05), knowledge and practices in hygiene are essential for overall health improvements.

Community Participation Score:

The community participation score is significantly positively correlated with hygiene knowledge and practices score (r = .533, p < .01) and accessibility score (r = .246, p < .05). It shows a positive but non-significant correlation with perceived impacts (r = .187, p > .05).

4.3.3 Regression Results

The multiple regression analysis was conducted to examine the influence of the composite scores (availability, accessibility, refuse disposal, hygiene knowledge and practices, community participation) on perceived impacts of WASH interventions among households in the Adaklu district. The descriptive statistics, correlations, and regression results are presented below.

Table 4.9438: Descriptive Statistics for Composite Scores and Perceived Impacts (N = 85)

Variable	Mean	Std. Deviation
Availability Score	2.17	0.32

Accessibility Score	1.59	0.21
Refuse Disposal Score	1.81	0.25
Hygiene Knowledge & Practices	1.68	0.27
Community Participation Score	1.60	0.34
Impacts	2.96	1.09

Table 4.9539: Pearson Correlations Between Composite Scores and Perceived Impacts

Variable	1	2	3	4	5	6
1. Availability Score	1					
2. Accessibility Score	.243* (.025)	1				
3. Refuse Disposal Score	.237* (.029)	.261* (.016)	1			
4. Hygiene Knowledge & Practices	.188 (.085)	.315** (.003)	.392** (.000)	1		
5. Community Participation Score	.069 (.528)	.246* (.023)	.091 (.408)	.533** (.000)	1	.
6. Impacts	.466** (.000)	.094 (.393)	.017 (.878)	.186 (.088)	.187 (.087)	1

Note: *p < .05, **p < .01 (two-tailed).

Table 4.406: Model Summary for Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.510	.260	.213	.963	.260	5.548	5	79	.000

The regression model was statistically significant, $F(5, 79) = 5.548$, $p < .001$, with an R^2 value of .260. This indicates that approximately 26% of the variance in perceived impacts can be explained by the composite scores of availability, accessibility, refuse disposal, hygiene knowledge and practices, and community participation.

Table 4.417: ANOVA for Regression Analysis

Model	Sum of Squares	df	Mean Square	F	Sig.
1	25.702	5	5.140	5.548	.000**

Table 4.98: Coefficients for Regression Analysis

Variable	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	-.444	1.107		-.401	.689		
Availability Score	1.638	.345	.483	4.748	.000**	.904	1.106
Accessibility Score	-.254	.535	-.050	-.474	.637	.838	1.193
Refuse Disposal Score	-.568	.465	-.133	-1.221	.226	.785	1.274
Hygiene Knowledge & Practices	.381	.504	.096	.756	.452	.582	1.717
Community Participation Score	.403	.372	.126	1.084	.282	.688	1.454

Note: **p < .01

Multicollinearity

The tolerance values and VIF statistics indicated no multicollinearity issues, with all VIF values below the threshold of 10 and tolerance values above 0.1.

4.3.4 One-Way ANOVA

The One-Way ANOVA was conducted to examine the effect of gender on the composite scores (availability_score,accessibility_score,RefuseDisposal_score,Hygiene_KnowlegeNPractices_score, CommunityParticipation_score) among households in the Adaklu district.

Table 4.429: Descriptive Statistics

Composite Variable	SEX	N	Mean	Std. Deviation	Std. Error
Community Participation Score	MALE	33	1.6182	0.32544	0.05665
	FEMALE	52	1.5885	0.35294	0.04894
	Total	85	1.6000	0.34087	0.03697
Availability Score	MALE	33	2.2011	0.30173	0.05252
	FEMALE	52	2.1547	0.33296	0.04617
	Total	85	2.1727	0.32017	0.03473
Accessibility Score	MALE	33	1.5657	0.16922	0.02946
	FEMALE	52	1.6090	0.23875	0.03311
	Total	85	1.5922	0.21440	0.02326
Refuse Disposal Score	MALE	33	1.8278	0.28260	0.04919
	FEMALE	52	1.8067	0.23784	0.03298
	Total	85	1.8149	0.25470	0.02763
Hygiene Knowledge & Practices	MALE	33	1.6869	0.23388	0.04071
	FEMALE	52	1.6795	0.29722	0.04122
	Total	85	1.6824	0.27292	0.02960

Table 4.10043: Test of Homogeneity of Variances

Composite Variable	Levene Statistic	df1	df2	Sig.
Community Participation Score	0.415	1	83	0.521
Availability Score	1.795	1	83	0.184
Accessibility Score	1.812	1	83	0.182
Refuse Disposal Score	1.448	1	83	0.232
Hygiene Knowledge & Practices	3.306	1	83	0.073

Table 4.10144: ANOVA

Composite Variable		Sum of Squares	Df	Mean Square	F	Sig.
Community Participation Score	Between Groups	0.018	1		0.018	0.152
	Within Groups	9.742	83		0.117	
	Total	9.760	84			
Availability Score	Between Groups	0.043	1		0.043	0.421
	Within Groups	8.567	83		0.103	
	Total	8.611	84			
Accessibility Score	Between Groups	0.038	1		0.038	0.822
	Within Groups	3.824	83		0.046	
	Total	3.861	84			
Refuse Disposal Score	Between Groups	0.009	1		0.009	0.137
	Within Groups	5.440	83		0.066	
	Total	5.449	84			
Hygiene Knowledge & Practices	Between Groups	0.001	1		0.001	0.015
	Within Groups	6.256	83		0.075	

Total	6.257	84

Table 4.10245: Robust Tests of Equality of Means

Composite Variable	Statistic	df1	df2	Sig.
Community Participation Score	Welch	0.158	1	72.319
	Brown-Forsythe	0.158	1	72.319
Availability Score	Welch	0.440	1	73.156
	Brown-Forsythe	0.440	1	73.156
Accessibility Score	Welch	0.955	1	81.904
	Brown-Forsythe	0.955	1	81.904
Refuse Disposal Score	Welch	0.127	1	59.669
	Brown-Forsythe	0.127	1	59.669
Hygiene Knowledge & Practices	Welch	0.016	1	79.084
	Brown-Forsythe	0.016	1	79.084

The One-Way ANOVA was conducted to examine the effect of gender on the composite scores (availability_score,accessibility_score,RefuseDisposal_score,Hygiene_KnowlegeNPractices_score, CommunityParticipation_score) among households in the Adaklu district.

Descriptive Statistics

The descriptive statistics for the composite scores reveal that both male and female respondents have similar mean scores across all variables. Specifically, the mean scores for community participation, availability, accessibility, refuse disposal, and hygiene knowledge and practices were closely aligned between genders. For instance, the mean community participation score was 1.6182 for males and 1.5885 for females, while the availability score was 2.2011 for males and 2.1547 for females. These results suggest a uniform perception and experience of WASH interventions among both genders in the Adaklu district.

Homogeneity of Variances

Tests for homogeneity of variances indicated no significant differences across genders for any of the composite variables. Levene's test results showed p-values greater than 0.05 for all variables, suggesting that the variance in scores is consistent between male and female respondents. This consistency supports the validity of using ANOVA to compare mean scores between genders.

1. Agortime Ziope District

Descriptive statistics were computed for the composite scores of availability, accessibility, refuse disposal, hygiene knowledge and practices, community participation, and monthly income among households in the Agortime district. The descriptive statistics are summarized in Table 4.36.

Table 4.10346: Descriptive Statistics for Composite Scores and Monthly Income (N = 102)

Variable	Min.	Max.	M	SD	Variance	Skewness	Std. Error (Skewness)	Kurtosis	Std. Error (Kurtosis)
Availability Score	1.14	2.73	2.18	0.33	0.11	-1.08	0.24	1.35	0.47
Accessibility Score	1.06	2.11	1.62	0.23	0.05	0.09	0.24	0.28	0.47
Refuse Disposal Score	1.37	2.53	1.80	0.24	0.06	0.77	0.24	1.31	0.47
Hygiene Knowledge & Practices	1.17	2.33	1.73	0.29	0.08	0.05	0.24	-0.75	0.47
Community Participation Score	1.00	2.60	1.62	0.36	0.13	0.75	0.24	0.22	0.47
Monthly Income	1.00	4.00	2.17	1.11	1.23	0.37	0.24	-1.25	0.47

The descriptive statistics for the Agortime Ziope district reveal important aspects of WASH (Water, Sanitation, and Hygiene) infrastructure and practices among households. These insights are essential for evaluating the effectiveness of current interventions and identifying areas for improvement.

Regression Analysis Results

Descriptive Statistics

The analysis included 102 households from Agortime Ziope District. The descriptive statistics for the variables are as follows:

Table 104: Descriptive Statisitcs

Factor	Mean	Standard deviation (SD)
Impact	2.39	1.073
Availability score	2.18	0.327

Accessibility score	1.62	0.225
Refuse Disposal score	1.80	0.240
Hygiene knowledge and practice score	1.72	0.287
Community participation score	1.62	0.364

Correlation Analysis

The correlation analysis showed the following significant relationships:

Availability Score had a negative correlation with Hygiene Knowledge and Practices Score ($r = -0.211$, $p < 0.05$) and Community Participation Score ($r = -0.248$, $p < 0.05$). Accessibility Score had positive correlations with Refuse Disposal Score ($r = 0.300$, $p < 0.01$), Hygiene Knowledge and Practices Score ($r = 0.444$, $p < 0.01$), and Community Participation Score ($r = 0.287$, $p < 0.01$). Refuse Disposal Score had positive correlations with Hygiene Knowledge and Practices Score ($r = 0.452$, $p < 0.01$) and Community Participation Score ($r = 0.199$, $p < 0.05$). Hygiene Knowledge and Practices Score had a positive correlation with Community Participation Score ($r = 0.540$, $p < 0.01$).

Regression Analysis

The regression model included Availability Score, Accessibility Score, Refuse Disposal Score, Hygiene Knowledge and Practices Score, and Community Participation Score as predictors of Impact. The model summary and coefficients are detailed below.

Table 4.105: Model Summary

Metric	**Value**
R	0.190
R Square	0.036
Adjusted R Square	-0.014

Standard Error of the Estimate	1.081
Durbin-Watson	1.615

Table 4.106: ANOVA

Metric	Value
Regression Sum of Squares	4.217
Residual Sum of Squares	112.097
Total Sum of Squares	116.314
F	0.722
P	0.608

Table 4.10747: Coefficients table

Predictor	B	Std. Error	Beta	T	P
(Constant)	1.379	1.402		0.983	0.328
Availability Score	-0.206	0.343	-0.063	-0.600	0.550
Accessibility Score	0.483	0.542	0.101	0.890	0.375
Refuse Disposal Score	0.185	0.507	0.041	0.365	0.716
Hygiene Knowledge and Practices	0.350	0.512	0.093	0.683	0.496
Community Participation Score	-0.160	0.357	-0.054	-0.448	0.655

The regression model explains only 3.6% of the variance in the Impact ($R^2 = 0.036$), and this is not statistically significant ($F = 0.722$, $p = 0.608$). None of the individual predictors were significant at the 0.05 level.

Availability Score had a negative but non-significant effect on Impact ($B = -0.206$, $p = 0.550$). Accessibility Score had a positive but non-significant effect on Impact ($B = 0.483$, $p = 0.375$). Refuse Disposal Score had a positive but non-significant effect on Impact ($B = 0.185$, $p = 0.716$). Hygiene Knowledge and Practices Score had a positive but non-significant effect on Impact (B = 0.350, p = 0.496). Community Participation **Score** had a negative but non-significant effect on Impact (B = -0.160, p = 0.655).

ANOVA Results Report

Descriptive Statistics

The one-way ANOVA analysis included 102 households from Agortime Ziope District, with 43 male and 59 female participants. The descriptive statistics for the composite scores based on sex are as follows:

Table 4.108: Descriptive statistics for the composite scores based on sex

Score Type	Gender	Mean	Standard Deviation (SD)
Availability Score	Male	2.20	0.33
Availability Score	Female	2.17	0.33
Availability Score	Total	2.18	0.33
Accessibility Score	Male	1.60	0.20
Accessibility Score	Female	1.64	0.24
Accessibility Score	Total	1.62	0.23
Refuse Disposal Score	Male	1.81	0.26
Refuse Disposal Score	Female	1.80	0.23
Refuse Disposal Score	Total	1.80	0.24
Hygiene Knowledge and Practices Score	Male	1.74	0.29
Hygiene Knowledge and Practices Score	Female	1.73	0.29
Hygiene Knowledge and Practices Score	Total	1.73	0.29
Community Participation Score	Male	1.57	0.35
Community Participation Score	Female	1.66	0.37
Community Participation Score	Total	1.62	0.36

Test of Homogeneity of Variances

Levene's test for homogeneity of variances indicated that the variances were equal for all composite scores across sex groups ($p > 0.05$).

Table 4.10948: Test of Homogeneity of Variances

Score	Levene Statistic	df1	df2	Sig.
Availability Score	0.959	1	100	0.330
Accessibility Score	3.176	1	100	0.078
Refuse Disposal Score	1.258	1	100	0.265
Hygiene Knowledge and Practices	0.241	1	100	0.624
Community Participation Score	0.760	1	100	0.385

ANOVA Results

The one-way ANOVA results showed that there were no statistically significant differences between male and female participants across all composite scores.

Table 4.110: ANOVA

Score	Sum of Squares	df	Mean Square	F	Sig.
Availability Score	0.025	1	0.025	0.231	0.632
Accessibility Score	0.031	1	0.031	0.613	0.436
Refuse Disposal Score	0.002	1	0.002	0.034	0.855
Hygiene Knowledge and Practices	0.001	1	0.001	0.017	0.895
Community Participation Score	0.182	1	0.182	1.382	0.243

Robust Tests of Equality of Means

The Welch and Brown-Forsythe tests confirmed the ANOVA results, indicating no significant differences between the means for males and females across all composite scores.

Table 4.111: Robust Tests of Equality of Means

Score	Test	Statistic	df1	df2	Sig.
Availability Score	Welch	0.230	1	90.258	0.633
	Brown-Forsythe	0.230	1	90.258	0.633
Accessibility Score	Welch	0.648	1	98.059	0.423
	Brown-Forsythe	0.648	1	98.059	0.423
Refuse Disposal Score	Welch	0.032	1	83.164	0.858
	Brown-Forsythe	0.032	1	83.164	0.858
Hygiene Knowledge and Practices	Welch	0.017	1	91.446	0.895
	Brown-Forsythe	0.017	1	91.446	0.895
Community Participation Score	Welch	1.401	1	92.900	0.240
	Brown-Forsythe	1.401	1	92.900	0.240

The results indicate that there are no significant differences between male and female participants in terms of Availability Score, Accessibility Score, Refuse Disposal Score, Hygiene Knowledge and Practices Score, and Community Participation Score in Agortime Ziope District. This suggests that both males and females have similar experiences and perceptions regarding these WASH (Water, Sanitation, and Hygiene) related factors in this district.

Given that the p-values for all scores are greater than 0.05, we fail to reject the null hypothesis that there is no difference in the composite scores between male and female participants. Further studies could explore other demographic variables or use a larger sample size to see if significant differences emerge.

3. Ho West District

Descriptive Statistics for Ho West District

The analysis of the Ho West District includes data from 83 households, focusing on key variables such as income, availability score, accessibility score, refuse disposal score, hygiene knowledge and practices score, and community participation score.

Income: The income levels in the Ho West District ranged from 1.00 to 4.00, with an average of 2.20 (SD = 1.12). The skewness value of 0.27 and kurtosis of -1.37 indicate a slight positive skew and a relatively flat distribution compared to a normal distribution.

Availability Score: The availability score, reflecting the availability of WASH facilities, had a mean of 2.15 (SD = 0.37). The score distribution is slightly negatively skewed (-0.91), suggesting that a larger number of households have higher availability scores, but the distribution has a slight positive kurtosis (0.66), indicating a peaked distribution.

Accessibility Score: The accessibility score averaged 1.71 (SD = 0.25), with a slight negative skew (-0.22) and a negative kurtosis (-0.29). This suggests a fairly symmetric distribution around the mean with a tendency towards lower scores.

Refuse Disposal Score: The refuse disposal score averaged 1.90 (SD = 0.28) and displayed a positive skew (0.47) with near-zero kurtosis (-0.01), indicating a slightly right-skewed distribution and a fairly normal distribution shape.

Hygiene Knowledge and Practices Score: This score had a mean of 1.81 (SD = 0.30) with a slight negative skew (-0.11) and negative kurtosis (-0.67), suggesting a relatively symmetric but flatter distribution.

Community Participation Score: The community participation score averaged 1.66 (SD = 0.46), with a positive skew (0.55) and a negative kurtosis (-0.84), indicating a right-skewed distribution and a relatively flat distribution compared to a normal distribution.

Correlation Analysis for Ho West District

The correlation analysis for the Ho West District examined the relationships between the impact score and five composite scores: community participation, refuse disposal, hygiene knowledge and practices, availability, and accessibility. The results are summarized in Table 1 below.

Table 4.112: Pearson Correlation Coefficients:

Variable 1	Variable 2	r (Correlation Coefficient)	p-value
Impact	Community Participation Score	0.069	0.533
Impact	Refuse Disposal Score	0.025	0.822
Impact	Hygiene Knowledge and Practices Score	0.037	0.741
Impact	Availability Score	-0.192	0.083
Impact	Accessibility Score	-0.124	0.264
Community Participation Score	Refuse Disposal Score	0.084	0.452
Community Participation Score	Hygiene Knowledge and Practices Score	0.504**	< .001
Community Participation Score	Availability Score	0.150	0.176
Community Participation Score	Accessibility Score	0.255*	0.020

Table 4.113: Pearson Correlation Coefficients:

Refuse Disposal Score	Hygiene Knowledge and Practices Score	0.339**	0.002
Refuse Disposal Score	Availability Score	0.365**	0.001
Refuse Disposal Score	Accessibility Score	0.363**	0.001
Hygiene Knowledge and Practices Score	Availability Score	0.392**	< .001
Hygiene Knowledge and Practices Score	Accessibility Score	0.561**	< .001
Availability Score	Accessibility Score	0.390**	< .001

Table 4.114: Spearman's rho Correlation

Variable 1	Variable 2	r (Spearman's rho)	p-value
Impact	Community Participation Score	0.052	0.644
Impact	Refuse Disposal Score	0.006	0.957
Impact	Hygiene Knowledge and Practices Score	-0.008	0.943
Impact	Availability Score	-0.205	0.063
Impact	Accessibility Score	-0.172	0.120
Community Participation Score	Refuse Disposal Score	0.060	0.589
Community Participation Score	Hygiene Knowledge and Practices Score	0.436**	< .001
Community Participation Score	Availability Score	0.096	0.387
Community Participation Score	Accessibility Score	0.130	0.241
Refuse Disposal Score	Hygiene Knowledge and Practices Score	0.320**	0.003
Refuse Disposal Score	Availability Score	0.297**	0.006
Refuse Disposal Score	Accessibility Score	0.411**	< .001
Hygiene Knowledge and Practices Score	Availability Score	0.346**	0.001
Hygiene Knowledge and Practices Score	Accessibility Score	0.592**	< .001
Availability Score	Accessibility Score	0.274*	0.012

Table 4.115: Kendall's tau_b Correlation

Variable 1	Variable 2	r (Kendall's tau_b)	p-value

Impact	Community Participation Score	0.038	0.674
Impact	Refuse Disposal Score	0.006	0.946
Impact	Hygiene Knowledge and Practices Score	-0.004	0.966
Impact	Availability Score	-0.158	0.066
Impact	Accessibility Score	-0.137	0.116
Community Participation Score	Refuse Disposal Score	0.049	0.551
Community Participation Score	Hygiene Knowledge and Practices Score	0.335**	< .001
Community Participation Score	Availability Score	0.074	0.364
Community Participation Score	Accessibility Score	0.098	0.236
Refuse Disposal Score	Hygiene Knowledge and Practices Score	0.235**	0.003
Refuse Disposal Score	Availability Score	0.214**	0.006
Refuse Disposal Score	Accessibility Score	0.284**	< .001
Hygiene Knowledge and Practices Score	Availability Score	0.235**	0.003
Hygiene Knowledge and Practices Score	Accessibility Score	0.432**	< .001
Availability Score	Accessibility Score	0.206**	0.009

Regression Analysis Report for Ho West District

Descriptive Statistics

The descriptive statistics for the variables used in the regression analysis are presented below:

Table 4.116: Deescriptive statistics

Variable	Mean	Standard Deviation (SD)
SEX	1.5904	0.49476
Availability Score	2.1484	0.37470
Accessibility Score	1.7055	0.24506
Refuse Disposal Score	1.8960	0.28127
Hygiene Knowledge and Practices Score	1.8092	0.29778
Community Participation Score	1.6627	0.46004

Correlation Analysis

The Pearson correlation coefficients between the dependent variable (SEX) and the independent variables (composite scores) are as follows:

Table 4.117: Correlations

Variable 1	Variable 2	r (Correlation Coefficient)	p-value
SEX	Availability Score	0.030	0.394
SEX	Accessibility Score	-0.001	0.495
SEX	Refuse Disposal Score	-0.075	0.251
SEX	Hygiene Knowledge and Practices Score	-0.013	0.455
SEX	Community Participation Score	-0.100	0.184

The correlations indicate that none of the composite scores are significantly correlated with the sex of the respondents. This suggests that these factors do not have a significant linear relationship with sex.

Regression Analysis

A multiple regression analysis was conducted to evaluate how well the composite scores (availability, accessibility, refuse disposal, hygiene knowledge and practices, and community participation) predict the dependent variable (SEX).

Table 4.118: Model Summary

Metric	Value
R	0.151
R Square	0.023
Adjusted R Square	-0.041
Standard Error of the Estimate	0.50470
Durbin-Watson	1.573

The R square value of 0.023 indicates that approximately 2.3% of the variability in the dependent variable (SEX) can be explained by the independent variables in the model. However, the adjusted R square value of -0.041 suggests that the model does not fit the data well, likely due to the small sample size or the variables not being strong predictors.

Table 4.119: ANOVA

Source	Sum of Squares	Df	Mean Square	F	p-value
Regression	0.459	5	0.092	0.360	0.874
Residual	19.614	77	0.255	-	-
Total	20.072	82	-	-	-

The F-ratio of 0.360 with a p-value of .874 indicates that the overall regression model does not significantly predict the dependent variable (SEX). This suggests that the independent variables do not collectively explain a significant portion of the variance in SEX.

Table 4.120: Coefficients

Predictor	Unstandardized Coefficient (B)	Std. Error	Standardized Coefficient (Beta)	t	Sig.
(Constant)	1.795	0.494	-	3.635	.000
Availability Score	0.081	0.170	0.061	0.473	.637
Accessibility Score	0.032	0.286	0.016	0.113	.911
Refuse Disposal Score	-0.197	0.223	-0.112	-0.882	.380
Hygiene Knowledge and Practices Score	0.100	0.263	0.060	0.379	.706

Community Participation Score	-0.144	0.141	-0.134	-1.023	.309

None of the predictors are significant at the 0.05 level. This means that individually, none of the composite scores are significant predictors of the dependent variable (SEX).

Residuals Statistics:

The residuals statistics indicate that the predicted values range from 1.3623 to 1.7602, with a mean of 1.5904 and a standard deviation of 0.07478. The residuals range from -0.74188 to 0.59786, with a mean of 0.00000 and a standard deviation of 0.48907. The standard residuals indicate no major deviations, suggesting that the residuals are approximately normally distributed.

One-Way ANOVA Analysis Report for Ho West District

Descriptive Statistics

The descriptive statistics for the composite scores by sex are as follows:

Table 4.121: Descriptive statistics

Score	Male: Mean (M), SD	Female: Mean (M), SD	Total: Mean (M), SD
Availability Score	M = 2.1350, SD = 0.38284	M = 2.1577, SD = 0.37265	M = 2.1484, SD = 0.37470
Accessibility Score	M = 1.7059, SD = 0.21820	M = 1.7052, SD = 0.26430	M = 1.7055, SD = 0.24506
Refuse Disposal Score	M = 1.9211, SD = 0.30860	M = 1.8786, SD = 0.26254	M = 1.8960, SD = 0.28127
Hygiene Knowledge and Practices Score	M = 1.8137, SD = 0.30364	M = 1.8061, SD = 0.29677	M = 1.8092, SD = 0.29778

Community Participation Score	M = 1.7176, SD = 0.46480	M = 1.6245, SD = 0.45759	M = 1.6627, SD = 0.46004

Test of Homogeneity of Variances

Levene's Test for equality of variances showed that the variances were not significantly different across sexes for all the composite scores:

Table 4.122: Test of Homogeneity of Variances

Score	F-Statistic	p-value
Availability Score	F(1, 81) = 0.000	0.993
Accessibility Score	F(1, 81) = 1.519	0.221
Refuse Disposal Score	F(1, 81) = 0.781	0.379
Hygiene Knowledge and Practices Score	F(1, 81) = 0.091	0.763
Community Participation Score	F(1, 81) = 0.072	0.789

ANOVA Results

The one-way ANOVA results are as follows:

Table 4.123: One-way ANOVA

Score	Between Groups: SS, df, MS	Within Groups: SS, df, MS	Total: SS, df	F-Statistic	p-value
Availability Score	SS = 0.010, df = 1, MS = 0.010	SS = 11.502, df = 81, MS = 0.142	SS =11.513, df = 82	0.073	.788
Accessibility Score	SS = 0.000, df = 1, MS = 0.000	SS = 4.924, df = 81, MS = 0.061	SS = 4.924, df = 82	0.000	.990
Refuse Disposal Score	SS = 0.036, df = 1, MS = 0.036	SS = 6.451, df = 81, MS = 0.080	SS = 6.487, df = 82	0.454	.503

Hygiene Knowledge and Practices Score	SS = 0.001, df = 1, MS = 0.001	SS = 7.270, df = 81, MS = 0.090	SS = 7.271, df = 82	0.013	.910
Community Participation Score	SS = 0.174, df = 1, MS = 0.174	SS = 17.180, df = 81, MS = 0.212	SS =17.354, df = 82	0.821	.367

Robust Tests of Equality of Means

Welch and Brown-Forsythe tests indicate no significant differences in means for any of the composite scores across sexes:

Table 4.124: Robust Tests of Equality of Means

Score	Welch F, df	Welch p-value	Brown-Forsythe F, df	Brown-Forsythe p-value
Availability Score	F(1, 69.887) = 0.072	p = .789	F(1, 69.887) = 0.072	p = .789
Accessibility Score	F(1, 78.476) = 0.000	p = .990	F(1, 78.476) = 0.000	p = .990
Refuse Disposal Score	F(1, 63.465) = 0.428	p = .515	F(1, 63.465) = 0.428	p = .515
Hygiene Knowledge and Practices Score	F(1, 70.079) = 0.013	p = .910	F(1, 70.079) = 0.013	p = .910
Community Participation Score	F(1, 70.416) = 0.817	p = .369	F(1, 70.416) = 0.817	p = .369

4.3.5 Qualitative Report on the Identification and Mapping of Households with Improved Sanitation and Hygiene Facilities

4.3.5.1 Adaklu District

The WASH intervention has brought about significant improvements in sanitation practices, particularly in the construction and use of latrines, as well as in handwashing practices. These changes have led to a notable reduction in water-related diseases across the district, benefiting both the general population and vulnerable groups like children.

Theme 1: Adoption of Handwashing and Hygiene Practices

Participants from Adaklu noted a substantial shift in hygiene behavior, particularly regarding handwashing. The intervention introduced social and behavioral change communication (SBCC) strategies that have successfully ingrained better hygiene habits into everyday life. A community member mentioned, *"Before, we didn't know much about the importance of washing hands, but now everyone washes their hands, and you can see the difference in how healthy people are."*

This transformation was particularly visible in schools where children, through School Health Clubs (SHCs), played a critical role in disseminating information about hygiene. Children proudly reported improvements in cleanliness practices, noting that the reduced incidence of water-related diseases in their households was directly linked to their education on proper handwashing. One student said, *"We used to get sick a lot from drinking dirty water, but now we wash our hands before eating and after using the toilet. It has made a big difference."*

Theme 2: Improved Sanitation Infrastructure

The construction of latrines has significantly increased throughout Adaklu, with households adopting reinforced latrine designs that have helped mitigate the collapse of structures during heavy rains. This is particularly important in rural areas where traditional pit latrines used to collapse during the rainy season, leading to poor sanitation and health risks. As one participant put it, *"We used to lose our latrines every rainy season, but now they last longer because we use cement and blocks."*

However, while the majority of households in the district now have access to latrines, some marginalized groups continue to rely on relatives' or neighbors' facilities, revealing an ongoing challenge in achieving full sanitation coverage. This gap, particularly in impoverished households, indicates that while the intervention has made significant strides, it has not yet fully reached the most vulnerable populations.

Theme 3: Health Benefits of Improved Sanitation

The health benefits of improved sanitation were widely acknowledged by participants. Reduced cases of diseases such as diarrhoea, typhoid, and cholera were commonly cited, with many attributing this reduction to both the use of latrines and better hand hygiene. A male participant from the Focus Group Discussion (FGD) in Adaklu Wumenu said, *"Before, we had problems with diarrhoea and typhoid. These diseases were common because we didn't have enough latrines, and people didn't wash their hands. But since the WASH programme, we see fewer illnesses, and we save money on hospital bills."*

4.3.5.2 Agortime Ziope District

In Agortime Ziope, the WASH intervention focused heavily on increasing access to improved sanitation facilities and promoting better hygiene practices. The construction of reinforced latrines has been an essential part of the intervention, particularly in areas where soil instability posed a significant challenge.

Theme 1: Structural Improvements in Latrine Construction

In regions with loose soil, the intervention introduced reinforced latrines to prevent collapse. Community members reported that the new designs, which include the use of cement, stones, and blocks, have significantly improved the durability of latrines. *"The reinforced latrines last longer, and we don't have to rebuild them every few months like before,"* remarked a community member. This has provided a sense of security, particularly during the rainy season, when latrine collapses were common, contributing to the spread of diseases.

Theme 2: Gaps in Inclusive Sanitation Coverage

Despite these improvements, challenges in inclusivity remain. Marginalized groups, particularly low-income households, often lack the resources to construct their own latrines and are forced to rely on shared facilities. A participant explained, *"We don't have the money to build a latrine for ourselves, so we use our neighbor's. But it's not always easy because sometimes there's a long queue."* This highlights the need for additional support and tailored interventions that focus on the most vulnerable households to ensure comprehensive sanitation coverage.

Theme 3: Community Participation in Sanitation Solutions

The community-driven nature of the WASH intervention was a key element of its success. Through training and capacity-building sessions, local artisans were taught how to build reinforced latrines, and community members were actively involved in the maintenance of these facilities. This participatory approach not only ensured the sustainability of the interventions but also empowered the community to take ownership of their sanitation infrastructure. A local artisan commented, *"We learned how to build latrines ourselves, so now we can help others in the community build theirs too."*

4.3.5.1 Ho West District

The Ho West District has made notable strides in improving sanitation practices and hygiene behavior, thanks to the intervention's focus on reinforcing latrine construction and promoting consistent handwashing. However, challenges remain, particularly in areas where water quality issues hinder overall hygiene improvement.

Theme 1: Health Impact of Improved Sanitation

Participants in Ho West reported significant health improvements as a result of the WASH intervention. The construction of latrines, combined with better hygiene practices, has led to a reduction in waterborne diseases. As one community leader observed, *"We used to have many cases of cholera and typhoid, but since people started using latrines and washing their hands, these diseases have reduced a lot."*

Theme 2: Water Quality and Its Effect on Hygiene

While sanitation has improved, participants expressed concerns about water quality, particularly during the dry season when the community is forced to rely on streams. Poor water quality compromises the overall hygiene benefits of the WASH intervention. *"We have latrines, and people are washing their hands, but the water from the stream is dirty. It makes it hard to keep clean,"* noted a participant from Ho West. This highlights the interdependency of water quality and sanitation, underscoring the need for improved water infrastructure to fully realize the health benefits of WASH interventions.

Theme 3: Economic and Health Benefits

The consistent use of latrines and the adoption of better hygiene practices have also brought economic benefits to the district. Reduced healthcare costs associated with waterborne diseases were frequently mentioned by participants. *"Before, we were spending a lot of money on hospital bills for diseases like diarrhoea and typhoid. Now, we don't have to go to the hospital as often, and we can use that money for other things,"* shared a respondent. This economic relief is an important secondary benefit of the WASH intervention and one that strengthens the sustainability of improved hygiene practices.

4.4 Specific Objective 4: To investigate Open Defecation Free (ODF) relapse.

This section presents an analysis of Open Defecation Free (ODF) status relapse in three districts: Agotime-Ziope, Adaklu, and Ho West. The objective aims to investigate the prevalence of ODF relapse and determine if there are significant differences in relapse rates among the districts. The findings will provide insights into the effectiveness of the Community-led Total Sanitation (CLTS) program and highlight areas that require further attention.

The data includes information on the number of households, community population, and ODF status before, during, and currently in the selected districts. A chi-square test for independence was performed to test if there are significant differences in ODF relapse rates between the districts. Household latrine coverage was also analyzed to understand its impact on ODF status.

4.4.1 Relapse Rates

The relapse rates for each district were calculated based on the number of communities that transitioned back to open defecation (OD) status after being declared ODF. The results are summarized in Table 1 and Figure 1.

Table 49: ODF Relapse Rates by District

District	Total ODF Communities	ODF Relapsed	ODF Not Relapsed	Relapse Rate (%)
Agotime	49	21	28	78%
Adaklu	45	16	29	76%
Ho West	49	11	38	22%

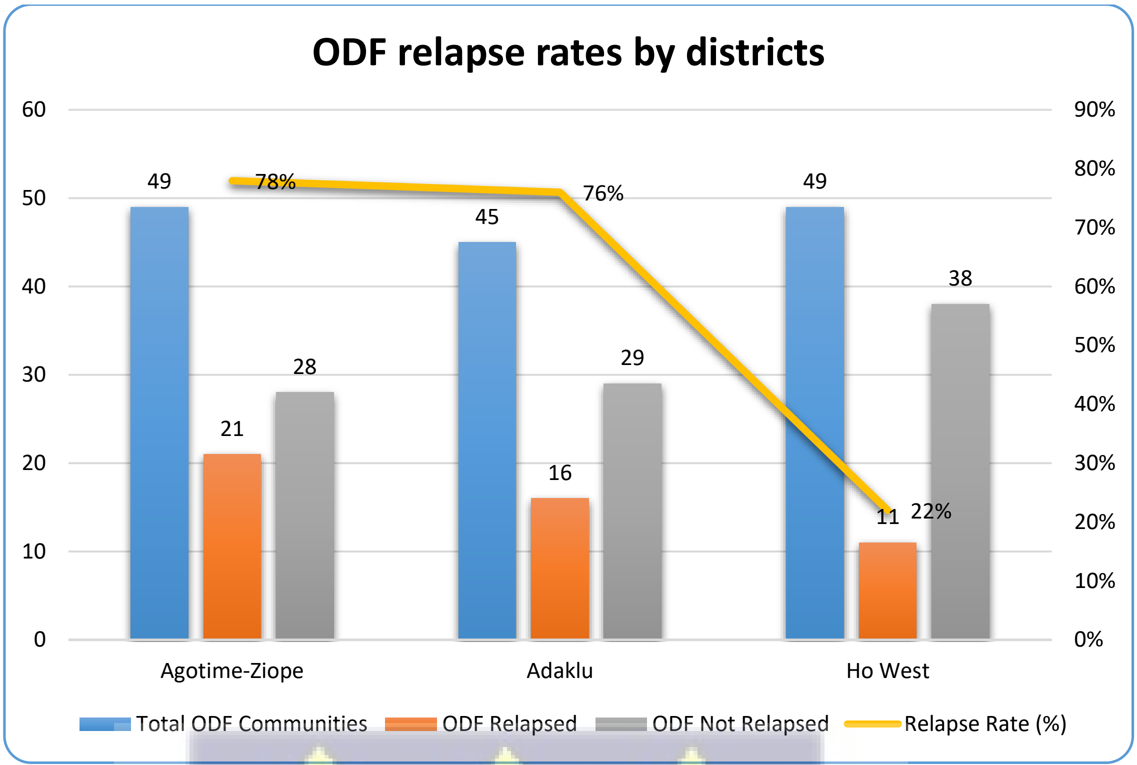


Figure 4.7: ODF relapse rates by Districts

Agotime-Ziope and Adaklu have significantly higher relapse rates (78% and 76% respectively) compared to Ho West (22%). This indicates that the majority of communities in Agotime-Ziope and Adaklu have reverted to OD status.

4.4.2 Chi-Square Test for Independence

A chi-square test was conducted to determine if there is a significant association between the districts and the ODF relapse status. The test results are shown in Table 2.

Table 4.126: Chi-square test results

Statistic	**Value**
Chi-Square Value	5.860
Degrees of Freedom	2
p-value	0.053

The chi-square test statistic is 5.860 with a p-value of 0.053. This result is marginally significant at the 0.05 level, suggesting that there might be differences in relapse rates between the districts that could be explored further.

4.4.3 Household Latrine Coverage

Household latrine coverage was analyzed to understand its impact on ODF relapse. The coverage rates for each district are shown in Table 3.

Table 4.50: Household Latrine Coverage by District

District	No. of Households	No. of Household Latrines	Household Latrine Deficit	Coverage (%)
Agotime	7116	2858	4258	40.2
Adaklu	2600	886	1714	34.1
Ho West	25875	3268	22607	12.6

Household latrine coverage is relatively low in all districts, with Ho West having the lowest coverage at 12.6%. This low coverage might contribute to the higher relapse rates observed in Agotime-Ziope and Adaklu.

The analysis reveals significant challenges in maintaining ODF status, particularly in the districts of Agotime-Ziope and Adaklu. The high relapse rates in these districts suggest that factors specific to these areas might be contributing to the reversion to open defecation. The marginally significant chi-square test result indicates potential differences in relapse rates that warrant further investigation.

Low household latrine coverage appears to be a major contributing factor to the high relapse rates. This is evident from the coverage percentages, which are below 50% in all districts. Addressing this deficit is crucial for sustaining ODF status and preventing relapse.

4.4.4 Qualitative Analysis on the Investigation of Open Defecation Free (ODF) Relapse

This section analyzes the recurrence of open defecation in communities that have achieved Open Defecation Free (ODF) status. The objective focuses on the reasons behind the relapse and the structural, social, and economic challenges that hinder the sustainability of ODF achievements across the districts of Adaklu, Agortime Ziope, and Ho West.

4.4.4.1 Adaklu District

In the Adaklu District, ODF status has been achieved in many communities, but sustaining it has proven to be challenging due to a combination of infrastructure failure and socio-economic barriers.

Theme 1: Infrastructure-Related Challenges

One of the main reasons for the ODF relapse in Adaklu is the collapse of pit latrines during the rainy season. In rural areas where latrines are constructed with traditional materials, these structures often fail due to poor quality and lack of durability. A respondent from Adaklu explained, *"Our latrines collapsed during the rainy season, and now we use our neighbor's toilet until we can rebuild ours."* This reliance on temporary solutions, such as sharing toilets, compromises the sustainability of ODF achievements.

Theme 2: Economic Constraints in Rebuilding Latrines

Low-income households in the district face difficulties in maintaining or rebuilding latrines, which leads to a relapse into open defecation. The economic cost of constructing durable latrines is prohibitive for many families, particularly in remote areas. A participant noted, *"We want to build toilets, but the materials are too expensive. Some of us still have to go back to the bush."* This reflects the broader issue of financial accessibility, where without external support, many households struggle to maintain adequate sanitation facilities.

Theme 3: Community Monitoring and Enforcement

The WASH committees (WASHCOMs) and local government authorities play an important role in monitoring ODF status, but lapses in enforcement have led to occasional relapses. While there is community engagement, participants cited a need for more regular inspections and stronger enforcement of community by-laws to prevent open defecation. A local official commented, *"We need to keep monitoring regularly, otherwise people go back to their old habits, especially when the latrines collapse."*

4.4.4.2 Agotime Ziope District

In Agotime Ziope, the district has made significant progress toward maintaining ODF status, but the relapse is still observed, particularly among marginalized groups.

Theme 1: Socio-Economic Barriers to Total ODF Achievement

In the more impoverished areas of Agortime Ziope, socio-economic barriers play a key role in relapse. Households that cannot afford to build or maintain latrines often revert to open defecation, which undermines the district's ODF achievements. A male participant from the community said, *"We try to maintain ODF, but not everyone can afford a latrine, so some people still defecate in the open."* This highlights the need for targeted interventions, including subsidies or financial aid, to help vulnerable households build and maintain proper sanitation facilities.

Theme 2: Social Stigma and Behavior Change

In many communities, open defecation is increasingly stigmatized due to education campaigns and social pressure. However, the entrenched practice among some individuals is hard to eradicate entirely. Despite achieving ODF status, some community members, particularly children and marginalized groups, continue to engage in open defecation, especially when toilets are unavailable due to overcrowding or lack of maintenance.

Theme 3: Reinforcement of Sanitation Infrastructure

While the district has made strides in reinforcing sanitation infrastructure, certain areas still experience pit latrine collapses due to unstable soil and flooding. The intervention program has introduced reinforced latrines, but not all households have adopted this technology. *"We've been taught how to build stronger latrines, but not everyone can afford the materials,"* a respondent mentioned, emphasizing the need for sustained community education and financial support.

4.4.4.3 Ho West District

In Ho West, the relapse into open defecation has been less prevalent, thanks to strong community engagement and the involvement of local schools in sanitation education. However, occasional relapses still occur due to infrastructure challenges.

Theme 1: Role of Schools and Community Engagement

The district has largely maintained ODF status through the active involvement of schools and community leaders. Schools, in particular, have played a critical role in maintaining sanitation standards by educating students and encouraging them to influence their families. One schoolteacher explained, *"The children learn about hygiene and sanitation in school, and they remind their parents to keep using the latrines."* This has helped to create a strong community culture around sanitation, contributing to the district's success in minimizing relapse.

Theme 2: Infrastructure Failures and Pit Latrine Collapse

Despite the positive progress, some relapses still occur when latrines collapse due to environmental factors such as rain and flooding. As in the other districts, Ho West faces challenges with maintaining latrines during the rainy season. A community leader mentioned, *"Our latrines are strong, but when the rains are heavy, some of them collapse, and people go back to open defecation."* This suggests that while the community engagement is strong, further efforts are needed to ensure the sustainability of infrastructure during adverse weather conditions.

Theme 3: Monitoring and Sustained Efforts

The district's success in maintaining ODF status can also be attributed to regular monitoring and follow-ups by WASHCOMs and local government authorities. However, participants noted that continuous education and financial support for maintaining latrines are crucial for sustaining ODF status. *"We can't become complacent. People need to keep learning and building strong latrines,"* said a WASHCOM member.

CHAPTER FIVE

5.0. DISCUSSION OF RESULTS

5.1. Introduction

This chapter provides a detailed discussion of the key findings from this study on Water, Sanitation, and Hygiene (WASH) facilities and practices in the study districts. The primary aim of the study was to investigate the availability, accessibility, and usage of WASH facilities, as well as to understand the factors contributing to the relapse of Open Defecation Free (ODF) status. This investigation spanned households, schools, and healthcare facilities within the selected districts.

In this chapter, the findings are analyzed in relation to the objectives, providing a deeper understanding of the challenges and opportunities within the WASH sector. The discussion integrates both quantitative and qualitative data, offering a comprehensive view of the current state of WASH facilities and practices. Theoretical frameworks are applied to help interpret the findings, and the implications of these results for policies and Sustainable Development Goals (SDGs) in Ghana are thoroughly explored.

The chapter is structured to first discuss the availability and accessibility of WASH facilities in the different settings, followed by an exploration of their usage in practice. Finally, the chapter delves into the factors contributing to ODF relapse and its broader implications for sustainable sanitation practices. Each section is supported by relevant literature to contextualize the findings within the broader scope of WASH research.

5.1 Availability and Accessibility of WASH Facilities Across Study Districts

This section provides an integrated discussion of the results on Water, Sanitation, and Hygiene (WASH) facilities across the study districts using both quantitative and qualitative insights. The Social Ecological Model (SEM) serves as the theoretical framework, allowing us to examine how individual, community, and societal factors interact to influence the availability, accessibility, and sustainability of WASH services. This model allows for a multi-dimensional understanding of WASH issues, ranging from individual household behaviors to broader community-level dynamics, such as infrastructure availability and community engagement.

5.1.1 Quantitative and Qualitative Insights into Water Access

Access to water across the three districts varies significantly, with infrastructure playing a critical role in determining reliability. In Adaklu, households with access to piped water reported the highest levels of reliability, with about 70.8% of households consistently having access to clean water. In contrast, Agotime Ziope and Ho West recorded low levels of consistent water access, with only 9.6% and 3.7% of households respectively reporting always-available water. In contrast, Adaklu achieved 53.4%, mainly because more households rely on mechanised boreholes and small-town water systems, which supply water more regularly. Agotime Ziope and Ho West depend heavily on streams and rainwater, leading to irregular access. Improving water reliability in these districts will require expanding boreholes, strengthening small-town systems, and ensuring proper maintenance to reduce dependence on unsafe natural sources. These findings align with previous studies that highlight the uneven distribution of infrastructure across rural Ghana and its impact on public health and hygiene (Boisson et al., 2015, Abanyie et al., 2023).

This study's findings are consistent with national data from the 2021 Population and Housing Census (PHC) and the 2017 Ghana Demographic and Health Survey (GDHS). Both sources indicate that access to clean water is higher in urban than rural areas, where infrastructure remains underdeveloped. For example, the PHC reports that in rural areas, only 51.3% of households have access to improved water sources, compared to 92.8% in urban areas. The GDHS similarly identifies lower access to improved water sources in rural communities, underscoring the pressing need for investments in water infrastructure. In comparison, this study's findings in Agortime Ziope and Ho West further highlight the critical gap between policy goals and on-the-ground realities in rural areas. In Agortime Ziope, only 40.2% of households reported always having access to clean water, while Ho West recorded 39.8%. These figures show limited reliable access compared with Adaklu, where 42.4% of households reported consistent access. The higher level in Adaklu reflects the wider use of piped water and boreholes, which offer more stable supply. The lower percentages in Agortime Ziope and Ho West are linked to heavy reliance on streams and rainwater.

The Social Ecological Model (SEM) framework helps contextualize these findings within both individual and community layers. At the individual level, households that have consistent access to clean water are better equipped to maintain hygiene, reduce disease incidence, and enhance their overall quality of life. At the community level, shared infrastructure and management practices significantly impact access. Community-based water management teams, which were effective in areas like Bawku West District, exemplify the importance of local governance in maintaining reliable water sources (Abanyie et al., 2019). Without such support structures, communities often face significant barriers to consistent access.

The theoretical framework of Social Ecological Model (SEM) also brings attention to broader societal influences. National targets such as SDG 6 aim for universal access to clean water.Yet the study results show that this goal is far from being met in the rural districts studied. Only 40.2% of households in Agortime Ziope and 39.8% in Ho West reported always having access to clean water, compared with 42.4% in Adaklu. Ho West also recorded the highest proportion of households that never had access (19.3%). The disparities observed in this study suggest that Ghana still faces significant hurdles in meeting these goals, particularly in rural districts like Agortime Ziope and Ho West. While national averages suggest moderate progress, localized data from this study highlight the need for targeted interventions that address infrastructural gaps, seasonal water shortages, and management inefficiencies.

5.1.2 WASH Facility Usage and Functional Status

The functionality of WASH facilities across the districts also varies significantly, with simpler systems such as KVIP latrines being more sustainable in the long term compared to more complex systems like flushed toilets. In Adaklu, 66.7% of KVIP latrines were functional, whereas only 23.6% of flushed toilets were in working condition. These patterns were replicated in Agortime Ziope and Ho West, indicating a broader issue with the maintenance and sustainability of more complex sanitation systems in rural settings. Studies from other rural areas in sub-Saharan Africa have shown similar trends, where simpler systems such as KVIP latrines, VIP toilets and pit latrines are more effective due to lower maintenance costs and fewer mechanical failures (Crocker et al., 2017, Appiah-Effah et al., 2019). This pattern is also seen in the study districts. For example, 58.3% of KVIP toilets in Agortime Ziope were functional, compared with only 25.3% of flushed toilets. Similar results appeared in Adaklu and Ho West, where flushed toilets recorded the lowest functionality.

The 2021 Population and Housing Census corroborates these findings, showing that 54.1% of rural households in Ghana rely on basic latrines, while only 9.6% have access to flush toilets. The Census further highlights the challenges rural households face in maintaining more advanced sanitation systems, often due to economic barriers, limited access to spare parts, and lack of technical expertise. This comparison underscores the importance of promoting simpler, community-driven sanitation solutions, which have proven more sustainable in the long run.

Qualitative data from community discussions provide further insight into these disparities. The survey results show that flushed toilets consistently recorded the lowest functionality across the districts. For example, in Agortime Ziope only 25.3% of flushed toilets were functional, while 41.0% were not functional and 33.7% of users did not know their status. In contrast, simpler systems performed better; 58.3% of KVIPs were functional and 100% of pit latrines without slabs were functional. The SEM framework helps contextualize these issues at multiple levels. At the individual level, these figures show that households using KVIPs and pit latrines are able to maintain their toilets more easily because they do not require spare parts or technical support. At the community level, the higher functionality of simpler toilets suggests that local management structures are more able to support these systems. Flushed toilets fail more often because households lack the skills and resources to repair them. Without adequate community support, more complex sanitation systems are prone to failure.

These findings have significant implications for Ghana’s broader development goals. SDG 6 aims to ensure universal access to sanitation, but the challenges observed in this study suggest that achieving this goal in rural areas will require a shift in focus towards simpler, community-led sanitation solutions. Investment in education and training for local maintenance teams, as well as support for the adoption of low-cost sanitation technologies, will be critical in addressing these challenges.

5.1.3 Open Defecation Free (ODF) Relapse and Sustainability

A key challenge identified in this study is the issue of Open Defecation Free (ODF) relapse, particularly in Agortime Ziope and Adaklu. While communities initially achieved ODF status through Community-Led Total Sanitation (CLTS) programs, maintaining this status proved difficult due to a lack of ongoing community engagement and infrastructure maintenance. A key challenge identified in this study is the issue of Open Defecation Free (ODF) relapse, particularly in Agortime Ziope and Adaklu. The household data show clear signs of slippage. In Agortime Ziope, only 32.4% of toilets were functional, while 40.2% were not functional and 27.5% of households did not know the status of their toilets.

Similar patterns appeared in Adaklu, where 34 households reported non-functional toilets and 25 households were unsure of their toilet status. These conditions suggest that many households are unable to rely on their toilets, increasing the likelihood of returning to open defecation. The absence of regular community engagement also contributes to this relapse. Only 55.6% of communities reported active focus on WASH maintenance, and just 11.1% had committees working on financing, limiting the ability to sustain ODF gains. National data from the GDHS and Population and Housing Census confirm the persistence of open defecation in rural areas, with 17.1% of rural households still practicing open defecation, compared to 5.7% in urban areas. This highlights the limitations of CLTS programs when not accompanied by sustained community engagement and government support (Apanga et al., 2020).

The Social Ecological Model (SEM) helps contextualize ODF relapse within the community and societal levels. At the community level, the lack of sustained leadership and follow-up from external agencies weakens the momentum initially built by CLTS programs. In communities where leadership remains strong, ODF status is more likely to be maintained. However, where community dynamics shift or external support wanes, relapse becomes a significant risk. This underscores the need for long-term support mechanisms, such as regular monitoring and community education programs, to ensure the sustainability of ODF status. The pattern in the data supports these observations. In Ho West, 36.1% of households reported that their toilets were not functional, and 14.5% did not know the condition of their facilities. This suggests weak follow-up and reduced community engagement after the initial implementation of sanitation programmes. In Agortime Ziope, 40.2% of households reported non-functional toilets and 27.5% were unsure about their status. The high “don’t know” responses show limited supervision and weak maintenance systems. In Adaklu, 40% of households also indicated that their facilities were not usable. These findings show that many households returned to unsafe practices when community structures and external support declined.

At the societal level, policy gaps also contribute to the challenges of maintaining ODF status. This implies that limited monitoring, weak leadership, and poor maintenance arrangements increase the likelihood of ODF relapse. Also, the lack of long-term funding for sanitation infrastructure, particularly in rural areas, leaves communities vulnerable to relapse. Ghana’s commitment to SDG 6 is undermined by these structural challenges, suggesting that greater government investment and policy innovation will be required to close the gap between ODF achievements and their sustainability.

5.2 Comparative Analysis Across Districts: Integrating Quantitative and Qualitative Findings

5.2.1 Differences and Commonalities in Water Access

While significant differences in water access were observed across the districts, commonalities also emerged. Adaklu, with its more developed piped water infrastructure, exhibited higher levels of consistent water access. In contrast, Agotime Ziope and Ho West, where households relied more heavily on streams or rainwater, experienced more frequent interruptions. The findings show that, in Adaklu, 70.8% of households used piped water and 26.0% sometimes lacked clean water. In Agotime Ziope, 88.4% relied on streams or rainwater and 39.8% reported interrupted access. Ho West showed a similar picture, as 66.7% of households using pipe-borne water did not always have a reliable supply. These results explain the repeated interruptions reported in the two districts. The PHC confirms these findings, showing that rural communities relying on natural water sources are significantly more vulnerable to seasonal shortages.

Qualitative data from community interviews further emphasize the strain placed on natural water sources during the dry season, with residents expressing concerns over water quality and accessibility during droughts. These views match the survey results. In Agotime Ziope, 39.8% of households sometimes had clean water and 88.4% relied on streams or rainwater. In Ho West, 37.3% sometimes had clean water. These figures support the concerns expressed in the interviews.

These findings align with national data and suggest that rural districts like Agotime Ziope and Ho West require targeted interventions to address water access disparities. Investments in boreholes, rainwater harvesting systems, and piped water infrastructure will be critical to ensuring reliable access to clean water, particularly in light of Ghana's commitment to achieving SDG 6. The SEM framework highlights the interconnectedness of individual, community, and societal influences on water access. While individual households may implement coping strategies such as water storage, long-term solutions require collective community action and substantial infrastructural investment from the government.

5.2.2 Sanitation Functional Status and Sustainability

A comparative analysis of sanitation across districts reveals that simpler systems, such as KVIP latrines, are more sustainable in the long term. This finding is supported by both the quantitative data presented in this study and national data from the Population and Housing Census, which show that rural households predominantly rely on basic sanitation systems. The Census reports that 54.1% of rural households use basic latrines, while only 9.6% have access to flush toilets. This pattern is in line with findings from the present study. In Ho West, 38.5% of households with KVIPs had functional toilets, compared with 23.1% for flushed toilets. In Agortime Ziope, 58.3% of KVIPs were functional, while only 25.3% of flushed toilets worked. In Adaklu, 66.7% of KVIPs were usable, but only 23.6% of flushed toilets were working. These figures show that simpler systems remain functional more often than water-dependent systems. These findings align with studies from other sub-Saharan African contexts, where simpler sanitation systems have been shown to have better maintenance outcomes and lower rates of failure (Venkataramanan et al., 2018).

In terms of policy implications, these findings suggest that achieving SDG 6 in rural Ghana will require a greater focus on promoting simpler, low-cost sanitation technologies. National policies should prioritize community-driven solutions, with an emphasis on sustainability and local capacity building. The SEM framework reinforces this point by highlighting the importance of community-level governance and local leadership in maintaining functional sanitation systems. Without strong community engagement, even well-constructed sanitation infrastructure is likely to fail over time

5.2.3 Implications for SDGs and Policy Recommendations

The findings of this study have several implications for Ghana's progress towards SDG 6, which aims to ensure universal access to water and sanitation by 2030. While significant progress has been made in urban areas, rural districts like Adaklu, Agortime Ziope, and Ho West face significant challenges in achieving these goals. The disparities observed in water access and sanitation underscore the need for targeted policy interventions that address the unique challenges faced by rural communities. Investments in infrastructure, capacity building, and community engagement will be critical in bridging the gap between rural and urban WASH outcomes.

Additionally, the integration of quantitative and qualitative findings in this study highlights the importance of a multi-faceted approach to WASH interventions. While quantitative data provide valuable insights into access and functionality, qualitative data from community interviews offer a deeper understanding of the social and cultural dynamics that influence WASH behaviors. The Social Ecological Model provides a comprehensive framework for understanding these dynamics, emphasizing the need for interventions that operate at both the individual and community levels.

In summary, this integrated analysis of WASH facilities across districts reveals significant disparities in access, functionality, and sustainability. These findings, contextualized within the Social Ecological Model, highlight the importance of addressing both infrastructural and social challenges in improving WASH outcomes in rural Ghana. By aligning local interventions with national SDG targets, Ghana can make significant progress towards ensuring universal access to clean water and sanitation by 2030.

5.2 Households with Improved Water, Sanitation and Hygiene Facilities

5.2.1 Access to Improved Sanitation and Hygiene Facilities: Integrated Findings

The overall access to improved sanitation facilities among households in the study area is encouraging, with 76.7% of households using flushed toilets. This aligns with national progress towards SDG 6, which aims to achieve universal access to adequate sanitation. National data from the 2021 Population and Housing Census (PHC) and the 2017 Ghana Demographic and Health Survey (GDHS) confirm that access to improved sanitation has improved across the country. However, disparities remain between rural and urban areas, with rural areas continuing to lag in terms of access to the highest levels of sanitation.

This study's findings reflect those disparities, as households continue to use a mix of sanitation facilities. For instance, 15.2% of households rely on KVIP latrines and 5.9% on unlined ventilated pit latrines, demonstrating the ongoing need for infrastructure improvements in these areas. These basic facilities, while better than open defecation, pose challenges in terms of hygiene and convenience, which were also highlighted in qualitative responses from household members. The Social Ecological Model (SEM) helps explain this by framing these issues within community-level dynamics, where the availability of resources and social norms influence the types of facilities households use.

At the same time, qualitative insights show that many community members recognize the importance of hygiene and sanitation for health and well-being. For instance, in Ho West, 49.4% of households had functional toilets and many linked working facilities to better hygiene. In Agotime Ziope, 32.4% had functional toilets and several respondents mentioned that safe waste disposal protects household health. In Adaklu, 30.6%

reported usable toilets, which aligns with the emphasis placed on hygiene during the interviews. In some areas, particularly those with higher access to flushed toilets, respondents noted improvements in water-related diseases and a general reduction in the burden of illness. In Adaklu, 70.8% of households used piped water and 23.6% had functional flushed toilets. These households reported fewer problems linked to unsafe water. In Ho West, 38.5% of flushed toilets were functional. Residents in these areas noted fewer stomach-related illnesses, which matches the higher use of improved water and sanitation systems. The findings are corroborated by studies like Abanyie et al. (2019) and Apanga et al. (2020). These improvements reflect the positive impact of targeted WASH interventions. However, qualitative accounts also revealed that in areas with lower sanitation coverage, such as households still using unimproved latrines, issues of disease persistence remain, underscoring the need for more targeted support in these areas.

5.2.2 Water Sources and Hygiene Practices

According to the study, about 40.7% (Table 4.88) of households still rely on streams and rivers for their water supply, which raises considerable concerns about the safety and reliability of their water sources. This finding is particularly concerning given the known health risks associated with unsafe water. Boisson et al. (2015) and Delaire et al. (2022) have both demonstrated the links between contaminated water sources and increased rates of waterborne diseases, such as diarrhea and cholera. While national data from the PHC and GDHS reveal overall improvements in water access across the country, they also indicate that many rural households still face challenges in accessing clean, safe water.

Qualitative responses from households reinforce this finding, with several respondents highlighting concerns about the quality and reliability of water from streams and rivers, especially during the dry season when these sources are often depleted or contaminated. This variability in access to clean water is compounded by the fact that 27.4% of households rely on pipes, while 17.0% use rainwater harvesting systems. While rainwater and pipe-borne systems can provide cleaner alternatives, respondents noted that these sources are not always reliable, particularly during periods of drought.

The Social Ecological Model (SEM) provides a framework for understanding the challenges of water access at the individual and community levels. At the individual level, respondents' behaviors—such as opting for untreated water when safer sources are unavailable—are driven by the availability of resources. At the community level, systemic challenges, such as the lack of consistent infrastructure and maintenance, create ongoing barriers to achieving universal access to clean water. This highlights the need for integrated water and sanitation interventions, which align with SDG 6's emphasis on safe and sustainable access to both water and sanitation services.

5.2.3 Key Factors Influencing Sanitation and Water Access

Through factor analysis, it became clear that several key components significantly influence access to improved sanitation and hygiene. The principal component analysis (PCA) results show that infrastructure quality loaded strongly on Component 1 with values above 0.70 for toilet condition and water source reliability. Community engagement loaded on Component 2 with high values for participation in sanitation activities and community monitoring. Access to resources loaded on Component 3, shown by strong loadings for distance to water points and cost of water. These results explain why these components shape sanitation and water access across the districts.

Abanyie et al. (2019) similarly found that these factors are critical in driving improvements in WASH outcomes in Ghana. Additionally, Garn et al. (2017) emphasized that sanitation improvements must be supported by behavior change, education, and ongoing maintenance to ensure sustainability.

These findings are further supported by qualitative responses from households, which indicate that where sanitation infrastructure has been improved—such as in areas with new or rehabilitated latrines—there has been a marked improvement in hygiene practices, particularly handwashing. Respondents noted that WASH facilities in schools have contributed to broader community improvements in hygiene, as children bring home lessons learned about sanitation. This supports the SEM framework's focus on the interconnectedness of individual and community behaviors, showing that investments in infrastructure can have cascading effects on public health.

However, the continued reliance on natural water sources like streams and rivers points to gaps in water infrastructure. The PCA results suggest that these gaps are not merely a matter of availability but also of access to resources and community-level management. This is shown in the PCA results. Access to resources had high loadings on Component 3, especially distance to water points (0.74) and cost of water (0.71). Community management also loaded strongly on Component 2 with values above 0.70. In areas where water management systems have not been well-maintained, the burden of securing safe water falls disproportionately on individual households, particularly women and children, who are often responsible for collecting water. Qualitative accounts reveal that households in these areas face daily challenges in accessing clean water, which undermines the health benefits of improved sanitation.

5.2.4 Integrated Discussion of Quantitative and Qualitative Findings

The integration of quantitative and qualitative findings reveals several critical insights into the state of WASH facilities across the districts studied. While the quantitative data show that most households have access to improved sanitation, qualitative responses highlight the ongoing challenges faced by those still relying on basic or unimproved facilities. In Adaklu for instance, 66.7% of households had improved toilets, yet 26.0% sometimes lacked clean water. In Agotime Ziope, 32.4% had functional toilets, but 39.8% sometimes had clean water. In Ho West, 49.4% had usable sanitation, yet 37.3% reported interrupted water access. Qualitative accounts of long queues and shared stream points during the dry season support these gaps in sanitation use and water reliability.

Rather than separating the districts, the analysis reveals overarching trends that are consistent across the study area. In all districts, more than 30% of households reported non-functional toilets—40% in Adaklu, 40.2% in Agotime Ziope, and 36.1% in Ho West. Interrupted water access was also common in every district. These shared gaps show consistent trends across the study area. For example, while households in Adaklu have made significant progress in reducing waterborne diseases due to improved sanitation, similar challenges related to water access persist across all districts. This suggests that while sanitation improvements are critical, they must be supported by parallel investments in water infrastructure to fully realize their health benefits. As Boisson et al. (2015) noted, integrated WASH interventions are necessary to achieve the broadest possible improvements in public health.

Similarly, while some districts have made strides in constructing new latrines and promoting hygiene practices, qualitative responses from marginalized groups in these communities suggest that inclusivity remains a challenge. In areas like Agotime Ziope, where some respondents noted that certain individuals still lack access to latrines, the challenge is not only infrastructural but also social. Marginalized groups face barriers in accessing resources that others take for granted, highlighting the need for policies that prioritize inclusivity in WASH interventions. This mirrors findings by Abebe and Tucho (2020), who noted that similar challenges are faced by marginalized groups in Ethiopia.

The Social Ecological Model (SEM) framework is valuable in understanding how individual, community, and societal factors intersect to influence WASH outcomes. At the societal level, policies aimed at improving water and sanitation must address structural inequalities, ensuring that resources are distributed equitably. At the community level, the availability of infrastructure and resources influences individual behaviors, such as the decision to use improved sanitation facilities. This interconnectedness highlights the need for holistic interventions that address not only physical infrastructure but also community engagement, education, and social inclusion.

5.2.5 Implications for Policy and SDG 6

The findings from this study have important implications for Ghana's progress toward achieving SDG 6. First, the reliance on unimproved water sources by a significant portion of households suggests that more work is needed to ensure universal access to clean and safe water. While progress has been made in sanitation, the benefits of these improvements will be limited unless they are complemented by corresponding improvements in water access. This is consistent with the WHO’s (2020) call for integrated WASH interventions that address both sanitation and water access to improve public health outcomes.

Second, the study highlights the need for inclusive WASH policies that address the needs of marginalized groups. In districts where some community members still lack access to improved sanitation, targeted interventions—such as subsidies for latrine construction or community-led initiatives—are necessary to ensure equitable access. Garn et al. (2017) emphasize that equitable access to sanitation facilities is critical to achieving broad-based health improvements.

Finally, the SEM framework underscores the importance of multi-level interventions that address individual, community, and societal factors. Achieving SDG 6 will require holistic approaches that integrate infrastructure improvements with community engagement and policy interventions. By aligning local WASH initiatives with national and global targets, Ghana can make significant strides toward achieving universal access to clean water and sanitation by 2030.

5.3 Consistent Use of WASH Facilities and Its Impacts on Households with Focus on Women and Girls

This section discusses the results of the extent of the consistent use of WASH (Water, Sanitation, and Hygiene) facilities and their impact on households, with a particular focus on women and girls. The findings presented are based on both qualitative and quantitative data collected across the districts. The results are integrated and discussed in relation to the theoretical framework, which provides insight into how WASH facility use impacts health and well-being at various levels of the Social Ecological Model (SEM), specifically addressing individual, community, and societal influences.

The SEM is used to understand how individual and collective behaviors are influenced by the presence of WASH facilities and how these impact gendered roles, especially in rural communities. Moreover, the findings are discussed in relation to the Sustainable Development Goals (SDGs), particularly Goal 6 (Clean Water and Sanitation) and Goal 3 (Good Health and Well-being), emphasizing the role of WASH facilities in achieving health outcomes and equitable access to water and sanitation.

5.3.1 Discussion of Descriptive Statistics and Data Analysis for All Districts

The analysis of WASH facility availability, accessibility, and use in the districts reveals important patterns. The availability and accessibility scores, which range from 1.05 to 2.73 with moderate to high averages, reflect significant improvements in WASH infrastructure in the surveyed areas. For instance, Adaklu District exhibited a mean availability score of 2.17 (SD = 0.32), indicating a high prevalence of WASH facilities, consistent with studies such as those by Abanyie et al. (2021), who highlighted how increased WASH availability in schools positively impacts broader community health. Meanwhile, the moderate accessibility score of 1.59 (SD = 0.21) in Adaklu reflects a mixed situation, where although facilities are present, consistent and equitable access may still be a challenge for some households. This observation echoes Garn et al. (2017), who emphasize the critical role of accessibility in ensuring the effective and sustained use of sanitation facilities.

In all districts, hygiene practices show a moderate adherence rate, with scores averaging around 1.68 to 1.73, reflecting room for improvement. For instance, in Ho West District, hygiene knowledge and practices have a significant correlation with community participation ($r = .504$, $p < .001$), indicating the role that engagement and education play in enhancing sanitation behaviors. The qualitative and quantitative data show that while significant gains have been made, gaps in consistency of WASH use still exist, particularly for women and girls, whose roles in water collection and sanitation are directly impacted by these facilities.

5.3.2 Impacts on Households, Women, and Girls

The findings highlight the gendered impact of WASH facility use, especially for women and girls. Access to clean water, for instance, reduces the burden on women, who traditionally bear the responsibility of water collection in rural areas. This finding aligns with Guégan et al. (2018), who demonstrated that improved access to WASH facilities alleviates physical and temporal burdens on women, contributing to improved well-being. Consistent use of WASH facilities also improves hygiene practices, which significantly reduces the incidence of waterborne diseases, particularly among children and pregnant women, as supported by Boisson et al. (2015) and Milan (2017).

In Agortime Ziope District, for instance, qualitative interviews revealed that households that regularly used boreholes had lower rates of waterborne diseases, highlighting the direct health benefits of reliable water sources. This aligns with studies by Fernandez (2020), who noted that consistent water access plays a critical role in reducing disease prevalence and improving health outcomes. However, households that struggled with consistent access, especially during peak usage times, demonstrated higher disease incidences, pointing to the critical need for demand management strategies and infrastructure maintenance. This finding mirrors Jobbins et al. (2018), who emphasized the complexity of managing water resources in areas with fluctuating demand and intermittent supply.

5.3.3 Theoretical Framework and Its Role in Understanding the Findings

The Social Ecological Model (SEM) provides a multi-level framework for understanding the findings. The individual level is reflected in how households adopt and use WASH facilities, influenced by hygiene education and socio-cultural norms. For instance, the use of WASH facilities is higher in households where hygiene education has been emphasized, underscoring the importance of individual-level interventions, as supported by Abanyie et al. (2021).

At the community level, factors such as community participation play a significant role in sustaining WASH practices. For example, in all three districts, there is a strong correlation between community engagement in WASH programs and the consistent use of these facilities, aligning with Abebe and Tucho (2020), who found that community involvement is key to maintaining the long-term success of sanitation interventions. This emphasizes that the sustainability of WASH facilities goes beyond mere infrastructure improvements to include continuous community engagement and education, as highlighted by Venkataramanan et al. (2018).

The societal level of the SEM is reflected in broader implications for national and international goals, such as the SDGs. Access to clean water and sanitation directly contributes to SDG 6 and, by extension, improves health outcomes under SDG 3. The findings indicate that while significant strides have been made in providing WASH infrastructure, there are still critical gaps in consistent access and use, particularly for marginalized groups, which poses challenges for achieving these global targets.

5.3.4 Comparative Analysis with Population and Housing Census and GDHS Data

When compared with national-level data from the Population and Housing Census and the Ghana Demographic and Health Survey (GDHS), the findings from this study align with broader trends but also highlight district-specific challenges. The national census indicates that approximately 59% of households have access to improved sanitation, while this study finds higher rates in the studied districts, such as 76.7% in Adaklu District. This discrepancy may be due to focused interventions in these areas, but it also raises questions about equity in WASH access across different regions of Ghana.

Similarly, the GDHS reports that access to improved water sources stands at 78%, closely mirroring findings from the qualitative data in Ho West District, where access is generally high, but with notable seasonal fluctuations in water quality and availability. This seasonal variability underscores the need for year-round, reliable water access to ensure sustained health benefits, as emphasized by Das et al. (2021).

5.3.4 Regression and ANOVA Results Discussion

As part of the findings, regression analysis shows that availability is the most significant predictor of perceived impacts of WASH interventions. Higher availability of WASH facilities is strongly correlated with perceived positive impacts on households. However, other factors, such as accessibility, refuse disposal, and community participation, while important, do not show significant predictive power for perceived impacts, pointing to the need for integrated approaches that address not only infrastructure but also socio-economic and behavioral factors, as noted by Sweileh (2020) and Howden-Chapman et al. (2017).

Moreover, ANOVA results indicate no significant gender differences in WASH-related outcomes, suggesting that both men and women in the studied districts experience similar access and use of WASH facilities. This finding aligns with Venkataramanan et al. (2018), who stressed the importance of gender-neutral WASH interventions to ensure equitable benefits for all members of the community.

5.3.5 Implications for Water and Sanitation Policies and SDGs

The findings have significant implications for WASH policies and SDGs in Ghana. First, while the availability of WASH facilities has improved, ensuring equitable access and sustained use remains a challenge, particularly for women and girls. Policies must focus on enhancing accessibility and addressing socio-economic barriers to consistent WASH use. For instance, providing targeted financial support or subsidies for low-income households could improve their ability to maintain WASH facilities, as suggested by Jobbins et al. (2018).

Second, community participation is crucial for the long-term sustainability of WASH interventions. The findings emphasize the need for continued community engagement through education and capacity-building initiatives, which will foster a sense of ownership and responsibility among residents. As Abebe and Tucho (2020) suggest, sustained community involvement is key to the successful implementation and maintenance of sanitation facilities.

Lastly, addressing issues of water quality, especially during dry seasons, should be a priority. The findings from Ho West District, where water quality fluctuates seasonally, highlight the need for resilient infrastructure that can maintain consistent water quality year-round. This is essential for achieving SDG 6, as water quality directly impacts health outcomes under SDG 3.

5.4 Specific Objective 4: To Investigate Open Defecation Free (ODF) Relapse

The investigation of ODF relapse in the districts of Agotime-Ziope, Adaklu, and Ho West reveals important insights into the factors contributing to the regression of these communities from ODF status. This discussion of the analysis integrates both qualitative and quantitative data to provide a holistic understanding of the issue, grounded in the Social Ecological Model (SEM). By exploring how ODF status is maintained or lost, we can better understand the broader implications for water, sanitation, and hygiene (WASH) practices, particularly in the context of Sustainable Development Goals (SDGs) 3 (Good Health and Well-being) and 6 (Clean Water and Sanitation) in Ghana.

5.4.1 Descriptive Statistics and Qualitative Insights: ODF Relapse Across Districts

5.4.1.1 Relapse Rates and Latrine Coverage

The quantitative data shows significant ODF relapse rates in Agotime-Ziope and Adaklu, where latrine coverage remains low—40.2% and 34.1% respectively. Ho West, in contrast, maintains a higher ODF status, with a latrine coverage of 12.6%. The higher rates of relapse in Agotime-Ziope and Adaklu can be linked to these low latrine coverage levels, a critical factor in ensuring sustained sanitary practices. This is supported by Garn et al. (2017), who highlight the importance of securing high latrine coverage to maintain ODF status.

From a qualitative perspective, households in Adaklu cited economic constraints as a major barrier to constructing and maintaining latrines. Some households reported relying on neighbors' facilities or communal latrines, which led to increased wear and tear and eventual collapse. This situation is exacerbated by the absence of financial support or subsidies to rebuild damaged latrines. Harter et al. (2019) emphasize that ongoing economic assistance is essential to prevent ODF relapse, particularly in resource-poor communities.

Similarly, Agotime-Ziope district faces challenges due to socio-economic disparities. While community-driven efforts have reduced open defecation, marginalized groups still lack access to latrines. The qualitative data highlights how these groups are disproportionately affected, unable to afford latrine construction or repairs. The combined effects of economic barriers and insufficient infrastructure support the findings of Woyessa et al. (2022), who note that poverty is a significant determinant of latrine utilization in Community-Led Total Sanitation and Hygiene (CLTSH) programs.

5.4.2 Chi-Square Test Results and Localized Challenges

The chi-square test results, with p-values close to the significance threshold, suggest that localized factors significantly influence relapse rates across the districts. These quantitative findings are corroborated by qualitative insights, which point to the lack of post-ODF support and follow-up as major contributing factors. In Agotime-Ziope and Adaklu, participants reported a lack of hygiene promotion after the initial ODF-triggering interventions, making it difficult for communities to sustain the sanitary behaviors encouraged by Community Led Total Sanitation (CLTS) programs. Kouassi et al. (2023) support this, emphasizing that post-triggering support is essential for preventing slippage from Open Defecation Free (ODF) status.

In contrast, Ho West district has benefitted from stronger community engagement and the integration of WASH initiatives into school programs, as reflected in both the qualitative interviews and the district's lower relapse rate. Participants in Ho West emphasized the role of schools in reinforcing sanitary behaviors among children, which in turn influenced the broader community. Lawrence et al. (2016) similarly found that school-led WASH initiatives play a crucial role in sustaining sanitation improvements in rural communities.

5.4.3 Integration of Quantitative and Qualitative Findings: Latrine Coverage, Economic Constraints, and Hygiene Promotion

5.4.3.1 The Role of Latrine Coverage

The quantitative data underscores the critical role of household latrine coverage in maintaining ODF status. The significant correlation between low latrine coverage and high relapse rates in Agotime-Ziope and Adaklu highlights the importance of ensuring that households have access to adequate sanitation facilities. In Ho West, where latrine coverage is higher, the relapse rate is notably lower. Garn et al. (2017) argue that high latrine coverage is foundational for successful sanitation strategies, a point that is strongly reflected in the quantitative results.

The qualitative data further elaborates on the barriers to achieving high latrine coverage. In interviews, participants from Agotime-Ziope and Adaklu emphasized the financial challenges of constructing and maintaining latrines. Many households lack the resources to invest in latrines, and without external financial support, they are forced to revert to open defecation. Harter et al. (2019) emphasize that without continuous guidance and support, initial gains in ODF status can easily be lost, especially in low-income communities where the cost of latrine construction is prohibitive.

5.4.3.2 Economic Constraints and Post-ODF Support

The significant economic constraints reported by households in both Agotime-Ziope and Adaklu are consistent with the quantitative findings, where low-income levels are associated with higher relapse rates. The reliance on communal or shared latrines in these districts contributes to the degradation of facilities, leading to increased open defecation when these facilities fail. As Woyessa et al. (2022) note, economic barriers are a major factor affecting latrine utilization and maintenance in Community Led Total Sanitation and Hygiene (CLTSH) programs.

Qualitative data from Ho West, however, paints a different picture. Here, community-based sanitation programs, often supported by local NGOs and government agencies, provide ongoing assistance to households in maintaining their latrines. This support helps prevent infrastructure collapse and ensures that households can continue using their latrines. This aligns with the findings of Kouassi et al. (2023), who argue that post-ODF interventions, including economic assistance and hygiene promotion, are critical for sustaining ODF status.

5.4.3.3 The Impact of Hygiene Promotion and Community Engagement

The qualitative data highlights a clear gap in post-ODF hygiene promotion in Agotime-Ziope and Adaklu. Participants reported that after the initial CLTS interventions, there was little follow-up or reinforcement of hygiene behaviors, leading to a gradual decline in sanitation practices. This lack of continuous hygiene education, as noted by Kouassi et al. (2023), is a common factor contributing to ODF relapse, particularly in rural areas where access to hygiene education is limited.

In contrast, Ho West has maintained its ODF status through active community engagement and regular hygiene promotion activities. Interviewees noted that school programs played a central role in reinforcing sanitary practices, with children acting as change agents within their households. This community-driven approach is reflected in the quantitative data, where Ho West has the lowest relapse rate among the three districts. Lawrence et al. (2016) similarly emphasize the role of community and school engagement in sustaining ODF status, highlighting the need for ongoing education and support to maintain sanitation improvements.

5.4.4 Regression and Correlation Analysis: Understanding the Predictors of ODF Relapse

5.4.4.1 Quantitative Results and Significant Predictors

The regression analysis highlights household latrine coverage as the most significant predictor of ODF relapse. Districts with higher latrine coverage, such as Ho West, are less likely to experience relapse compared to those with lower coverage, such as Agotime-Ziope and Adaklu. This is consistent with findings from Garn et al. (2017), who note that high latrine coverage is crucial for preventing relapse in CLTS programs. Interestingly, hygiene knowledge and practices did not emerge as a significant predictor in the regression model, despite its importance in sustaining ODF status. This may be due to the limited follow-up hygiene education in Agotime-Ziope and Adaklu, where participants reported a decline in sanitary behaviors after the initial interventions. As Kouassi et al. (2023) emphasize, continuous hygiene promotion is critical for maintaining ODF status, particularly in communities where initial knowledge gains may erode over time.

The correlation analysis supports these findings, showing significant relationships between latrine coverage and relapse rates, but weaker correlations between hygiene practices and ODF status. This suggests that while hygiene education is important, it must be reinforced through continuous engagement to have a lasting impact.

5.4.4.2 Implications for WASH and the SDGs in Ghana

The study revealed that ODF relapse have several important implications for WASH policies in Ghana, particularly in the context of the Sustainable Development Goals (SDGs). The following are some of the ODF relapse implications:

1. Post-ODF Support and Sustainability: The high relapse rates in Agotime-Ziope and Adaklu districts indicate that current sanitation interventions are insufficient

without continuous support. Post-ODF interventions, including economic assistance and hygiene promotion, are critical for sustaining the gains made through CLTS programs. Kouassi et al. (2023) emphasize the need for ongoing community engagement and support to prevent relapse, a conclusion that is strongly supported by the findings in this study.

2. Economic Assistance for Latrine Construction: The economic barriers faced by households in Agotime-Ziope and Adaklu highlight the need for financial support mechanisms, such as subsidies or microloans, to assist in latrine construction and maintenance. Without this assistance, households are unlikely to sustain their sanitary practices, leading to a reversion to open defecation. Harter et al. (2019) argue that economic support is essential for maintaining ODF status in resource-poor communities, a point that is clearly reflected in the data.
3. Integration of Hygiene Promotion and Community Engagement: The success of Ho West in maintaining ODF status underscores the importance of integrating hygiene promotion into community and school programs. Lawrence et al. (2016) emphasize the role of schools in reinforcing sanitary behaviors, and this study confirms that communities with active engagement in hygiene promotion are more likely to sustain their ODF status.
4. Achieving the SDGs: The findings from this study have important implications for Ghana's progress toward SDG 6, which aims to ensure availability and sustainable management of water and sanitation for all. By addressing the economic and educational challenges identified in this study, Ghana can make significant strides toward achieving universal sanitation access and maintaining ODF status.

CHAPTER SIX

6.1. SUMMARY, CONCLUSIONS AND RECOMMENDATION

6.1.1. Introduction

This study aimed to evaluate the availability, accessibility, functionality of WASH (Water, Sanitation, and Hygiene) facilities in the districts of Adaklu, Agortime Ziope, and Ho West, focusing on households, schools, and healthcare facilities. The evaluation was guided by four specific objectives: ascertaining the availability and accessibility of WASH facilities, identifying improved sanitation and hygiene facilities, exploring the use of WASH facilities, and investigating Open Defecation Free (ODF) relapse.

The following are summary and conclusions drawn from the study findings:

6.2. Availability and Accessibility of WASH Facilities

- The study concludes that the availability and accessibility of WASH facilities varied across the three districts. In Adaklu, most households reported high availability of WASH facilities, while accessibility was moderate.
- The proximity of water sources in Adaklu significantly reduced the time women and children spent on water collection, thereby improving school attendance for children and health outcomes for women.
- Similarly, Agortime Ziope had high availability of WASH facilities, but issues such as inadequate water pressure and depletion during peak usage times were noted.
- Ho West district exhibited relatively good availability and accessibility of WASH facilities but faced water quality challenges during dry seasons.
- While significant progress has been made in providing WASH facilities, there are still areas that require attention to ensure consistent and reliable access.

6.3. The State of Sanitation and Hygiene Facilities in Households, Schools, and Healthcare Facilities

- The descriptive statistics and cross-tabulation analyses revealed that improved sanitation and hygiene facilities were present in many households, schools, and healthcare facilities, but their functionality varied.
- In Adaklu, a significant proportion of households (78%) had functional household toilets, indicating a high level of improved sanitation.
- In Agortime Ziope, despite the high availability of WASH facilities, functionality issues persisted, with only 32.4% of households reporting functional household toilets.
- Ho West had relatively higher functionality in household toilets, with 49.4% of households reporting functional toilets.

These results highlight the importance of not just providing WASH facilities but ensuring their proper maintenance and functionality. Schools and healthcare facilities need targeted interventions to ensure that WASH facilities remain usable and effective over time.

6.4. Use of WASH Facilities in Households, Schools, and Healthcare Facilities

- The consistent use of WASH facilities had significant positive impacts on health and well-being.
- In Adaklu, the proximity of water sources benefited women and children by reducing the time spent on water collection and improving school attendance. Health improvements, particularly among women, were noted due to better water access and sanitation.

- In Agortime Ziope, the consistent use of boreholes reduced the incidence of diseases, though some households still struggled with water access during peak usage times.
- Ho West experienced reduced water-related diseases and financial savings on healthcare, although water quality issues persisted during dry seasons.

These findings emphasize the need for continuous use and proper maintenance of WASH facilities to achieve lasting health benefits. The health improvements observed, especially among women and children, underscore the social benefits of these interventions.

6.5. Open Defecation Free (ODF) Relapse

- The investigation into ODF relapse revealed that maintaining ODF status is a challenge in some communities.
- In Adaklu, 76% of communities relapsed to open defecation after achieving ODF status.
- In Agortime Ziope, relapse rate was 78%. Factors contributing to this relapse included inadequate post-ODF support, insufficient hygiene promotion, and limited resources for latrine construction and maintenance.
- In Ho West, 22% of ODF communities have relapsed which means ODF sustainability strategies put in place have proven more effective as compared to Adaklu and Agortime Ziope districts.

These findings suggest that achieving ODF status is not sufficient; ongoing support and resources are needed to maintain it. The significant relapse rates highlight the necessity for continuous community engagement and hygiene education to prevent regression to open defecation.

6.6. Key Findings

- **Availability and Accessibility:** High availability of WASH facilities was reported, but issues with accessibility, particularly during peak usage times and dry seasons, need to be addressed.
- **Functionality:** While many households have access to WASH facilities, the functionality of these facilities varies significantly, with notable maintenance issues.
- **Health and Social Impacts:** Consistent use of WASH facilities has led to significant health improvements and social benefits, especially for women and children.
- **ODF Relapse:** High relapse rates in achieving ODF status indicate the need for continuous support and resources to maintain ODF communities.

These insights provide a comprehensive understanding of the current state of WASH facilities in the studied districts and underscore the need for ongoing efforts to address the identified challenges and sustain the positive impacts of WASH interventions.

6.7. Recommendations

Based on the conclusions drawn from the study, the following are proposed to enhance the effectiveness and sustainability of WASH (Water, Sanitation, and Hygiene) interventions in the districts of Adaklu, Agortime Ziope, and Ho West. These recommendations aim to address the identified challenges and leverage the positive impacts observed, particularly focusing on the health and well-being of women and children.

6.9. Improve Availability and Accessibility of WASH Facilities

6.9.1. Address Water Pressure and Quality Issues:

To ensure consistent access to clean water, it is essential for Community Water and Sanitation Agency (CWSA) and the District Assemblies including other stakeholders to address issues related to water pressure and quality, especially during peak usage times and dry seasons. This can be achieved by:

- Upgrading and maintaining existing infrastructure to handle peak demands.
- Implementing water quality monitoring systems to ensure safe water supply throughout the year.
- Developing alternative water sources, such as rainwater harvesting systems, to supplement the primary water supply during dry periods.
- Addressing the challenges in water pressure and quality during peak and dry periods is crucial for sustaining the benefits of these interventions.

6.9.2. Expand Access in Underserved Areas:

Efforts should be made by Community Water and Sanitation (CWSA) in collaboration Ministry of Sanitation and Water Resources (MSWR) to extend WASH facilities to underserved and remote areas. This includes:

- Constructing additional boreholes and water points closer to households to reduce the time and effort required for water collection.
- Ensuring equitable distribution of WASH facilities, prioritizing communities that currently have limited access.

6.9.3. Enhance Functionality and Maintenance of Sanitation Facilities

6.9.3.1. Strengthen Maintenance Programs:

To improve the functionality of sanitation facilities, robust maintenance programs should be established by Metropolitan, Municipal and District Assemblies (MMDAs) in collaboration with Environmental Health and Sanitation Department and Works Department.

- Regular inspection and repair of toilets and latrines to ensure they remain usable.
- Providing training and resources for local communities to carry out basic maintenance tasks.
- Establishing community-based maintenance funds to cover the costs of repairs and replacements.

6.9.3.2. Promote Hygiene Education and Awareness:

Educating communities about the importance of maintaining functional sanitation facilities is crucial. This can be achieved by Environmental Health and Sanitation Department and Community Development in collaboration with Ministry of Sanitation of Water Resources, Ghana Health Service, Ghana Education Service and Community, Ministry of Information:

- Conducting regular hygiene promotion campaigns that emphasize the benefits of proper sanitation practices.
- Integrating hygiene education into school curricula to instill good practices from a young age.

- Engaging community leaders and influencers to advocate for improved sanitation and hygiene.

6.10. Ensure Consistent Use of WASH Facilities

6.10.1. Implement Behavioral Change Programs:

To encourage the consistent use of WASH facilities, behavioral change programs should be developed by Environmental Health and Sanitation Department and Community Development of MMDAs, Community Water and Sanitation Agency (CWSA) and other stakeholders like International Non-Governmental Organizations (INGOs). These programs should focus on:

- Addressing cultural and social barriers to the use of sanitation facilities.
- Promoting the health and social benefits of using WASH facilities consistently.
- Utilizing community-driven approaches, such as Community-Led Total Sanitation (CLTS), to foster local ownership and commitment.

6.10.2. Provide Continuous Support and Resources:

Maintaining the use of WASH facilities requires ongoing support and resources by MMDAs and CWSA in collaboration with Ministry of Sanitation and Water Resources (MSWR). This includes:

- Providing technical assistance and training for community members to ensure the proper use and maintenance of WASH facilities.
- Ensuring a reliable supply of essential hygiene products, such as soap and water treatment solutions.
- Establishing monitoring and evaluation systems to track the usage and impact of WASH facilities and identify areas for improvement.

6.11. Address Open Defecation Free (ODF) Relapse

6.11.1. Enhance Post-ODF Support:

To prevent relapse into open defecation, enhanced post-ODF support strategy should be designed by Ministry of Sanitation and Water Resources (MSWR), Non-Governmental Organizations (NGOs) and MMDAs. This can be achieved by:

- Continuing hygiene education and promotion activities beyond the initial ODF declaration.
- Providing incentives for communities to maintain ODF status, such as recognition programs or small grants for community projects.
- Establishing regular follow-up visits by health and sanitation officers to reinforce ODF practices and address emerging challenges.

6.11.2. Foster Community Engagement and Ownership:

MMDAs, Community Water and Sanitation Agency (CWSA), Ghana Health Service and NGOs encouraging community engagement and ownership is critical for sustaining ODF status. This involves:

- Involving community members in the planning, implementation, and monitoring of sanitation projects.
- Empowering local leaders and committees to take responsibility for maintaining ODF status and addressing sanitation issues.
- Creating platforms for community members to share their experiences and best practices in maintaining ODF status.

6.12. Strengthen WASH Interventions in Schools and Healthcare Facilities

6.12.1 Upgrade WASH Facilities in Schools:

Ensuring that schools and healthcare facilities have adequate WASH facilities, Ghana Education Service (GES) and the MMDAs must promote WASH Education among students. This includes:

- Constructing and maintaining separate sanitation facilities for boys and girls.
- Providing regular hygiene education sessions to instill good practices among students.
- Ensuring a consistent supply of water and hygiene products in schools.

6.12.2. Improve WASH Infrastructure in Healthcare Facilities:

Ghana Health Service (GHS) and the MMDAs must ensure healthcare facilities have reliable WASH facilities to provide safe and hygienic care. This can be achieved by:

- Upgrading water supply and sanitation infrastructure in healthcare facilities.
- Training healthcare staff on the importance of WASH practices and infection control.
- Ensuring the availability of hygiene products and cleaning supplies in healthcare settings.
- Provide special training on healthcare waste management.

6.13. Foster Collaboration and Partnership

6.13.1. Engage Multiple Stakeholders:

Effective WASH interventions require collaboration among various stakeholders, including government agencies, non-governmental organizations (NGOs), and local communities. This can be facilitated by:

- Establishing multi-stakeholder platforms to coordinate WASH activities and share best practices.
- Encouraging public-private partnerships to leverage resources and expertise for WASH improvements.
- Involving community-based organizations and local leaders in planning and decision-making processes.

6.13.2. Promote Policy Advocacy:

Ministry of Sanitation and Water Resources (MSWR), Ministry of Education (MoE), Ministry of Health (MoH), Community Water and Sanitation Agency (CWSA) and the MMDAs must Advocate supportive policies and funding for WASH interventions. This involves:

- Engaging policymakers to prioritize WASH issues and allocate sufficient resources.
- Advocating for the integration of WASH into broader development agendas, such as health, education, and gender equality.
- Supporting research and data collection to inform evidence-based policy decisions.

By implementing these recommendations, the districts of Adaklu, Agortime Ziope, and Ho West can enhance the availability, accessibility, and functionality of WASH facilities, promote consistent use, prevent ODF relapse, and ultimately improve the health and well-being of their communities.

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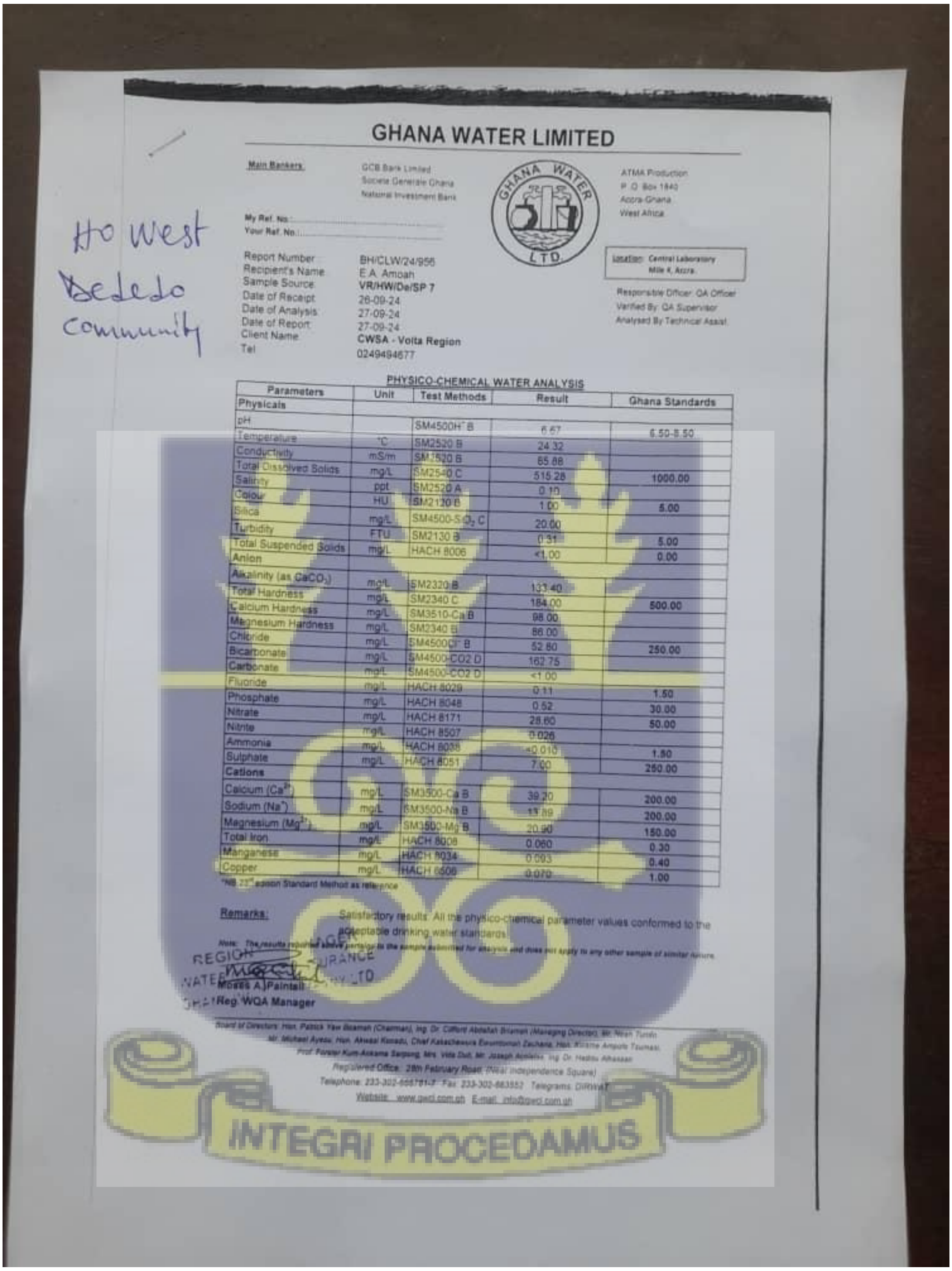
APPENDICES

APPENDIX 1

Water quality tests-Ho West District



Ho West
Dededo
community

GHANA WATER LIMITED

Main Bankers: GCB Bank Limited, Societe Generale Ghana, National Investment Bank

ATMA Production
P. O. Box 1840
Accra-Ghana
West Africa

My Ref. No.:
Your Ref. No.:

Location: Central Laboratory Mile 4, Accra.

Responsible Officer: QA Officer
Verified By: QA Supervisor
Analysed By Technical Assist.

Report Number	BH/CLW/24/956
Recipient's Name	E.A. Amoah
Sample Source	VR/HW/De/SP 7
Date of Receipt	26-09-24
Date of Analysis	27-09-24
Date of Report	27-09-24
Client Name	CWSA - Volta Region
Tel	0249494677

PHYSICO-CHEMICAL WATER ANALYSIS

Parameters	Unit	Test Methods	Result	Ghana Standards
Physicals				
pH		SM4500H⁺ B	6.67	6.50-8.50
Temperature	°C	SM2520 B	24.32	
Conductivity	mS/m	SM2520 B	65.88	
Total Dissolved Solids	mg/L	SM2540 C	515.28	1000.00
Salinity	ppt	SM2520 A	0.10	
Colour	HU	SM2120 B	1.00	5.00
Silica	mg/L	SM4500-SiO_2 C	20.00	
Turbidity	FTU	SM2130 B	0.31	5.00
Total Suspended Solids	mg/L	HACH 8006	<1.00	0.00
Anion				
Alkalinity (as $CaCO_3$)	mg/L	SM2320 B	133.40	
Total Hardness	mg/L	SM2340 C	184.00	500.00
Calcium Hardness	mg/L	SM3510-Ca B	98.00	
Magnesium Hardness	mg/L	SM2340 B	86.00	
Chloride	mg/L	SM4500Cl⁻ B	52.80	250.00
Bicarbonate	mg/L	SM4500-CO2 D	162.75	
Carbonate	mg/L	SM4500-CO2 D	<1.00	
Fluoride	mg/L	HACH 8029	0.11	1.50
Phosphate	mg/L	HACH 8048	0.52	30.00
Nitrate	mg/L	HACH 8171	28.60	50.00
Nitrite	mg/L	HACH 8507	0.026	
Ammonia	mg/L	HACH 8038	<0.010	1.50
Sulphate	mg/L	HACH 8051	7.00	250.00
Cations				
Calcium (Ca^{2+})	mg/L	SM3500-Ca B	39.20	200.00
Sodium (Na^+)	mg/L	SM3500-Na B	13.89	200.00
Magnesium (Mg^{2+})	mg/L	SM3500-Mg B	20.90	150.00
Total Iron	mg/L	HACH 8008	0.060	0.30
Manganese	mg/L	HACH 8034	0.093	0.40
Copper	mg/L	HACH 8506	0.070	1.00

*NB 23rd edition Standard Method as reference

Remarks: Satisfactory results. All the physico-chemical parameter values conformed to the acceptable drinking water standards.

Note: The results reported above pertain to the sample submitted for analysis and does not apply to any other sample of similar nature.

REGIONAL ... ASSURANCE ... WATER ... LTD

Moses A. Paintsil
Reg. WQA Manager

Ho West
Dedelo
Community

GHANA WATER LIMITED

Main Bankers: GCB Bank Limited
Societe Generale Ghana
National Investment Bank

GHANA WATER LTD

ATMA Production
P. O. Box 1840
Accra-Ghana
West Africa

My Ref. No.:
Your Ref. No.:

Location: Central Laboratory
Mile 4, Accra.

Report Number: BH/CLW/24/956
Recipient's Name: E.A. Amoah
Sample Source: **VR/HW/De/SP 7**
Date of Receipt: 26-09-24
Date of Analysis: 27-09-24
Date of Report: 27-09-24
Client Name: **CWSA - Volta Region**
Tel: 0249494677

Responsible Officer: QA Officer
Verified By: QA Supervisor
Analysed By: Technical Assist

BACTERIOLOGICAL WATER ANALYSIS

Parameters	Unit	Test Methods	Result	Ghana Standards
Heterotrophic Bacteria Count	CFU/1mL	GS ISO 6222	0	500
Total Coliforms	CFU/ 100mL	GS ISO 9308-2	0	0
E.coli	CFU/ 100mL	GS ISO 9308-2	0	0

*NB 23rd edition Standard Method as reference

Remarks: The microbiological analysis results are also satisfactory

***Note:** The results reported above pertains to the sample submitted for analysis and does not apply to any other sample of similar nature.*

REGIONAL MANAGER
WATER QUALITY ASSURANCE
GHANA WATER COMPANY LTD

Moses A. Paintsil
Reg. WQA Manager

Ho West
Abutia
Agove
Community

GHANA WATER LIMITED

Main Bankers: GCB Bank Limited
Societe Generale Ghana
National Investment Bank

ATMA Production
P. O. Box 1840
Accra-Ghana
West Africa

My Ref. No.:
Your Ref. No.:

Location: Central Laboratory
Mile 4, Accra.

Report Number: BH/CLW/24/958
Recipient's Name: E.A. Amoah
Sample Source: **VR/HW/Ag/SP 6**
Date of Receipt: 26-09-24
Date of Analysis: 27-09-24
Date of Report: 27-09-24
Client Name: **CWSA - Volta Region**
Tel: 0249494677

Responsible Officer: QA Officer
Verified By: QA Supervisor
Analysed By: Technical Assist.

PHYSICO-CHEMICAL WATER ANALYSIS

Parameters	Unit	Test Methods	Result	Ghana Standards
Physicals				
pH		SM4500H⁺ B	6.82	6.50-8.50
Temperature	°C	SM2520 B	24.71	
Conductivity	mS/m	SM2520 B	76.42	
Total Dissolved Solids	mg/L	SM2540 C	458.52	1000.00
Salinity	ppt	SM2520 A	0.03	
Colour	HU	SM2120 B	1.50	5.00
Silica	mg/L	SM4500-SiO_2 C	20.00	
Turbidity	FTU	SM2130 B	0.68	5.00
Total Suspended Solids	mg/L	HACH 8006	<1.00	0.00
Anion				
Alkalinity (as $CaCO_3$)	mg/L	SM2320 B	189.00	
Total Hardness	mg/L	SM2340 C	163.20	500.00
Calcium Hardness	mg/L	SM3510-Ca B	98.40	
Magnesium Hardness	mg/L	SM2340 B	64.80	
Chloride	mg/L	SM4500Cl^- B	16.40	250.00
Bicarbonate	mg/L	SM4500-CO2 D	230.58	
Carbonate	mg/L	SM4500-CO2 D	<1.00	
Fluoride	mg/L	HACH 8029	0.07	1.50
Phosphate	mg/L	HACH 8048	0.21	
Nitrate	mg/L	HACH 8171	1.32	50.00
Nitrite	mg/L	HACH 8507	0.020	3.00
Ammonia	mg/L	HACH 8038	0.037	1.50
Sulphate	mg/L	HACH 8051	5.00	250.00
Cations				
Calcium (Ca^{2+})	mg/L	SM3500-Ca B	39.36	200.00
Sodium (Na^+)	mg/L	SM3500-Na B	4.32	200.00
Magnesium (Mg^{2+})	mg/L	SM3500-Mg B	15.75	150.00
Total Iron	mg/L	HACH 8008	0.060	0.30
Manganese	mg/L	HACH 8034	0.025	0.40
Copper	mg/L	HACH 8506	0.010	1.00

*NB 23rd edition Standard Method as reference

Remarks: Satisfactory results. All the physico-chemical parameter values conformed to the acceptable drinking water standards

Note: The results reported above pertains to the sample submitted for analysis and does not apply to any other sample of similar nature.

Moses A. Paintsil
Reg. WQA Manager

Ho West
Abutia
Agove:
community

GHANA WATER LIMITED

Main Bankers: GCB Bank Limited
Societe Generale Ghana
National Investment Bank

ATMA Production
P. O. Box 1840
Accra-Ghana
West Africa

Location: Central Laboratory
Mile 4, Accra.

My Ref. No.: ....
Your Ref. No.: ....

Report Number:	BH/CLW/24/958
Recipient's Name:	E.A. Amoah
Sample Source:	**VR/HW/Ag/SP 6**
Date of Receipt:	26-09-24
Date of Analysis:	27-09-24
Date of Report:	27-09-24
Client Name:	**CWSA - Volta Region**
Tel:	0249494677

Responsible Officer: QA Officer
Verified By: QA Supervisor
Analysed By: Technical Assist.

BACTERIOLOGICAL WATER ANALYSIS

Parameters	Unit	Test Methods	Result	Ghana Standards
Heterotrophic Bacteria Count	CFU/1mL	GS ISO 6222	0	500
Total Coliforms	CFU/ 100mL	GS ISO 9308-2	0	0
E.coli	CFU/ 100mL	GS ISO 9308-2	0	0

*NB 23rd edition Standard Method as reference

Remarks: The microbiological analysis results are also satisfactory.

***Note:** The results reported above pertains to the sample submitted for analysis and does not apply to any other sample of similar nature.*

REGION... WATER... GHANA... MANAGER ...SURANCE ...LTD

Moses A. Paintsil
Reg. WQA Manager

APPENDIX 2

Water quality test-Agortime-Ziope District

Agotime-Ziope
Afegame

GHANA WATER LIMITED

Main Bankers: OCB Bank Limited
Societe Generale Ghana
National Investment Bank

Volta Region
P. O. Box 41
Ho-Ghana
West Africa

My Ref. No.: ....
Your Ref. No.: ....

Location: WGA
Regional Laboratory
Ho-Bankoe

Report Number	BhW/251031/002
Recipient's Name	PETER OWUSU
Sample Source/Location	**BOREHOLE (AGOTIME ZIOPE)**
Date of Receipt	31/Oct/25
Date Analysis Commenced	5/Nov/25
Date of Report	12/Nov/25
Client's Name:	**VR/AK/Af/Clearwell**
Client's Tel.	0249494677

Responsible Officer: QA Officer
Verified By: QA Supervisor
Analysed By: Technical Assist.

PHYSICO-CHEMICAL WATER ANALYSIS RESULTS

Parameters	Unit	Test Methods	Result	Ghana Standards
Physicals				
pH		SM4500H⁺ B	7.76	**6.50-8.50**
Conductivity	mS/m	SM2520 B	19.54	**100.00**
Salinity	ppt	SM2520 A	0.10	
Colour	HU	SM2120 B	**10.00**	**5.00**
Temperature	°C	SM2520 B	24.70	
Silica	mg/L	SM4500-SiO_2 C	0.00	
Turbidity	NTU	SM2130 B	5.39	**5.00**
Anion				
Alkalinity (as $CaCO_3$)	mg/L	SM2320 B	110.00	
Total Dissolved Solids	mg/L	SM2540 C	97.70	**1000.00**
Total Hardness	mg/L	SM2340 C	110.00	500.00
Calcium Hardness	mg/L	SM3510-Ca B	50.00	
Magnesium Hardness	mg/L	SM2340 B	60.00	
Chloride	mg/L	SM4500Cl⁻ B	39.00	**250.00**
Bicarbonate	mg/L	SM4500-CO2 D	134.20	
Carbonate	mg/L	SM4500-CO2 D	0.00	
Fluoride	mg/L	HACH 8029	0.17	**1.50**
Phosphate	mg/L	HACH 8048	2.06	**30.00**
Nitrate	mg/L	HACH 8171	8.36	**50.00**
Nitrite	mg/L	HACH 8507	0.05	**3.00**
Ammonia	mg/L	HACH 8038	0.22	**1.50**
Sulphate	mg/L	HACH 8051	2.00	**250.00**
Cations				
Calcium (Ca^{2+})	mg/L	SM3500-Ca B	20.00	**200.00**
Sodium (Na^{+})	mg/L	SM3500-Na B	25.31	**200.00**
Magnesium (Mg^{2+})	mg/L	SM3500-Mg B	14.58	**150.00**
Total Iron	mg/L	HACH 8008	0.30	**0.30**
Manganese	mg/L	HACH 8034	0.09	**0.40**

*NB 23rd edition Standard Method as reference

Remarks: **Colour** level is higher than the maximum acceptable value in drinking water. **However**, the other parameters analyzed on the sample are satisfactory.

Note: The results reported above apply only to the sample submitted for testing and does not apply to any other sample of similar nature.

REG. WATER QUALITY ASSURANCE
MANAGER (GWL)
HO, VR

NATHANIEL THOMPSON
(Reg. WQA Manager)

gotime Ziope
Afegame

GHANA WATER LIMITED

Main Bankers: GCB Bank Limited
Societe Generale Ghana
National Investment Bank

Volta Region
P. O. Box 41
Ho-Ghana
West Africa

My Ref. No.:..............................
Your Ref. No.:..............................

Location: WQA
Regional Laboratory

Report Number: BhW/251031/002
Recipient's Name: PETER OWUSU
Sample Source/Location: **BOREHOLE (AGOTIME ZIOPE)**
Date of Receipt: 31/Oct/25
Date Analysis Commenced: 5/Nov/25
Date of Report: 12/Nov/25
Client's Name: **VR/AK/Af/Clearwell**
Clients Tel: 0249494677

Responsible Officer: QA Officer
Verified By: QA Supervisor
Analysed By: Technical Assist

BACTERIOLOGICAL WATER ANALYSIS RESULTS

Parameters	Unit	Test Methods	Result	Ghana Standards
Total Coliforms	CFU/1ml	Pour Plate	3	0
E.Coli	CFU/1ml	Pour Plate	0	0

Remarks: The results of the bacteriological parameters determined on the water sample failed to meet acceptable drinking water standards.
We recommend that the borehole should be disinfected.

Note: The results reported above apply only to the sample submitted for testing and does not apply to any other sample of similar nature.

REG. WATER QUALITY ASSURANCE
MANAGER (GWL)
HO, VR.

NATHANIEL THOMPSON
[Reg. WQA Manager]

APPENDIX 3

Water Quality test-Adaklu District

Adaklu Abuadi

GHANA WATER COMPANY LIMITED

Main Bankers: GCB Bank Limited
Societe Generale Ghana
National Investment Bank

Volta Region
P. O. Box 41
Ho-Ghana
West Africa

My Ref. No.: ....
Your Ref. No. ....

Location: WQA
Regional Laboratory
Ho-Bankoe

Report Number: BhW/230526/001
Recipient's Name: ELIZABETH MENSAH
Sample Source/Location: **BOREHOLE (ADAKLU)**
Date of Receipt: 26/May/23
Date Analysis Commenced: 28/May/23
Date of Report: 2/Jun/23
Client's Name: **CWSA - ABUADI 1**
Client's Tel: 0249494677

Responsible Officer: QA Officer
Verified By: QA Supervisor
Analysed By: Technical Assist.

PHYSICO-CHEMICAL WATER ANALYSIS RESULTS

Parameters	Unit	Test Methods	Result	GS-175-1
Physicals				
pH		SM4500H⁺ B	6.50	6.50-8.50
Conductivity	mS/m	SM2520 B	54.80	100.00
Salinity	ppt	SM2520 A	0.27	
Colour	HU	SM2120 B	0.00	5.00
Temperature	°C	SM2520 B	25.10	
Turbidity	NTU	SM2130 B	0.00	5.00
Anion				
Alkalinity (as $CaCO_3$)	mg/L	SM2320 B	200.00	
Total Dissolved Solids	mg/L	SM2540 C	274.00	1000.00
Total Hardness	mg/L	SM2340 C	240.00	500.00
Calcium Hardness	mg/L	SM3510-Ca B	70.00	
Magnesium Hardness	mg/L	SM2340 B	170.00	
Chloride	mg/L	SM4500Cl⁻ B	44.00	250.00
Bicarbonate	mg/L	SM4500-CO2 D	244.00	
Carbonate	mg/L	SM4500-CO2 D	0.00	
Fluoride	mg/L	HACH 8029	0.00	1.50
Phosphate	mg/L	HACH 8048	2.63	30.00
Nitrate	mg/L	HACH 8171	7.92	50.00
Nitrite	mg/L	Palintest	0.00	3.00
Ammonia	mg/L	HACH 8038	0.10	1.50
Sulphate	mg/L	Palintest	18.00	250.00
Cations				
Potassium	mg/L	HACH 8049	0.70	30.00
Calcium (Ca^{2+})	mg/L	SM3500-Ca B	28.00	200.00
Sodium (Na^{+})	mg/L	SM3500-Na B	28.56	200.00
Magnesium (Mg^{2+})	mg/L	SM3500-Mg B	41.31	150.00
Total Iron	mg/L	HACH 8008	0.00	0.30
Manganese	mg/L	HACH 8034	0.01	0.40

*NB 23rd edition Standard Method as reference

Remarks: Results of the physicochemical parameters determined on the water sample **conformed** to acceptable drinking water standards. The water is therefore safe for domestic purposes in respect of the parameters analyzed. The results apply only to the sample tested.

REG. WATER QUALITY ASSURANCE
MANAGER (GWCL)
NATHANIEL THOMPSON
(Reg. WQA Manager)

Adaklu Abuadi

Ghana Water - Public

GHANA WATER COMPANY LIMITED

Main Bankers: GCB Bank Limited
Societe Generale Ghana
National Investment Bank

GHANA WATER COMPANY LIMITED

Volta Region
P. O. Box 41
Ho-Ghana
West Africa

My Ref. No.:..
Your Ref. No.:..

Location: WQA
Regional Laboratory

Report Number	BhW/230526/001
Recipient's Name	ELIZABETH MENSAH
Sample Source/Location	**BOREHOLE (ADAKLU)**
Date of Receipt	26/May/23
Date Analysis Commenced	28/May/23
Date of Report	2/Jun/23
Client's Name:	**CWSA - ABUADI 1**
Clients Tel	0249494677

Responsible Officer: QA Officer
Verified By: QA Supervisor
Analysed By: Technical Assist

BACTERIOLOGICAL WATER ANALYSIS RESULTS

Parameters	Unit	Test Methods	Result	GS-175-1
Total Coliforms	CFU/1mL	Pour Plate	9	0
E.Coli	CFU/1mL	Pour Plate	0	0

Remarks: The results of the bacteriological parameters determined on the water sample **failed** to meet acceptable drinking water standards. We recommend that the borehole should be disinfected. The results apply only to the sample tested.

REG. WATER QUALITY ASSURANCE MANAGER (GWCL)
NATHANIEL THOMPSON
[Reg. WQA Manager]

APPENDIX 4

Table A-51: list of district and municipal household latrine data

HOUSEHOLD & LATRINE DATA - VOLTA REGION					
S/N	**District**	**No. of HHs**	**No. of HHLs**	**HH Deficit**	**% Coverage**
1	Ho Municipal	49826	26394	23432	52.97234376
2	Hohoe	43329	21172	22157	48.86334787
3	Agortime Ziope	7116	2858	4258	40.16301293
4	Ketu South	46942	17063	29879	36.34911167
5	Adaklu	2600	886	1714	34.07692308
6	North Tongu	26191	8365	17826	31.93845214
7	Ketu North	35931	9679	26252	26.93774178
8	South Tongu	18531	4246	14285	22.91295667
9	Afadzato South	22529	3818	18711	16.94704603
10	Central Tongu	20307	2960	17347	14.57625449
11	Kpando	13439	1861	11578	13.84775653
12	Ho West	25875	3268	22607	12.62995169
13	Keta Municipal	37705	4362	33343	11.56875746
14	North Dayi	14357	1633	12724	11.37424253
15	Akatsi South	25941	1994	23947	7.686673605
16	Akatsi North	7696	542	7154	7.042619543
17	South Dayi	22733	1597	21136	7.025029693
	Total	**421048**	**112698**	**308350**	**23.34777773**

APPENDIX 5

Table A-52: District ODF Coverage data

DISTRICT	NO.OF COMMUNITIES	DECLARED ODF	ODF %
Agotime Ziope	90	27	30%
Afadjato South	86	23	27%
Adaklu	87	21	24%
Kpando	105	22	21%
Hohoe	121	25	21%
Akatsi South	206	69	33%
North Dayi	125	19	15%
South Dayi	72	6	8%
Ketu North	365	24	7%
Ho West	203	12	6%
Ho	112	6	5%
Keta	249	13	5%
Akatsi North	187	7	4%
Ketu South	420	3	1%
Central Tongu	215	0	0%
North Tongu	157	0	0%
South Tongu	214	0	0%
Total	**3014**	**277**	**9%**

Start	End	Today	Districts	Community	HH Name	HH Contact	hhl/Geo_Point	Geopoint_Latitude	Geopoint _longitude	Geopoint _Altitude	Geopoint_Precision
2017-03-0	2017-03-0	2017-03-08	agotime	Agohome	Grace	0249416170	6.59048672 0.72749612 138.0 6.0	6.59048672	0.72749612	138	6
2017-03-0	2017-03-0	2017-03-08	agotime	Agohome	Fred Alato	0203925117	6.59123368 0.72748454 129.0 6.0	6.59123368	0.72748454	129	6
2016-07-1	2016-07-1	2016-07-13	agotime	Ahiagbakope	Emmanuel Asem	0245681665	6.5163717 0.70026649 103.0 5.0	6.5163717	0.70026649	103	5
2016-07-1	2016-07-1	2016-07-13	agotime	Ahiagbakope	Togbe Asem	0245681665	6.51639578 0.70032128 100.0 3.0	6.51639578	0.70032128	100	3
2017-03-0	2017-03-0	2017-03-08	agotime	Ahiagbakope	Amedekanya Korsi	000	6.51594681 0.70115985 107.0 6.0	6.51594681	0.70115985	107	6
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Ewia Elizabeth	0545219656	6.49149693 0.487935 141.0 5.0	6.49149693	0.487935	141	5
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Wisdom Atakumah	0505320497	6.49130911 0.48775855 146.0 6.0	6.49130911	0.48775855	146	6
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Salome Gogo	0553985314	6.49036624 0.48723972 119.0 4.0	6.49036624	0.48723972	119	4
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Celestine Xeve	0208621960	6.4901929 0.48696116 119.0 3.0	6.4901929	0.48696116	119	3
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Charity Dzakuma	0209166343	6.49003271 0.4866679 130.0 4.0	6.49003271	0.4866679	130	4
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Gblor Harry	0248894519	6.49080564 0.48674358 84.0 5.0	6.49080564	0.48674358	84	5
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Gladys Agbo	0543559633	6.49162672 0.48703688 105.0 4.0	6.49162672	0.48703688	105	4
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Wedanu Gabriel	0208615542	6.4910911 0.48625502 148.0 6.0	6.4910911	0.48625502	148	6
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Mary Gblor	0554995931	6.49194797 0.48595292 124.0 6.0	6.49194797	0.48595292	124	6
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Samuel Dor	0200384855	6.49210504 0.48522436 127.0 5.0	6.49210504	0.48522436	127	5
2016-11-0	2016-11-0	2016-11-03	adaklu	Awanyaviwope	Micheal Agbale	0244211122	6.49256131 0.48648743 143.0 5.0	6.49256131	0.48648743	143	5
2016-07-2	2016-07-2	2016-07-21	adaklu	Bekuikope	Dorgah Nana	0263403629	6.36227372 0.6115233 85.0 6.0	6.36227372	0.6115233	85	6
2016-07-2	2016-07-2	2016-07-21	adaklu	Bekuikope	Favour Abey	0266258339	6.36213376 0.61139238 112.0 6.0	6.36213376	0.61139238	112	6
2016-07-2	2016-07-2	2016-07-21	adaklu	Bekuikope	Evelyn Amenuvor	0278167512	6.3617837 0.61113283 102.0 4.0	6.3617837	0.61113283	102	4
2016-07-2	2016-07-2	2016-07-21	adaklu	Bekuikope	Saviour Dake	0269850214	6.36149817 0.61165817 104.0 5.0	6.36149817	0.61165817	104	5
2016-07-2	2016-07-2	2016-07-21	adaklu	Bekuikope	Daniel Agbogah	0269093270	6.36153413 0.61187165 83.0 5.0	6.36153413	0.61187165	83	5
2017-03-0	2017-03-0	2017-03-08	agotime	Dzotsikope	Godsway Seke	0200173316	6.57379834 0.75103997 116.0 4.0	6.57379834	0.75103997	116	4
2016-07-1	2016-07-1	2016-07-13	agotime	Effiakope	Gbetoryidzi Kwame	0247698748	6.51868496 0.69034109 112.0 3.0	6.51868496	0.69034109	112	3
2017-03-0	2017-03-0	2017-03-08	agotime	Effiakope	Gabriel Ahiamata	0000	6.51889838 0.68993457 120.0 6.0	6.51889838	0.68993457	120	6
2016-07-2	2016-07-2	2016-07-21	adaklu	Fordome	Henry Gamle	0543484747	6.42551444 0.69070513 90.0 5.0	6.42551444	0.69070513	90	5
2016-07-2	2016-07-2	2016-07-21	adaklu	Fordome	1	0543484747	6.426176 0.69026272 114.0 4.0	6.426176	0.69026272	114	4
2016-11-0	2016-11-0	2016-11-03	adaklu	Kpedzi (New Bethel)	Victor Nyavor	0543559633	6.52528523 0.4965707 149.0 6.0	6.52528523	0.4965707	149	6
2016-11-0	2016-11-0	2016-11-03	adaklu	Kpedzi (New Bethel)	odwin Yeboah Nyavo	0206083517	6.52454785 0.49663879 111.0 4.0	6.52454785	0.49663879	111	4
2016-11-0	2016-11-0	2016-11-03	adaklu	Kpedzi (New Bethel)	Wonder Dey	0246172024	6.52618551 0.49451662 117.0 3.0	6.52618551	0.49451662	117	3
2016-11-0	2016-11-0	2016-11-03	adaklu	Kpedzi (New Bethel)	Afezuke Dey	0246172024	6.52669561 0.49480727 96.0 4.0	6.52669561	0.49480727	96	4
2016-07-1	2016-07-1	2016-07-13	agotime	Lamankope	Patrick Awudey	0209021619	6.46596758 0.72482276 115.0 4.0	6.46596758	0.72482276	115	4
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Kumah Dodzaga	0561404240	6.35801791 0.61014768 98.0 5.0	6.35801791	0.61014768	98	5
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Cephas Agbekpe	0561404240	6.35806224 0.61005169 101.0 6.0	6.35806224	0.61005169	101	6
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Selorm Dordzaga	0261816223	6.35797304 0.61013862 97.0 4.0	6.35797304	0.61013862	97	4
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Goden Dordzaga	0206407608	6.35758284 0.61041417 102.0 4.0	6.35758284	0.61041417	102	4
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Francis Tsigbe	0274189152	6.35748976 0.61026551 111.0 6.0	6.35748976	0.61026551	111	6
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Atsu Anator	0261816223	6.35777422 0.61014049 90.0 6.0	6.35777422	0.61014049	90	6
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Amenyo Dordzaga	0208582689	6.35695329 0.61040439 21.0 5.0	6.35695329	0.61040439	21	5
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Emmanuel Anagbo	0261816223	6.35675755 0.61020933 59.0 6.0	6.35675755	0.61020933	59	6
2016-08-3	2016-10-0	2016-08-30	adaklu	Togbuikope	Esther Dordzaga	0261816223	6.35677181 0.6102875 71.0 6.0	6.35677181	0.6102875	71	6
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Cephas Dordzaga	0208582689	6.35682714 0.60959947 88.0 4.0	6.35682714	0.60959947	88	4
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Evans Ahator	0503622941	6.35715637 0.60941603 93.0 3.0	6.35715637	0.60941603	93	3
2016-08-3	2016-08-3	2016-08-30	adaklu	Togbuikope	Charles Amedzape	0261816223	6.35747058 0.6095055 94.0 4.0	6.35747058	0.6095055	94	4
2017-03-0	2017-03-0	2017-03-08	agotime	Vedome	Atiga Victor Yao	0504540673	6.57585034 0.74263116 132.0 6.0	6.57585034	0.74263116	132	6
2017-03-0	2017-03-0	2017-03-08	agotime	Vedome	Kovor Korku	0504540673	6.57629128 0.74267727 138.0 5.0	6.57629128	0.74267727	138	5
2017-03-0	2017-03-0	2017-03-08	agotime	Vedome	Benjamin Atiga	0205105092	6.5761145 0.74392473 181.0 4.0	6.5761145	0.74392473	181	4
2017-03-0	2017-03-0	2017-03-08	agotime	Vincent/Lamankope	Vincent Afianu	0555728345	6.46440131 0.72650055 124.0 6.0	6.46440131	0.72650055	124	6
2017-03-0	2017-03-0	2017-03-08	agotime	Vudzakpo	Godsway Zometsi	0249530738	6.49251728 0.70249775 108.0 6.0	6.49251728	0.70249775	108	6
2017-03-0	2017-03-0	2017-03-08	agotime	Wokope	Adza Kwasi	0243297281	6.5814025 0.73763015 131.0 6.0	6.5814025	0.73763015	131	6
2016-07-1	2017-08-1	2016-07-13	agotime	Wuvi 1	Ekpo Dawalo	0540503888	6.3872066 0.75606197 101.0 3.0	6.3872066	0.75606197	101	3
2016-08-0	2016-08-0	2016-08-02	agotime	Wuvi 1	Midao Kpoh	0247742083	6.4128707 0.7561034 0.0 3337.0	6.4128707	0.7561034	0	3337
2016-10-0	2016-10-0	2016-10-05	agotime	Wuvi 1	Degbe Edzorna	0543770767	6.38746767 0.75679261 104.0 3.0	6.38746767	0.75679261	104	3
2016-07-1	2016-07-1	2016-07-13	agotime	Wuvi 2	Agbo Ebenezer	0542369576	6.38534438 0.76300043 101.0 4.0	6.38534438	0.76300043	101	4
2016-07-1	2016-07-1	2016-07-13	agotime	Wuvi 2	Micheal Kobla Kloyo	0209304571	6.38507056 0.76321206 112.0 3.0	6.38507056	0.76321206	112	3
2016-08-3	2016-08-3	2016-08-30	adaklu	Xinakope	Nani Nukpese	0241838807	6.34917541 0.53664459 71.0 6.0	6.34917541	0.53664459	71	6

APPENDIX 6: List of Health Facilities and Geographical Coordinates in Ho West

S/N	List of Health facilities	Key contacts	Population	Area	Staff Strength	GPS Coordinates of Health Facilities	
						Latitude	Longitude
1	ABUTIA AGORVE HEALTH CENTRE	544753551	4363	Abutia Sub	11	6.505783	0.364633
2	ABUTIA KLOE HEALTH CENTRE	547560576	4210	Abutia Sub	11	6.484100	0.347250
3	ABUTIA NORVISI CHPS	553752041	5171	Abutia Sub	5	6.221000	0.146000
4	ABUTIA KLISSIFLUI CHPS	540255842	5919	Abutia Sub	6	6.387174	0.267081
6	AMEDZOFE HEALTH CENTRE	545792595	1285	Avatime Sub	7	6.851530	0.435550
7	FUME HEALTH CENTRE	543721628	1562	Avatime Sub	4	6.878533	0.420450
8	GBADZEME CHPS	545005485	769	Avatime Sub	2	6.861160	0.441320
	BIAKPA	553385168	818	Avatime Sub	2	6.838600	0.419150
9	VANE H/C	243838671	3178	Avatime Sub	5	6.825152	0.419550
12	ASHANTI KPOETA CHPS	242886076	3079	Kpedze Sub	4	6.910041	0.542770
13	KPEDZE HEALTH	245763186	6878	Kpedze Sub	34	6.846300	0.504090
14	HOLUTA CHPS	244203910	1236	Kpedze Sub	4	6.847070	0.518510
15	LUVUDO CHPS	542528848	766	Kpedze Sub	3	6.876329	0.524933
16	AVENUI CHPS	249186263	3855	Tsito Sub	4	6.600662	0.344003
17	DEDEDO CHPS	599111632	3281	Tsito Sub	5	6.263700	0.123200
18	TSIBU HEALTH CENTRE	244159178	2370	Tsito Sub	6	6.578150	0.278850

19	ANYRAWASE CHPS	242557477	5202	Tsito Sub	4	6.575408	0.312248
20	TSITO HEALTH CENTRE	242561210	10031	Tsito Sub	26	6.550930	0.301340
21	ANFOETA CHPS	249960312	3942	Weto Hedzefe	4	6.740500	0.391360
22	HLEFI HEALTH	248147922	3399	Weto Hedzefe	12	6.720800	0.376117
23	AKOME CHPS	242056988	2961	Yingor Sub	6	6.820300	0.467800
24	DODOME AWUIASU HEALTH	242005150	1269	Yingor Sub	4	6.767560	0.516270
25	DODOME TELEAFENUI HEALTH CENTRE	247280381	2541	Yingor Sub	7	6.803300	0.504150
26	DZOLOGBOGAME HEALTH CENTRE	245463170	3601	Yingor Sub	16	6.775450	0.476810
27	DZOLOKPUITA HEALTH CENTRE	243166614	1342	Yingor Sub	9	6.734690	0.444790
28	SAVIEFE CHPS	243269427	1802	Yingor Sub	3	6.784067	0.411633

APPENDIX 7

List of Health Facilities in Adaklu District with Geographical Coordinates.

Sub-District	Facility	Type	Latitude	Longitude
Ahunda	Ahunda Health Centre	Health Centre	6.28517	0.54351
Ahunda	Hlihave CHPS	CHPS	6.326463	0.576306
Ahunda	Kpetsu CHPS	CHPS	6.426856	0.513175
Helekpe	Adaklu Kordiabe CHPS	CHPS		
Helekpe	Helekpe Health Centre	Health Centre	6.490168	0.487589
Helekpe	Nutifafa Health Centre	Health Centre		
Helekpe	Tsrefe CHPS	CHPS	6.509731	0.49971
Sopa-Torda	Ablornu CHPS	CHPS	6.34797	0.63601
Sopa-Torda	Sofa (Salvation Army) Health Centre	Health Centre	6.38357	0.64361
Waya	Amuzudeve CHPS	CHPS	6.503276	0.628803
Waya	E.P MIMI CLINIC	CLINIC		
Waya	Anfoe CHPS	CHPS	6.46127	0.63951
Waya	Torda CHPS	CHPS	6.41097	0.66651
Waya	Waya Health Centre	Health Centre	6.446039	0.628547
Wumenu	Dave Health Centre	Health Centre	6.591163	0.506538
Wumenu	Have CHPS	CHPS	6.526196	0.437408
Wumenu	Kodzobi CHPS	CHPS	6.562671	0.45749
Wumenu	Wumenu Health Centre	Health Centre	6.57733	0.58474

APPENDIX 8: Introductory Letter from Agotime Ziope District

AGOTIME-ZIOPE DISTRICT ASSEMBLY

AGOTIME-ZIOPE DISTRICT ASSEMBLY
UNITY FOR DEVELOPMENT

Email: info@azda.gov.gh
or visit www.azda.gov.gh

AGOTIME-ZIOPE DISTRICT ASSEMBLY
P. O. Box 47, Kpetoe-V/R
Tel: 03620 91140

Our Ref: AZDA.16/10/01/04/02 Your Ref: .... Date: 2ND AUG. 2023

INTRODUCTORY LETTER MR. AUSTIN DICKSON AMOAKO

I write to respectfully introduce to you Mr. Austin Dickson Amoako a PHD Environmental Science Student of the Institute of Environment and Sanitation Studies, University of Ghana, Legon.

Mr. Amoako is undertaking a research in Water, Sanitation and Hygiene (WASH) Intervention Programmes in some Districts in Ghana.

In the light of this, approval is granted him to obtain the required information relating to his research in the District.

Kindly accord him the necessary assistance to enable him undertake the research, please.

Counting on your usual cooperation.

Thank you.

AKUFFO K. REUBEN
DISTRICT COORD. DIRECTOR
For: DISTRICT CHIEF EXECUTIVE

MR. AUSTIN DICKSON AMOAKO
UNIVERSITY OF GHANA
INSTITUTE FOR ENVIRONMENT AND
SANITATION STUDIES
ACCRA

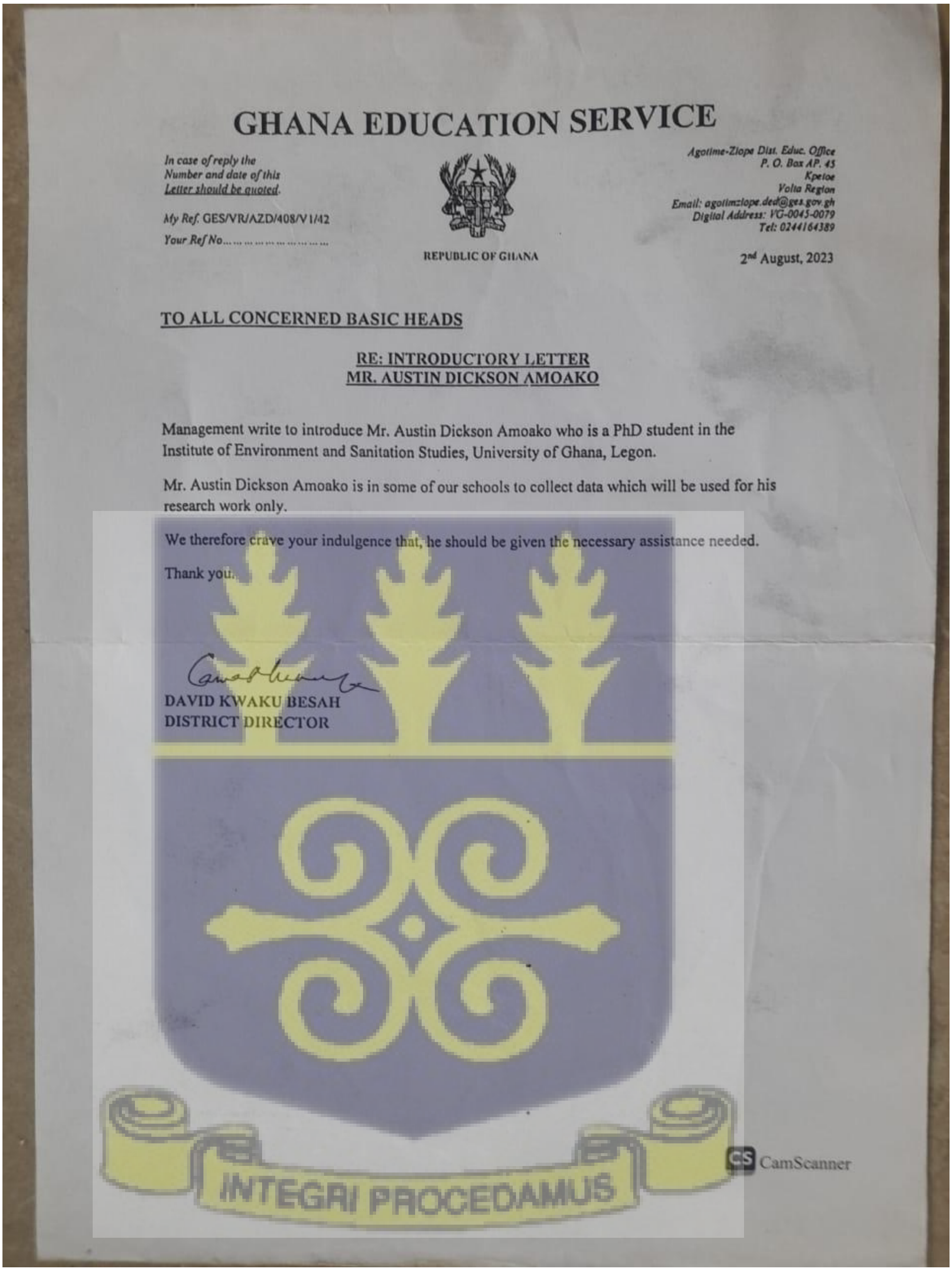
cc:

The District Director,
Ghana Health Service
Kpetoe

The District Director,
Ghana Education Service
Kpetoe

The District Environmental Health Officer
Agortime-Ziope District Assembly
Kpetoe

APPENDIX 9: Introductory Letter from Agotime Ziope, Ghana Education Service Directorate



GHANA EDUCATION SERVICE

In case of reply the
Number and date of this
Letter should be quoted.

My Ref. GES/VR/AZD/408/V1/42
Your Ref No……………………

REPUBLIC OF GHANA

Agotime-Ziope Dist. Educ. Office
P. O. Box AP. 45
Kpetoe
Volta Region
Email: agotimziope.ded@ges.gov.gh
Digital Address: VG-0045-0079
Tel: 0244164389

2nd August, 2023

TO ALL CONCERNED BASIC HEADS

RE: INTRODUCTORY LETTER
MR. AUSTIN DICKSON AMOAKO

Management write to introduce Mr. Austin Dickson Amoako who is a PhD student in the Institute of Environment and Sanitation Studies, University of Ghana, Legon.

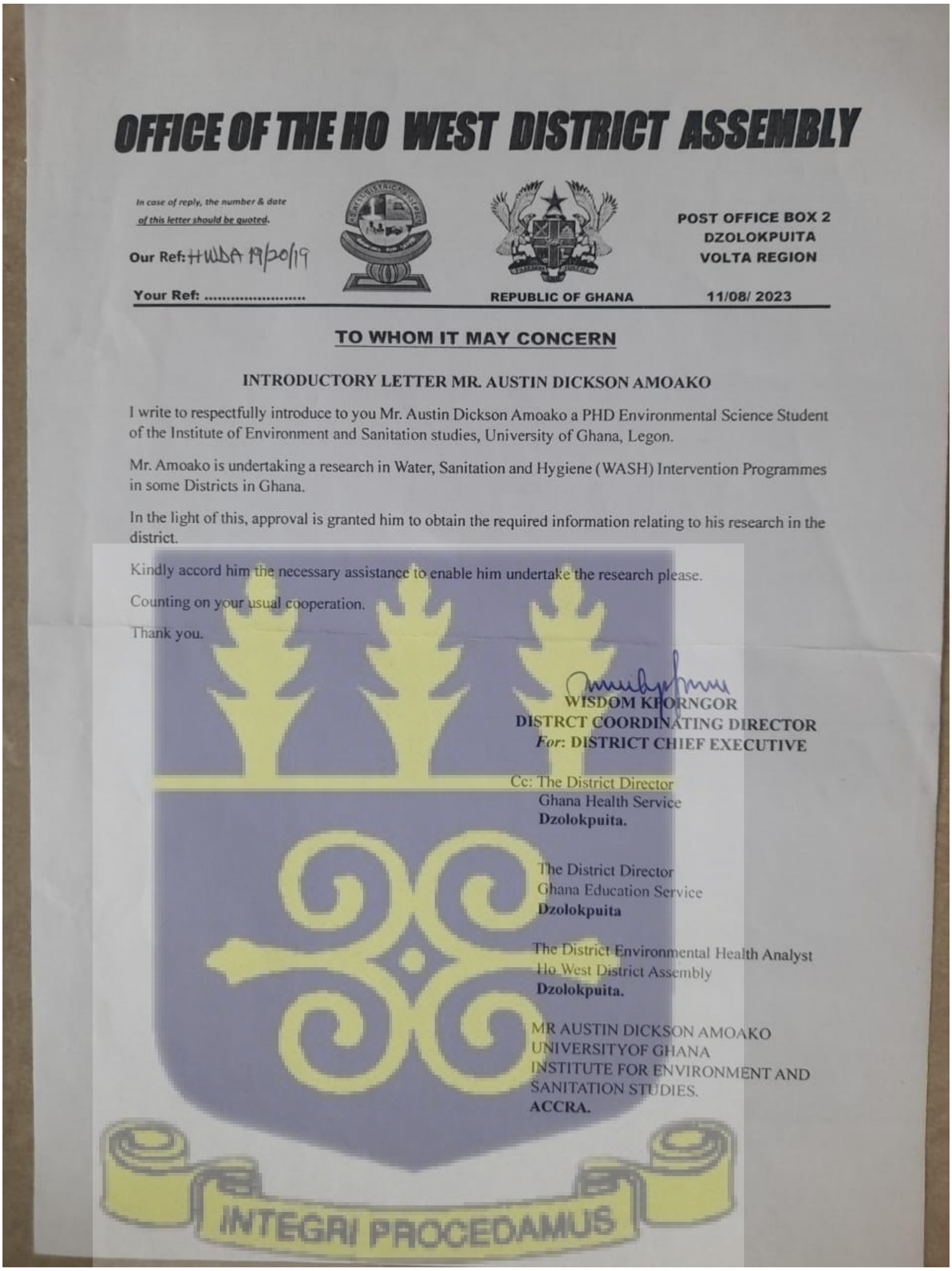
Mr. Austin Dickson Amoako is in some of our schools to collect data which will be used for his research work only.

We therefore crave your indulgence that, he should be given the necessary assistance needed.

Thank you.

DAVID KWAKU BESAH
DISTRICT DIRECTOR

APPENDIX 10: Introductory Letter from Ho West District Assembly



OFFICE OF THE HO WEST DISTRICT ASSEMBLY

In case of reply, the number & date of this letter should be quoted.

Our Ref: HWDA 19/20/19

Your Ref: ....

REPUBLIC OF GHANA

POST OFFICE BOX 2
DZOLOKPUITA
VOLTA REGION

11/08/ 2023

TO WHOM IT MAY CONCERN

INTRODUCTORY LETTER MR. AUSTIN DICKSON AMOAKO

I write to respectfully introduce to you Mr. Austin Dickson Amoako a PHD Environmental Science Student of the Institute of Environment and Sanitation studies, University of Ghana, Legon.

Mr. Amoako is undertaking a research in Water, Sanitation and Hygiene (WASH) Intervention Programmes in some Districts in Ghana.

In the light of this, approval is granted him to obtain the required information relating to his research in the district.

Kindly accord him the necessary assistance to enable him undertake the research please.

Counting on your usual cooperation.

Thank you.

WISDOM KHORNGOR
DISTRCT COORDINATING DIRECTOR
***For*: DISTRICT CHIEF EXECUTIVE**

Cc: The District Director
Ghana Health Service
Dzolokpuita.

The District Director
Ghana Education Service
Dzolokpuita

The District Environmental Health Analyst
Ho West District Assembly
Dzolokpuita.

MR AUSTIN DICKSON AMOAKO
UNIVERSITYOF GHANA
INSTITUTE FOR ENVIRONMENT AND SANITATION STUDIES.
ACCRA.

APPENDIX 11: Approval Letter from Ethics Committee, University of Ghana

UNIVERSITY OF GHANA

ETHICS COMMITTEE FOR BASIC AND APPLIED SCIENCES (ECBAS)

P. O. Box LG 1195, Legon, Accra, Ghana

INTEGRI PROCEDAMUS

Ref. No: ECBAS 108/22-23

7th November, 2023

Mr. Austin Dickson Amoako
Institute of Environment and Sanitation Studies (IESS)
P. O. Box LG 134
University of Ghana
Legon, Accra

Dear Mr. Amoako,

ECBAS 108/22-23: IMPACTS EVALUATION OF WATER ACCESS, SANITATION AND HYGIENE (WASH) INTERVENTION PROGRAMS IN GHANA. A CASE STUDY OF THREE DISTRICTS IN THE VOLTA REGION

This is to inform you that the above referenced study has been presented to the Ethics Committee for Basic and Applied Sciences for a full board review and the following actions taken subject to the conditions and explanation provided below:

Expiry Date:	14/11/2024
On Agenda for:	Initial Submission
Date of Submission:	15/09/2023
ECBAS Action:	Approved
Reporting:	Annually

Please accept my congratulations.

Yours sincerely,

ETHICS COMMITTEE FOR BASIC AND APPLIED SCIENCES
APPROVED
07 NOV 2023
UNIVERSITY OF GHANA

Professor Dorcas Osei-Safo
ECBAS Chairperson

APPENDIX 12

Structured Questionnaire for Households in the Study Districts

INTERVIEW GUIDE FOR THE HOUSEHOLDS

Project Title: Impacts Evaluation of Water, Sanitation and Hygiene (WASH) Intervention Programs in Ghana. A Case Study of Three Districts in The Volta Region.

AUSTIN D. AMOAKO (ID:10875876) - BSc Civil Engineering, BSc Public Health & Allied Sciences, MSc Environmental Engineering (Water Supply and Environmental Sanitation)

PhD Environmental Science Year IV Candidate – Institute for Environment and Sanitation Studies – College of Basic and Applied Sciences,

University of Ghana.

I am AUSTIN AMOAKO, a PhD Candidate from the University of Ghana College of Basic and Applied Sciences. This research is part of the requirement of University of Ghana for the PhD Environmental Science degree. The questionnaire is intended to evaluate WASH interventions and it is anonymous and meant for academic purpose only. For this reason, we would be grateful if you could devote few minutes of your time to fill this questionnaire.

PART A (PERSONAL INFORMATION)

NAME OF DISTRICT……………………………………………………………

NAME OF COMMUNITY……………………………………………………..

NUMBER OF HOUSEHOLD…………………………………………

NUMBER OF OCCUPANTS……………………………………………

NUMBER OF MALES…………………………………………………..

NUMBER OF FEMALES………………………………………………

EDUCATIONAL STATUS………………………………………………

OCCUPATION…………………………………………………………..

RELIGION…………………………………………………………………….

SEX……………………………………….

AGE……………………………………….

MONTHLY INCOME………………………………………………….

A. GHc 0 - 500

B. GHc 500 -1000

C. GHc1000 – 2000

D. Above GHc2000

PART B: AVAILABILITY, ACCESSIBILITY AND USE OF WATER FACILITIES

1. What is the source of water for the household?

A. Pipe borne water

B. Rain water

C. Stream/River

D. Groundwater

E. Other………………………………………………………….

2. What is the source of drinking water for your household?

A. Pipe borne water

B. Rain water

C. Stream/River

D. Groundwater

E. Other………………………………………………………….

3. Does your household have a container with fitting cover for drinking water storage?

A. Yes, container with fitting cover

B. Container without fitting cover

C. No container for drinking water storage

4. How often do you have access to clean water for drinking and other domestic uses?

A. Never

B. Sometimes

C. Often

D. Always

5. Do you treat your drinking water?

A. Yes

B. No

6. If Yes, how often do you treat your drinking water?

A. Always

B. Sometimes

C. Never

7. If ‘A’ or ‘B’ , how do you treat your water?

A. Chlorine

B. Iodine

C. Boiling

D. Other …………………………

E. Do not treat

8. Which types of water sources do you have?

A. Pipes

B. Covered Well

C. Uncovered Well

D. Mechanized borehole

E. River/Stream/Pond

F. Any other……………………………………………..

9. Do you have separate water for both drinking and domestic use?

A. Yes

B. No

10. Do you wash your hands after using the toilet?

A. Yes

B. No

11. If Yes, do you have water in your tippy tap or hand washing basin?

A. Yes

B. No

12. If No, have you ever heard of tippy tap?

A. Yes

B. No

13. If Yes, why don't you have a tippy tap?

A. No need

B. Don't know how to do the installation.

C. Don't have money to buy gallon and soap.

D. Others………………………………………………………………..

14. Where do you get MOST of your water for drinking and food preparation? (Tick all that apply)

A. Private Borehole

B. Private well

C. By truck (purchased)

D. Community mechanized / non mechanized borehole

E. Bottled/purchased.

F. River/Pond/Stream

G. Other…………………………………………………………………..

15. Are livestock or wild animals able to get into the source waters, wells or pump area?

A. Yes

B. No

16. Do you join que to get your water?

A. Always

B. Sometimes

C. Never

17. Does your water source provide water throughout the day?

A. Yes

B. No

C. No idea

18. If "No", for how many hours a day is water available?

A. Morning only (6 am- 12pm)

B. Afternoon only (12pm – 6pm

C. Evening only (3pm – 9pm)

D. Other……………………………………………………………..

19. Where do you get your water when the source is dry? (Tick all that apply)

A. Family and friend's borehole

B. Family and friend's well

C. Commercial borehole

D. Assembly/NGO supply

E. Other ……………………………………………………………

20. Do you have stored water in the house?

A. Yes

B. No

21. How much water did you gather yesterday from all sources for all your household uses?

A. Less than 3 Kufour gallons

B. More than 3 Kufour gallon

C. More than 5 Kufour gallons

D. Other……………………………………..

22. Was it enough for the family's domestic needs?

A. Yes

B. No

HOUSEHOLD ACCESS TO IMPROVED SANITATION AND HYGIENE FACILITIES

1. Do you have a household toilet?
   A. Yes
   B. No
2. If Yes, what type of household toilet does your household have access to?
   A. Flushed toilet to septic tank.
   B. Unlined Ventilated Improved Pit

C. Mozambique toilet

D. Kumasi Ventilated improved pit latrine (KVIP)

E. Pit latrine with slab

F. Pit latrine without slab

G. Composting toilet

H. Communal/public toilet

I. Other: ______________________________

3. Is your household toilet on-plot (close to household)?

A. Yes

B. No

C. Don't' know.

4. What materials were used for your toilet facility superstructure?

A. Mud

B. Bricks

C. Cement block

D. Palm mat

E. Wood

F. Bamboo

G. Palm/Cocoanut branches

H. Other……………………………………………………………………

5. What is the type of material used for the latrine roofing?

A. Roofing sheet

B. Thatch

C. Palm/cocoanut branches

6. Is your facility shared with others?

A. Yes

B. No

7. If Yes, how many households (including your own) use your facility?

A. 1 Household

B. 2 Households

C. 3 Households

D. More than 3 households

8. Is your household toilet functional or usable?

A. Yes

B. No

C. Don't know.

9. Has your household toilet been non-functional or unusable at any time in the past?

A. Yes

B. No

C. Don't know.

10. If yes, why is/was the household toilet not working?

A. Filled up

B. Caved in

C. Dirty

D. Collapsed substructure.

E. Collapsed superstructure.

F. Presence of reptiles

G. Other: ____

11. Is your household using the same toilet?

A. Yes

B. No

C. Don't know.

12. Is there evidence of cracking or damage to the toilet pedestal or squat-slab?

A. Yes

B. No

C. Don't know.

13. Are appropriate toilet materials present?

A. Yes

B. No

C. Don't 'know.

14. Is someone in charge of cleaning the toilet?

A. Yes

B. No

C. Don't know.

15. How often is the toilet cleaned?

A. Everyday

B. Every 3 days

C. Every 4 days

D. Every 5 days

E. Every 6 days

F. Other……………………………………….

17. Who oversees maintaining and repairing this toilet if the pit fills up or the facility breaks?

A. Household head

B. Spouse

C. Child

D. Other relatives

18. Have you or any member of your household seen a person openly defecate in the past?

A. Yes

B. No

C. Don't know.

19. Do you participate during World Toilet Day?

A. Yes

B. No

20. If the answer to the question above is yes, what activities do you see during the celebrations?

....
.....

REFUSE DISPOSAL

1. What are the items commonly found in your household waste?

A. Food waste

B. Paper and rubber

C. Animal waste

D. All the above

E. Any other……………………………………………

2. Do you mix children feaces with your refuse?

A. Yes

B. No

3. How often do you generate waste?

A. Daily

B. Every three days

C. Weekly

D. Other……………………………………………………………………….

4. How do you store your waste before disposal?

A. In a closed container.

B. In an open container.

C. In a polythene bag or sack

D. Other……………………………………………………………

5. What are the types of waste collection service available to your household?

A. Home collection

B. Roadside collection

C. Truck visit.

D. Communal container

E. Refuse dump

F. Other………..

6. Do you have a communal refuse disposal dump in your community?

A. Yes

B. No

7. If Yes, is the communal refuse dump fenced?

A. Yes

B. No

8. Does your household have separate refuse dump site in the community?

A. Yes
B. No

9. Do you sort / segregate your waste?

A. Yes
B. NO

10. How will you describe the sanitation situation around the waste container?

A. Very satisfactory
B. Satisfactory
C. Poor
D. Very poor

11. How do you dispose of your waste?

A. Burn
B. In the bush/ roadside/ drain
C. Backyard
D. Burying
E. Other method

12. Why do you dispose of your waste by this method?

A. I have no waste collection service.
B. The community doesn't have refuse dump/container.
C. Community refuse dump is far from my house.
D. I have no waste container.
E. I cannot afford service fee.

F. Other reason……………………………………………………………………

13. Do you find your waste disposal arrangement convenient?

A. Yes

B. No .

14. How will you describe the general waste situation in your neighborhood?

A. Very satisfactory

B. Satisfactory

C. Poor

D. Very poor

15. Do you pay for your waste disposal service?

A. Yes

B. No

16. Are you willing to pay for waste disposal services if already not paying?

A. Yes

B. No

17. If No, why?

A. I don't have money.

B. I am comfortable with my waste disposal method.

C. I do not generate much waste.

D. Other…………………………………………………………………………………

18. How will you describe the quality of waste disposal service you receive?

A. Very satisfactory

B. Satisfactory

C. Poor

D. Very poor

19. How would you rank environmental sanitation in your community?

A. One of the cleanest neighborhoods.

B. Averagely clean.

C. Dirty

D. One of the dirtiest communities in the city

20. In your view, how can waste disposal be improved in your community?
……………………………………………………………………………………………
…..
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
………………………………………

HYGIENE KNOWLEDGE AND PRACTICES

1. Do you wash your hands?

A. Yes

B. No

2. If Yes, what time do you wash your hands when food is ready?

A. Only before eating.

B. Only after eating.

C. All the above

3. Does your household have hand-washing facilities?

A. Yes

B. No

4. Does the hand-washing facility have access to enough water always, sometimes, or never?

A. Always

B. Sometimes

C. Never

5. Is the hand-washing facility supplied with soap always, sometimes, or never?

A. Always

B. Sometimes

C. Never

6. Does the hand-washing facility include resources for hygienic hand drying always, sometimes, or never?

A. Always

B. Sometimes

C. Never

7. When do you wash your hands? Tick all that may apply.

A. After defecation

B. After cleaning or changing a baby

C. Before food preparation

D. Before eating.

E. Before feeding a child

D. Other……………………………………………………………………………

9. How do you wash your hands?

A. Use of water only

B. Use of soap/ash under running water

C. Make contact between both hands.

D. Use of a rubbing motion

10. How do you dry your hand after hand washing?

A. Leave it to air dry.

B. Use kitchen napkin.

C. Rob hands on my dress.

D. All the above

11. Why do you wash your hands?

A. To prevent sickness.

B. To keep the hands looking good

C. To prevent the hands from smelling

12. Have you used soap today?

A. Yes

B. No

13. If No, why?

A. I don't have soap.

B. I forgot

C. I didn't see the soap

D. Other………………………………………………………………………

COMMUNITY PARTICIPATION AND CONTRIBUTION IN THE PROJECT

1. Did you participate in the initial stages of water/sanitation project planning?

A. Yes

B. No

2. Did you feel pressured to participate?

A. Yes

B. No

3. Did the community contribute in the design of the project?

A. Yes

B. No

4. Did the community contribute to the construction of the project?

A. Yes

B. No

5. If yes, how?

A. Labor

B. Cash

C. Both

D. Other………………………………………………………………...

THANK YOU

APPENDIX 13
Structured Questionnaire for Pupils

INTERVIEW GUIDE FOR PUPILS

Project Title: Impacts Evaluation of Water, Sanitation and Hygiene (WASH) Intervention Programs in Ghana. A Case Study of Three Districts in The Volta Region.

AUSTIN D. AMOAKO (ID:10875876) - BSc Civil Engineering, BSc Public Health & Allied Sciences, MSc Environmental Engineering (Water Supply and Environmental Sanitation)

PhD Environmental Science Year IV Candidate – Institute for Environment and Sanitation Studies – College of Basic and Applied Sciences,

University of Ghana.

I am AUSTIN AMOAKO, a PhD Candidate from the University of Ghana College of Basic and Applied Sciences. This research is part of the requirement of University of Ghana for the PhD Environmental Science degree. The questionnaire is intended to evaluate WASH interventions and it is anonymous and meant for academic purpose only. For this reason, we would be grateful if you could devote few minutes of your time to fill this questionnaire.

Name of the District-

____

Name of the

School____

Class____________________________

Sex____________________________

Age_______________________________

WATER ACCESS IN SCHOOLS

1. Do you have access to drinking water source in your school?

   A. Yes

   B. No

2. If Yes, what is the source?

   A. Borehole

   B. Rainwater Harvest System.

   C. Well

   D. Mechanized borehole

   E. Other…………………………………………………………………

3. Where do you drink water in your school if you don't have access to water?

   A. I buy sachet water from school canteen/vendor.

   B. I drink water from food seller.

   C. I drink from near-by house.

   D. I bring my own water from the house?

   E. Other………………………………………………………

4. Does your school have container for drinking water storage?

A. Yes

B. No

5. What type of storage container do you have in your school?

A. Polytank/Sintext tank

B. Plastic Backet

C. Veronica Backet

D. Other………………………………………………….

6. Does the drinking water storage container have fitting cover?

A. Yes

B. No

7. Do you use your personal water drinking cup/flask in school?

A. Yes

B. No

8. Does tap water flow in your school every day?

A. Yes

B. No

9. Is the water source for drinking and washing available anytime you need it?

A. Yes

B. No

10. Is water for drinking different from washing hands, dishes etc?

A. Yes

B. No

11. Does the community share the water facility with your school?

A. Yes

B. No

12. Is the water source locked with padlock after school?

A. Yes

B. No

SANITATION AND HYGIENE

1. Do you have toilet in your school?
   A. Yes
   B. No

2. If "YES", is it functional?
   A. Yes
   B. No

3. If "No", what is the problem?
   A. Broken down
   B. Locked
   C. No idea

4. What type of toilet facility do you have?
   A. KVIP
   B. Water Closet
   C. VIP
   D. Pit latrine
   E. Any other……………………………………………………………..

5. Is the toilet accessible to pupils?
   A. Yes
   B. No

6. What is the approximate distance between your classroom and the toilet?
   A. Less than 100 meters
   B. More than 100 meters
   C. No idea

7. Is there any sign of open defecation within the school environment?
   A. Yes

B. No
C. No idea

8. Are there visible signs of faeces and urine on the squat slab or the walls?
   A. Yes
   B. No
   C. Only faeces
   D. Only Urine
   E. No idea

9. Do you drop toilet paper materials in the pit?
   A. Yes
   B. No

10. If "NO", is there a waste bin with fitting cover in your toilet room?
    A. Yes
    B. No
    C. Only Waste bin without fitting cover

11. How do you dispose your toilet paper materials?
    A. Burning
    B. Burying
    C. Throwing into the bush
    D. Disposing in school refuse dump.
    E. Disposing in community waste bin.
    F. Any other……………………………

12. Are anal cleansing materials scattered on the latrine floor?
    A. Yes
    B. No

13. Is the latrine producing offensive odour?
    A. Yes
    B. No
    C. No idea

14. Is there any sign of fly breeding around the toilet?
    A. Yes
    B. No
    C. No idea

15. Do you have a School Health Club in place (SHC)?
    A. Yes

B. No
C. No idea

16. If yes, do you know the roles of the School Health Club or Committee (SHC)?

A. Yes

B. No

C. No idea

CARE AND MAINTENANCE OF LATRINES IN SCHOOLS

1. Are there visible cracks in the superstructure?

A. Yes

B. No

C. No idea

2. What is the condition of the roof?

A. Good

B. Bad

C. No idea

3. Does it have gate/door?

A. Yes

B. No

C. No idea

4. If Yes, do they lock it after school?

A. Yes

B. No

C. No idea

5. If No, do the community members use it too?

A. Yes

B. No

C. No idea

6. Do domestic animals have access to the toilet facility if it is not locked?

   A. Yes

   B. No

   C. No idea

7. Do pupils clean the toilet in your school?

   A. Yes

   B. No

   C. No idea

3. If yes, how often do you scrub the toilet?
   a. Everyday
   b. Every 3 days
   c. Every 5 days
   d. No idea
4. Have you ever had latrine user and maintenance training workshop?
   a. Yes
   b. No
   c. No idea

5. If Yes, do you know who organized the training?
   a. NGO
   b. District Assembly
   c. GES/Teachers
   d. Other…………………………………………………………………………….

6. If yes, how often do you receive such messages?

   a. Once a week
   b. More than once a month
   c. No idea

7. Do you receive hygiene practices messages apart from school?
   a. Yes
   b. No
   c. No idea

8. If yes, where?
   A. Home
   B. Church

C. Radio
D. Other…………………………………………………………

9. Do you practice what you hear?

   A. Yes

   B. No

10. If No, why don't you practice it?

   A. Message not clear

   B. I forgot

   C. Culture reasons

   D. Other……………………………………….

11. In your opinion, do these messages have any impact on the use and sustainability of the latrines?

   A. Yes

   B. No

12. Kindly suggest behaviors and practices that may encourage your peers to practice good hygiene.

   A. Regular education

   B. Punishment for failure to practice.

   C. Any other
   ……………………………………………………………………………
   ……………………………………………………………………………
   ………………………………………….

WASTE DISPOSAL IN SCHOOLS

1. How often do you collect and dispose waste?

   E. Daily

   F. Every three days

   G. Weekly

H. Other…………………………………………………………………………….

3. Do you have a waste bin in your school?

A. Yes

B. No

4. How do you store your waste before disposal?

A. In a closed container.

B. In an open container.

C. In a polythene bag or sack

D. Other…………………………………………………………

5. What are the items commonly found in your school waste?

A. Food waste

B. Paper and rubber

C. Animal waste

D. All the above

I. Any other……………………………………………………..

6. What are the types of waste collection services available in your school?

G. School collection

H. Truck visit.

I. Communal container

J. Other…………………………………………………………………………

7. Do you have refuse disposal dump in your school?

C. Yes

D. No

7. If Yes, is the school refuse dump fenced?

C. Yes

D. No

8. Does your school have separate refuse dump site aside the community one?

C. Yes

D. No

9. Do you segregate your waste?

C. Yes

D. NO

10. How will you describe the sanitation situation around the waste container in your school?

E. Very satisfactory

F. Satisfactory

G. Poor

H. Very poor

11. How do you dispose of your waste?

F. Burn

G. In the bush/ roadside/ drain

H. Backyard

I. Burying

J. Other method ……………………………………………………………………………

12. Why do you dispose of your waste by this method?

G. We have no waste collection service.

H. The school doesn't have refuse dump/container.

I. We have no waste container.

J. We cannot afford service fee.

K. Other reason…………………………………………………………………

13. Do you find your waste disposal arrangement convenient?

C. Yes

D. No

14. How will you describe the general waste situation in your school?

E. Very satisfactory

F. Satisfactory

G. Poor

H. Very poor

15. Does your school pay for waste disposal service?

C. Yes

D. No

16. If No, why?

E. We don't have money.

F. We are comfortable with our waste disposal method.

G. We do not generate much waste.

H. No idea

I. Other……………………………………………………………………………………

17. How would you rank sanitation in your school as compared to your community?

E. One of the cleanest schools.

F. Averagely clean.

G. Dirty

H. One of the dirtiest schools in the communities.

18. In your view, how can waste disposal be improved in your school?
…………………………………………………………………………………………………
…..

…………………………………………………………………………………………………
……**THANK YOU**

APPENDIX 14

Structure Questionnaire for Healthcare Professionals

INTERVIEW GUIDE FOR GHANA HEALTH SERVICE PROFESSIONALS:

Project Title: Evaluation of Water, Sanitation and Hygiene (WASH) Intervention Programs in Ghana. A Case Study of Three Districts in The Volta Region.

AUSTIN D. AMOAKO (ID:10875876) - BSc Civil Engineering, BSc Public Health & Allied Sciences, MSc Environmental Engineering (Water Supply and Environmental Sanitation)

PhD Environmental Science Year IV Candidate – Institute for Environment and Sanitation Studies – College of Basic and Applied Sciences,

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I am AUSTIN AMOAKO, a PhD Candidate from the University of Ghana College of Basic and Applied Sciences. This research is part of the requirement of University of Ghana for the PhD Environmental Science degree. The questionnaire is intended to evaluate WASH interventions and it is anonymous and meant for academic purpose only. For this reason, we would be grateful if you could devote few minutes of your time to fill this questionnaire.

SECTION A

1. Name of District…………………………………………………………………………….

2. Name of healthcare facility --

2. Status of healthcare facility

   A. Hospital
   B. Clinic
   C. CHIPS Compound
   D. Health Centre
   E. Other…………………………

3. Sex: ………………………………………..
4. Age: ………………………………………

5. Occupation:

   A. Doctor /Physician Assistant
   B. Nurse
   C. Laboratory Staff
   D. Environment officer
   E. Laborer

SECTION B. CLINICAL WASTE MANAGEMENT

9. Is waste generated in your healthcare facility segregated?

   A. Yes
   B. No

10. How do you rate the segregation of clinical waste?

   A. Poor
   B. Good
   C. Very Good
   D. Excellent

11. Where is clinical waste temporarily stored in your facility?

   A. Open Space
   B. Garage

C. Special Room

E. Others…………………………………………………

12. How is the storage of clinical waste awaiting transportation to the incinerator?

A. Secured

B. Unsecured

13. How do you rate the handling of clinical waste in your facility?

A. Excellent

B. Very Good

C. Good

D. Poor

14. Do you have Environmental Health and Safety officer/Unit in your facility?

A. Yes

B. No

15. Are you provided with protective clothing when handling clinical waste?

A. Yes

B. No

16. If No, what is the reason?

A. Lack of fund

B. Shortage

C. No idea

17. Have you received any training in clinical waste management?

A. Yes

B. No

18. If yes, how often do you receive the training?

A. Once a month

B. Once a year

C. Twice a year

D. No training

19. Has the training given you enough skills to manage waste according to WHO standard?

A. Yes

B. No

20. How do you rate the training?

A. Poor

B. Good

C. Very good

D. Excellent

21. Which body gave you the training?

A. MOH

B. GHS

C. Healthcare Facilities Regulatory Agency

D. EPA

E. Municipal Assembly

F. Others…………………………………………………………………………………

22. If NO, why?

A. I was never selected.

B. No training was ever organized.

C. I did not have time to attend.

D. Other……………………………………………………………………………………………

23. Who collects clinical waste in your healthcare facility?

A. Nurse

B. Labourer

C. Cleaner

D. Others……………………………………………

24. Does the person use Personal Protective Equipment?

A. Yes

B. No

C. No idea

21. How often is clinical waste collected in your healthcare facility?

A. Everyday

B. Every week

C. When it gets full

D. When it produces offensive Odour

22. How do you carry or transport clinical waste within the healthcare facility?

A. With truck

B. On shoulder

C. On head

D. With hand

23. Is there any Clinical Waste Management Facility in your healthcare facility?

A. No

B. Yes

24. If Yes, which type?

A. Autoclave

B. Incinerator

C. Microwave

D. Combustion

25. Where is clinical waste dumped?

A. Open pit

B. Back yard

C. Bush

D. Municipal waste bin

26. How do you manage or dispose liquid waste in your facility?

A. Flash it with water into sanitary sink

B. Flash it into the toilet pot

C. Pour it in a covered drain/gutter

D. Pour on the ground outside.

E. Others……………………………………………………………………..

29. How do you rate the effectiveness of clinical waste management processes in your healthcare facility?

A. Poor

B. Good

C. Very Good

D. Excellent

30. What are the guidelines and procedures taken for effective management of clinical waste in your facility? ---
----

----

31. What problems do you encounter in managing clinical waste in your healthcare facility?

A. Lack of a pedal bin

B. Lack of trained waste managers

C. Lack of managerial commitment

D. State others………………………………………………………………………………..

32. Do external regulatory bodies come to monitor and evaluate the waste management process in your facility?

A. Yes

B. No

C. No idea

33. If Yes, which external regulatory body supervises or monitors your waste management process?

A. EPA

B. Municipal Assembly

C. MOH

D. Others ………………………………

SECTION C: SANITATION FACILITIES

1. Do you have toilet facility in your health care facility?
   A. Yes
   B. No
2. What type of toilet facility do you have?
   A. Kumasi Ventilated Improved Pit
   B. Water Closet
   C. Ventilated Improved Pit
   D. Pit latrine with slab
   E. Pit latrine without slab
   F. Other…………………………………………………………………………….
3. Do you have hand washing facility in your healthcare facility?
   A. Yes
   B. No
4. Do you have waste bin in your healthcare facility?
   A. Yes
   B. No
5. Do you have separate waste bin for domestic waste storage and clinical waste storage?
   A. Yes
   B. No

6. If Yes, does the waste bin have fitting cover
   A. Yes
   B. No
7. How often do you dispose your domestic waste?
   A. Everyday
   B. Every two days
   C. Every three days
   D. When it is full
   E. Other…………………………………………………………………….
   .
8. Where do you dispose your waste?
   A. Communal refuse dump.
   B. Incinerator
   C. Backyard
   D. Bush
   E. Burring/burning
   F. Other…………………………………………………………………..

SECTION D: WATER ACCESS IN HEALTHCARE FACILITIES

34. Does your facility have water facility?
   A. Yes
   B. No

35. Who provided it?

A. District Assembly

B. NGO

C. GHS

D. Other………………………………………………………………………….

35. What type of water facility do you have in your healthcare facility?

A. Borehole

B. Mechanized Borehole

C. Piped Borne

D. Stream

E. Other……………………………………………..

36. Do you have water connected to delivery room and other wards?

A. Yes

B. No

37. Where do you fetch water from if there is no reliable water source in your healthcare facility?

A. Well

B. Stream/Reiver/Pond

C. Rainwater harvest system.

D. Buy/Tanker services

E. Other…………………………………………………………………………

38. Do you have water storage container in your facility?

A. Yes

B. No

39. If there is water in your facility, is it accessible to patients?

A. Yes

B. No

C. No idea

40. If No, where do in-patients and their relatives get water to use?

A. Home

B. Buy

C. From health workers

D. Other………………………………………………………………………………………

41. If "B" (buy), who buys it (Tick all that apply)

A. The healthcare Facility

B. Patients and Relatives

C. NGOs

D. Other……………………………………………………………………………

SECTION E: WASH-RELATED MORTALITY AND MORBIDITY RATES IN HEALTHCARE FACILITIES

41. Do your patients come with Water and Sanitation related diseases?

A. Yes

B. No

42. If Yes, which diseases are they. (Tick all that apply)

A. Typhoid fever

B. Cholera

C. Hypertitise B

D. Dysentary

E. Malaria

F. Other…………………………………………………………………………………….

43. Which of them is the highest recorded in the last 12 months?

A. Typhoid fever

B. Cholera

C. Hypertitise B

D. Dysentary

E. Malaria

F.
Other……………………………………………………………………………………….

43. What was the WASH related mortality rate in the last 1 year?

A. 0 – 9%

B. 10 – 19%

C. 20 – 29 %

D. 30 – 39%

E. Above 40%

44. How many school children report WASH related cases in your facility in a week?

A. 0 – 5

B. 6 – 10

C. 11 – 15

D. 16 – 20

E. 21 – 30

F. Above 30

**Comments………………………………………………………………………………………
…………………………………………………………………………………………………**

THANK YOU