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Assessing the Impact of Community-Led Total Sanitation and Sustainability of WASH Services in the Mion District of Northern Ghana

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Abstract:

The study was conducted in the Mion District of the Northern Region with the objective of evaluating the impact of community-led total sanitation (CLTS) and the sustainability of WASH services. The study design was mainly quantitative, in which a sample of 225 was employed to collect the data. The study found that 73.4% indicated that their toilets have hand washing facilities for washing their hands after defecating, and 62.2% of the respondents indicated that their toilets had hand washing facilities, running water, and soap for people who use their toilets. Before CLTS in the Mion District, 84.0 percent of the respondents indicated that besides the cost of constructing toilets, other factors made it difficult for them not to have toilets in their homes. Over eighty-four (84.4%) percent of the respondents indicated that they needed technical support from the government and other benevolent organizations to help them construct toilets. The study recommends that government should ensure the harmonization of CLTS activities by non-governmental organizations in the Mion District in the implementation of CLTS. Further education of community members and cooperation between governmental, non-governmental, and chiefs are essential to ensure sustainability.

Keywords: Climate change, household toilets, open defecation, sanitation, water resources

1. Introduction

Globally, achieving good sanitation has remained a mirage. Nearly 2.5 billion worldwide have no access to improved sanitation (WHO/UNICEF, 2006; WHO/UNICEF, 2013); 946 engage in open defecation (WHO/UNICEF, 2015), and over 780 million have no access to improved drinking water (WHO, 2006). As a result, the United Nations has called for ending open defecation and universal access to adequate and equitable sanitation in the Sustainable Development Goals (SDGs) (UN General Assembly, 2015). These have become a challenge in developing countries as over 80 percent of diseases are due to poor sanitation (WHO/UNICEF, 2006) and cause the death of one and a half million death in children less than 5 years (WHO/UNICEF, 2013).

In Ghana, nearly 28.0 % of the population has no access to good sanitation (Plan International, Ghana, 2013). Northern Region of Ghana is poor in sanitation. In 2006, it was reported that nearly 73% of the population was engaged in open defecation, with over two metric tonnes of human excreta generated daily. Most of the inhabitants are farmers and use human excreta to fertilize their farmlands or dispose of them away in the open fields (Plan International, Ghana, 2015). This is because the engineering land field site is only in the regional capital, Tamale.

Therefore, it was essential to introduce Community-Led Total Sanitation (CLTS) to improve sanitation in rural districts with no household toilets to protect them from sanitation-related diseases, poverty, and death. CLTS was first introduced in Ghana in the towns of Mankessim, Asesewa, and Bawjiase in the Central Region in 2006 by the Community Water and Sanitation Agency (CWSA) and was later supported by Plan International Ghana (Plan Ghana) and United Nations Children Emergency Fund (UNICEF) to scale up in 2010. As CLTS gained recognition of success, the Government of Ghana (GoG) revised the National Sanitation Policy of 1999 (Ministry of Local Government and Rural Development (Plan International, Ghana, 2013) to update its scope and to address the underlying causes of poor sanitation and improve the health of the citizens. The national environmental and sanitation policy in Ghana had a co-ordinating council mandated to acquire and protect lands for the purpose of treatment and disposal of waste; to encourage public and private developers to factor waste management in their developmental plans; to streamline the cost and payment of sanitation services; ensure the ownership of household toilets; to introduce environmental and sanitation day that will be celebrated once a year and to established bylaws to regulate sanitation and prevent pollution in their districts (Plan International, Ghana,

2015). GoG also adopted the CLTS approach as a national strategy for expanding sanitation and hygiene practices and developed an open defecation-free (ODF) protocol for assessing communities' ODF status and systems of award and recognition of ODF communities. Factors that enabled the implementation of CLTS and which could contribute to its sustainability in Ghana are supportive of government policies and strategies and national guidelines for CLTS implementation, and CLTS co-ordinating committees (Crocker & Bogle, 2015).

CLTS is a relatively new approach with both opportunities and challenges. CLTS may not be sustainable (Guiteras et al., 2015) as it is appropriate in high baseline open defecation (Crocker et al., 2016) and high social capital (Cameron et al., 2015). CLTS is more sustainable where there is a supportive enabling environment such as sufficient follow-up visits, market-access to latrine products and materials, and socially cohesive communities (Hanchett et al., 2011; Mukherjee et al., 2012; Tyndale-Biscoe et al., 2013; Cavill et al., 2014). There is limited literature on the impacts and sustainability of CLTS (Garn et al., 2016), and creating longer-term reports on sanitation impacts is a new research priority (Waddington et al., 2009).

The concept of CLTS began in the year 2000 and has since been adopted by over 60 countries, including Ghana. These countries have included CLTS in their national policies (Institute of Development Studies, 2016). CLTS appealed to strong emotions such as self-respect, shame, and disgust. A central tenet of the approach is that behavior change occurs when emotional responses are combined with cognitive understanding. CLTS uses three main triggers to bring about behavior change. Direct observation of defecation practices, hands-on demonstration, and handling of feces provoke shame and disgust when participants realize that feces can get into the body through the mouth. If this trigger is effectively executed, a collective sense of urgency for change is created. Instead of focusing on households, CLTS creates a collective sense of disgust and uses peer pressure to generate a need for collective action. CLTS uses public visual monitoring of achievement and recognition of successes. It maintains the momentum of change by motivating pride and competition to boost the household's commitments in public. A potential weakness of CLTS is that the effectiveness of the triggering process depends on external factors such as the quality of the facilitation and the degree of participation by the community (Crocker et al., 2016).

The benefits of CLTS include not having to go to the toilet before dawn or after dark, safety from the associated risks of violence in defecating in bushes and sexual abuse, time saved, and less embarrassment (Crocker & Bogle, 2015). As a result of these benefits, several agencies collaborate in implementing CLTS in rural communities. Among them are UNICEF, USAID, SNV Netherland Development Organization, Global Communities, WaterAid Ghana, World Vision International, and local organizations such as Presby Water, Catholic Relief Services (CRS), and Afram Plains Development Organization (APDO). CLTS is participatory and generally includes capacity building in addressing open defecation (Kar & Chambers, 2008; Pickering et al., 2015). Their successes have been providing water, sanitation, and hygiene through participatory rural appraisal (PRA) techniques (Crocker et al., 2016). In CLTS, the communities understand that the process is a shift towards a zero subsidy approach rather than providing them with money to construct latrines.

It is reported that the Northern Region of Ghana ranks third highest among ten Regions (before the year 2020) with 72.9 % open defecation. Since the inception of CLTS, many interventions have been made, and the Mion District is on the verge of attaining district-wide ODF. In an earlier study by Crocker et al. (2016) in Ghana, it was found that open defecation decreased in CLTS-implemented communities. Also, health extension worker-facilitated CLTS performed better than teacher-facilitated CLTS in Ethiopia (Crocker et al., 2016). However, no impact study has been conducted in Ghana to assess its successes and sustainability. The study, therefore, intends to evaluate the impact of the CLTS and its sustainability in the Mion District of Northern Region of Ghana.

2. Study Area and Methodology

2.1. Study Area

The Mion District was established on February 6, 2012, by LI 2064 and was officially inaugurated in June 2012. The capital of the district is Sang (Figure 1). The Mion District is located in the eastern corridor of the Northern Region of the republic of Ghana between Latitude 9°35' North and Longitudes 0°30' West and 0°15' East.

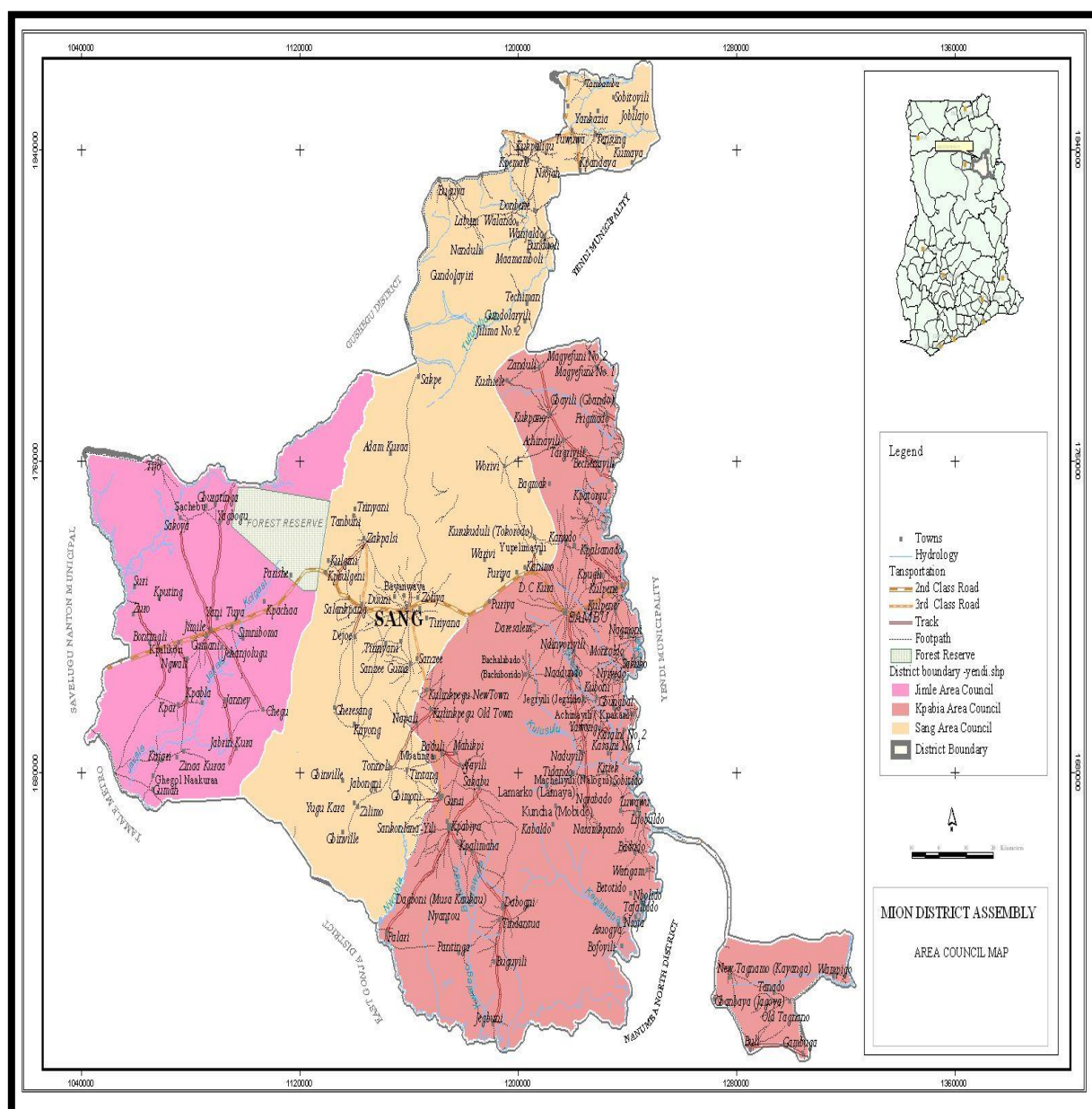


Figure 1: Map of Mion District
Source: Issahaku et al., 2022

The population of the district is 81,812 (GSS, 2014) and is varied in terms of ethnicity, with the Dagomba constituting the majority. The other ethnic groups include Konkomba, Akan, Ewe, Basare, Moshie, Chokosi, and Hausa. The population is largely rural, with 92.0 % living in rural areas.

2.2. Study Design

The study employed both quantitative and qualitative data collection techniques. Quantitative research is a formal, objective, and systematic process in which numerical data are utilized to obtain information about the work. Structured questionnaires were used for the quantitative data, while in-depth interview guides and observational checklists were used for the qualitative study. The study adopted a conceptual framework (Kar & Chambers, 2008) for sanitation assessment and monitoring.

2.3. Sample Size

The total number of households in Mion District stands at 7,139, and the average household size is 9.3, and there are three (3) Area Councils in the District: Jimle, Sang, and Kpabia (GSS, 2014). Nine (9) ODF communities were randomly selected from the Mion District Assembly for the study. The communities selected were; Jelsma No.1, Jibilajo No.2, Nkwanta, Kpumale, Macheliyili, Namoni, Motondo, Nayinkundo, Bichado. These communities were selected because:

- They were part of those communities CLTS has been implemented in the district and therefore have knowledge regarding the implementation of the CLTS and what ODF communities are,
- The community members are willing to respond to the survey questionnaire, and

- The researcher can easily get access to the community leaders to assist in the mobilization of the heads of households

A representative sample is one whose key characteristics closely approximate those of the total population. Therefore, smaller chunks of a unit sample are chosen to represent the relevant attributes of the whole of the units. A formula for determining sample size given by Krejcie and Morgan (1970) was used to have a simple random sample that is devoid of bias. Thus:

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)} \dots \dots \dots (1)$$

Where:

- S= Required sample size
- X²= The table value of Chi-square for 1 degree of freedom at desired confidence interval (3.841 or 1.96×1.96)
- N= The population size=542
- P= The population proportion (Assumed to be 0.5 since this would provide the maximum sample size)
- d= The degree of accuracy expressed as a proportion (0.05).

From the information above:

$$S = \frac{3.841(542)(0.5)(1-0.5)}{(0.05)^2(542-1) + (3.841)(0.5)(1-0.5)}$$

$$S = 520.4555 / 1.3525 + 0.96025$$

$$S = 520.4555 / 2.31275$$

$$S = 225.0375$$

$$S = 225$$

The sample size of 225 respondents was proportionally distributed to the communities based on the total number of households as given by the Mion District Assembly. The sample frame and the sample size of the communities are shown in table 1.

Name of Community	Total Households	Sample Size
Jilma No.1	26	11
Jibilajo No.2	53	22
Nkwanta	18	7
Kpumale	35	15
Wasambo - B	27	11
Macheliyili	43	18
Kubagmado	12	5
Frigmado	22	9
Tuya	21	9
Namoni	18	7
Binagmando	24	10
Motondo	23	10
Sobitido	35	15
Nayinkundo	18	7
Kuboni	39	16
Bungbali	33	14
Yawondo	30	12
Bichado	28	12
Chirizang	19	8
zanduli	18	7
Total	542	225

Table 1: Sampling Size in Various Communities

Source: Field Survey, 2020

In addition to the community survey of the 225 respondents, 15 staff of non-governmental organizations (NGOs) and ten staff of the Mion District Assembly were purposefully selected with the support of the district assembly and interviewed using an interview guide for a qualitative study. The instruments for the study were designed in line with the trainers' guide for CLTS (Plan International, Ethiopia, 2012).

2.4. Sampling Procedures

For the survey, the target population was made up of households in Mion District. Curtis (1998) suggests that it is necessary for hygiene studies to focus on households because this is the level at which internal and external processes come together to produce health. In this regard, the concept of the household was used as defined in the 2010 Population and Housing Census. For this census, a household was defined as a person or group of persons who live together in the same dwelling, share the same house-keeping arrangements, and are catered for as a unit (GSS, 2014). By this definition, family members may not necessarily be household members based on their living arrangements. In the same vein, not everyone who lives in the same house can be defined as constituting a household. Further, the length of time of stay of members was considered as some may just be visitors to the house and may not necessarily be permanent members of the

household. Therefore, the study focused on people who live in the same house and eat from the same pot and have access to the same facilities in the house at least six months before the study.

A complete sampling frame obtained from the district assembly was used to select households to be included in the study. From this list of 542 households, 225 households were chosen using a systematic sampling technique. Numbers were assigned to each household in the list, and starting from the first house, any other house was chosen until the sample size was reached. This survey targeted household heads, but in their absence, any adult (18 years and above) who was found within the household was interviewed. For the selected staff of the NGOs and the District Assembly, purposive sampling was used because of their in-depth knowledge with regards to the subject matter at hand. A total of 25 in-depth interviews were conducted by the researcher.

2.5. Pre-data Collection Procedures

Community entry can be very difficult without the use of social connections. Therefore, it was necessary to contact as many relevant people as possible. This was also necessary not only to gain access to the community but to erase as much as possible suspicion in the minds of the people. It also fostered a better understanding of the ways in which issues are handled, especially those pertaining to the study. The community entry was facilitated by the District Environmental Health Officer (DEHO) of the Mion District Assembly. The DEHO often conducts monitoring and supervision of his staff in the communities, so he is popular among the people. This goodwill was further enhanced when natives who are part of the implementation (Natural leaders) in each of the communities were made translators for the study; the community entry process was made fairly easy.

The researcher began data gathering in 2020 by first training four Assistant researchers and also familiarizing himself with the field. This was done by identifying and establishing rapport with key informants. These key informants were mostly suggested through formal and informal discussions with some of the community members. The first persons to be contacted were the assembly persons for the communities who represent the political authority at the community levels or electoral areas. They were contacted to give permission for the conduct of the study and to seek their assistance in identifying people whose views could be of immense help to the study. After explaining the intent and purpose of the study, the chiefs of the communities were met.

2.6. Data Collection

The study collected both primary and secondary data. The primary data were collected using a structured questionnaire at the household level and the district NGO staff using interview guides. The Secondary data were collected from registers of monitoring tools, quarterly reports, review reports, annual reports, and plans of district and regional environmental health and sanitation unit offices to compare with the primary data collected. The quantitative data were collected using a questionnaire, which was designed as the result of an intensive literature search, programme theory, and conceptual framework of the pre-determined questions and responses. Household heads were selected for the study. In their absence, a household member who is 18 years and above was selected for the study. During data collection, the head of households was requested for their consent to participate in the study.

The semi-structured interview guide was used to conduct in-depth interviews with key informants, including programme implementers. The information collected during the quantitative research approach was confirmed by qualitative research. The qualitative data were collected through an interview guide. The interview guide was developed after a series of conceptualizations of the literature review and programme theory of CLTs.

2.7. Data Processing and Analysis

The data were checked for distribution and outliers. The questionnaire was coded and entered using Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics was done to derive numerical and non-numerical data presentation models, including graphs, tables, and frequencies. For the qualitative data, coding was done according to the objectives that were set. Grouping of the coded data was done according to themes. Also, data were checked for consistency. The recorded interviews were transcribed for the qualitative study and used in the write-up under specific themes.

2.8. Ethical Considerations

The households were first informed of the intended survey. After agreeing to grant the interview, an appointment was booked with them. A day before the interview, the natural leaders called to remind them of the appointment. Some cancelled the meeting, rescheduled, or had someone answer the questions on their behalf. Before conducting the interview, they were assured of their confidentiality. After that, permission was sought to be allowed to record or write on a notepad with the assurance of anonymity. This is very vital because some informants are uncomfortable when they know what they are saying is being recorded and might not even provide the necessary information.

3. Results and Discussion

3.1. Socio-Demographic Characteristics of Respondents

Information on the socio-demographic information of the respondents included both males and females. The least age of the respondents was 18 years, with a maximum age of 60 years. There were a total of 225 respondents who

responded to the structured questionnaire. Out of this, 170 were males representing 75.6% of the respondents, and 55 were females representing 24.4% of the respondents (Figure 2).

This is because males are the household heads in the study district. The results showed that:

- 29 respondents, representing 12.9% of the respondents, were between 18-25 years,
- 23.6% of the respondents were between the age of 26-33 years,
- 21.3 % of the respondents were between 34-41 years of age,
- 24.4% of the respondents were between 42-49 years of age,
- 12.9% of the respondents were between 50-57 years of age,
- 4.9 % of the respondents were 58-60 years of age (Table 2)

	Frequency	Percentage
Sex		
Male	55	24.0
Female	170	76.0
Total	225	100.0
Age Group		
18-25 years	29	12.9
26-33 years	53	23.6
34-41 years	48	21.3
42-49 years	55	24.4
50-57 years	29	12.9
58 plus years	11	4.9
Total	225	100.0
Education of Respondents		
No formal education	177	78.7
Primary/JHS	38	16.9
Secondary/SHS	7	3.1
HND/Diploma	3	1.3
Total	225	100.0
Religion		
Muslims	40	17.8
Christians	94	41.8
African Traditional Religion	91	40.4
Total	225	
Occupation of Respondents		
Farmers	211	93.8
Traders	11	4.9
Government workers	2	0.9
Unemployed	1	0.4
Total	225	100.0
Household Size		
1-5	52	23.1
6-10	82	36.4
11-15	37	16.4
16-20	20	8.9
21-25	31	13.8
26 and above	3	1.4
Total	225	100.0

Table 2: Age of Respondents

Also, on education, the study revealed that:

- 78.7% of the respondents had no formal education,
- 16.9% of the respondents completed primary/JHS,
- 3.1% of the respondents had SHS education,
- 1.3% of the respondents had HND/Diploma

On the religion of respondents, the study revealed that:

- 17.8% of the respondents were Muslims,
- 41.8% of the respondents were Christians,
- 40.4% of the respondents were traditionalists

On the occupation of respondents, the study revealed that:

- 93.8% of the respondents were farmers,

- 4.9% of the respondents were traders,
- 0.9% of the respondents were government workers,
- 0.4% of the respondents were unemployed

The dominance of farming in the Mion District is because the district is rural-based. According to the Ghana Statistical Service, 92.0% of the population of the district lives in rural areas. Abramovsky et al. (2016) observed that CLTS was effective in small, rural, homogenous communities, as in the case of the Mion District.

3.1.1. Household Monthly Income

The income earned by a household is a major factor in determining the social facilities that are provided in the household. The study looked at the income of the household heads per month, which revealed that 97.3% of the respondents earn <GHC500 per month, while 2.7% of the respondents earn between GHC500-1000 per month.

3.2. Household Size of Respondents

The study indicates that:

- 23.1% of the households have a household size of between 1-5 people,
- 36.4% of the households have a household size of between 6-10 people,
- 16.4% of the households have a household size of between 11-15 people, and
- 8.9% of the households have a household size of between 16 - 20 people

Also, 13.8% of the respondents indicated that the number of people in their households was between 21-25 people, and 1.3% of the respondents have a household size of over 26 people, as shown in table 2.

3.3. Household Asset

Nearly sixty-seven (66.7%) percent of the respondents own bicycles, and 33.3 percent of the respondents do not have bicycles. Also, 52.9 percent of the respondents own radio, while 44.4 percent of the respondents do not own radio, again 1.8 percent of the respondents own Television (TV), while as high as 98.2 percent of the respondents do not own TV. It further revealed that 78.7 percent of the respondents own farm animals, while 22.7 percent of the respondents do not own farm animals. Furthermore, 77.3 percent of the respondents own farms, while 21.3 percent of the respondents do not own farms.

The study further revealed that 13.8% of the respondent's own motorbikes for personal use, while 86.2% of the respondents do not own tricycles. Again, the study revealed that 100% of the respondents do not own tricycles for transportation. Also, 26.7% of the respondents own mobile phones, while 73.3% of the respondents do not own mobile phones (Table 3).

Type of Asset	Yes	%	No	%	Total
Bicycle	150	66.7	75	33.3	100.0
Radio	119	52.9	100	44.4	100.0
TV	4	1.8	221	98.2	100.0
Farm animals	177	78.7	48	22.7	100.0
Farm	174	77.3	51	21.3	100.0
Moto bike for personal use	31	13.8	194	86.2	100.0
Tricycle for transportation	0	0.0	225	100.0	100.0
Mobile phone	60	26.7	165	73.3	100.0

Table 3: Assets of Respondents

Source: Field Survey, 2020

N=225

A study conducted by Garn et al. (2016) concluded that good sanitation communities have enough capital to acquire personal assets and live healthy life. The present study is consistent with their findings because the ODF communities had basic assets necessary for good living, at least in rural areas.

3.3.1. Availability of Household Toilet

On the question of households having toilets, the study revealed that as high as 94.1% of households had household toilets, while 5.9% of the household had no household toilets. This means that communities in the Mion district have more than the 80% thresh-hold of household toilet coverage and were therefore open defecation free. The CLTS verification protocol states that a community can become ODF if 80% of households have and use household toilets and the remaining 20% of households do not defecate in the open (WaterAid, 2013).

3.3.2. Cost of Household Toilet

The minimum amount needed to construct a basic toilet in 2012 ranged from US\$35.00 for a basic pit latrine to US\$180.00 for a VIP latrine (WASHCost, 2012), but it is now US\$283.33. Latrines constructed at cheaper rates than those quoted are at risk of long-term failures, such as the collapse of the superstructure or substructures. If construction costs are high, most poor households and vulnerable groups like the aged and the destitute cannot construct household latrines. The study suggests that households must be helped financially as a social intervention by the government. This finding is

in sync with WSP's learning strategy, which states that combining CLTS and social interventions or marketing would create sustainable behavior change and strengthen the supply of products and services (WSP, 2009). The cost of building latrines varies because of variability in the US Dollar to Ghana Cedi rate and the variability in fuel prices in Ghana. Currently, one US Dollar is about eight Ghana Cedis (1.00 US\$=GHS 8.00), and the price of petrol for a litre is 10 Ghana Cedis (GHS 10.00). The combined effect of these variables affects the cost of materials used to construct latrines in households. For example, a bag of cement in the Northern Region is Sixty-two Ghana Cedis, an equivalent of Seven US Dollars, Seventy-five cents (US Dollars 7.75), and a trip of sand is Five Hundred Ghana Cedis (US Dollars 26.5). These materials are important for the substructure. Other important factors whose costs cannot be determined in the construction of a household latrine are the cost of labour, building, and construction materials.

The survey on the type of toilet built by the households shows that 74.5% of the households built the traditional pit latrine, while 25.5% of the respondents built the improved pit latrine. This means that majority of the households in the communities built traditional pit latrine toilets in their houses.

3.4. Perceptions for Not Having Toilets in Households

Respondents indicated that households were willing to have household toilets as was found by WaterAid (2013). However, various perceived reasons were given for not having household toilets. The interviews indicated that household heads did not have money to construct household toilets because of poverty and the high cost of construction. Others said they preferred using the bush, while some said they were not comfortable defecating on another person's faeces when they were not sick. From the survey, the cost of construction of the toilet was indicated by 84.0% of the respondents as the reason why they do not have a toilet in their houses. Again, 67.5% of the respondents attributed the reason why they did not want to construct a toilet as not important for them. A further 84.4% of the respondents indicated that lack of technical support is the reason why they do not have toilet facilities in their households. Additionally, 64.6% of the respondents indicated that they were waiting for external support as a reason why they did not have toilets in their households, as shown in table 4.

Reasons	Yes	%	No	%	Total
Cost	34	16.0	178	84.0	100.0
Not important	69	32.5	143	67.5	100.0
Lack of technical support	33	15.6	179	84.4	100.0
Waiting for external support	75	35.4	137	64.6	100.0

Table 4: Reasons for Not Having Toilet in the Household

Source: Field Survey, 2020

N=225

This finding is similar to the finding of Barnard et al. (2013). Their study revealed that 72% of households had a toilet which was increased by 10% when compared with control villages in India. According to Barnard et al. (2013), the main reason for households not using the toilet was that they preferred open defecation (29%). Also, 20% said the toilets were inconvenient to them because of their smell, 23% said the toilets lacked privacy, 17% said their toilets were blocked, and 22% of the respondents used their toilets for storage purposes.

The survey looked at the availability of hand-washing facilities, and it was revealed that 73.4% of the respondents had hand-washing facilities for household members to wash their hands after defecating. The survey revealed that 62.2% of the respondents had hand-washing facilities with soap for people who use their toilets to wash their hands. This implies that people will be protected from carrying diseases from the toilets to their food or for further transmission to other people in the community.

3.5. Source of Water for Households

The source of water for the household is always a concern in the Mion District. The study showed that:

- 46.9% of the respondents depended on the river as a source of water for the household,
- 33.5% of the respondents depended on boreholes as a source of water for the household, and
- 19.6% of the respondents depended on spring as a source of water for their household, as shown in figure 2 below

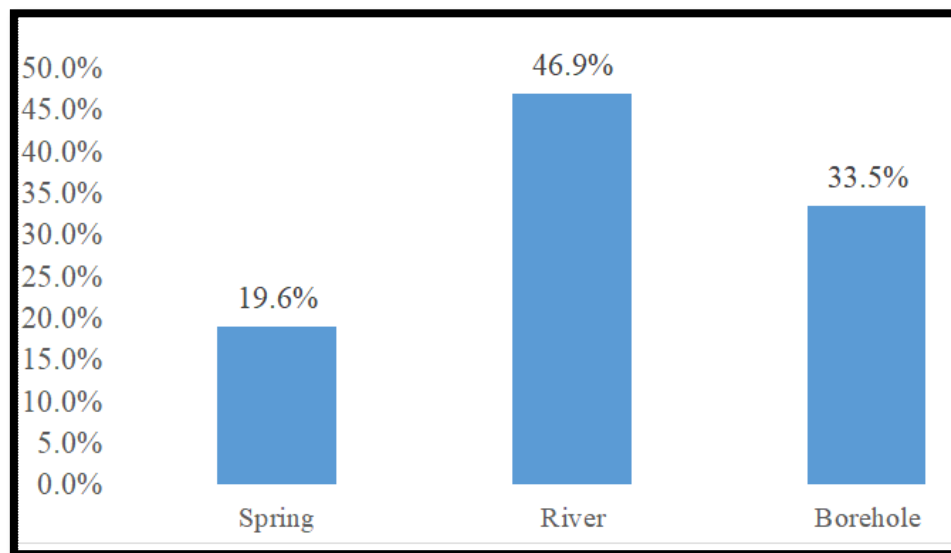


Figure 2: Source of Water for Households
Source: Field survey, 2020

The study showed that the sources of water in the district are not safe. According to Pickut (2015), clean water is safe enough to drink because it is protected at source and free of mineral and biological pollutants, so it cannot cause harm. There is, therefore, the need to monitor the drinking water sources (Bartran et al., 2014) to ensure the safety of the consumers. However, the majority of the respondents depend on river water and boreholes, which could be contaminated with pathogenic bacteria and heavy metals due to human activities and the mineralization of underlying rocks. Water is a limited resource all over the world, and increasing amounts of organic waste threaten water resources' quality and availability. Research in the Densu River basin by Karikari and Ansa-Asare (2006) concluded that microbial presence was due to contamination caused by human activities such as intensive agriculture and livestock. Groundwater resource is generally good except for some cases of localized pollution and areas with high levels of iron, fluoride, and other minerals (USAID, 2011). This is worsened by climate change, a phenomenon caused by increasing emissions of Carbon dioxide and other greenhouse gases (Nitrous Oxide, Nitric acid, Methane, Chlorofluorocarbons, etc.) and subsequently increasing temperatures in the atmosphere (Asumadu-Sarkodie & Owusu, 2016). The impact of climate change in Mion District is felt on water resources, with research showing that there is increased evaporation, decreased and highly variable rainfall pattern, and frequent pronounced flood and drought situations (Asumadu-Sarkodie et al., 2015a; Asumadu-Sarkodie et al., 2015b). The impacts of the rising temperature are felt during the dry season (December–March). In Mion District, the felling of trees for firewood, charcoal production, farming, and development are some of the human activities that contribute to climate change.

Rainwater harvesting is common in the Mion District and has great potential to increase water availability in certain localized areas (WRC Ghana, 2015). According to Anokye and Gupta (2012), Integrated Water Resources Management (IWRM) is an integrated approach that ensures public participation, the role of gender, and the recognition of the economic value of water. IWRM also advocates awareness creation of the importance of water among policy-makers and the public (Lonergan & Brooks, 1994) and involves water users in the planning and implementation of water projects. IWRM ensures that the management, operation, and maintenance of water resources are placed in the hands of community members (Anokye & Gupta, 2012; WRC Ghana, 2015).

3.6. Relationship between Socio-Demographic Characteristics and Open Defecation-Free Communities

The research sought to find out whether there was a relationship between household sizes and the type of communities within the study area. The column percentages show that there was a remarkable difference in the communities in terms of household sizes. One household toilet was enough for smaller household sizes compared to larger households with just one toilet. The inadequacy of a single toilet for larger households implies that some members of the households might engage in open defecation. The study found that a household between 1 and 5 years was dominant in Montolo at 26.9% compared to a household size of over 26 persons found at Binagmando at 66.7% (Table 5). A Pearson Chi-square of $p=0.00$ indicated that there was a strong relationship between household size and the type of communities.

Name of Community		Household Size						Total
		1-5	6-10	11-15	16-20	21-25	26 and Above	
Jilma	Count	6 _a	5 _{a,b}	0 _b	0 _{a,b}	0 _b	0 _{a,b}	11
	% within HHsize	11.5%	6.1%	0.0%	0.0%	0.0%	0.0%	4.9%
Jibilago	Count	0 _a	19 _b	9 _b	1 _{a,b}	0 _a	0 _{a,b}	29
	% within HHsize	0.0%	23.2%	24.3%	5.0%	0.0%	0.0%	12.9%
Nkwanta	Count	0 _a	7 _b	0 _{a,b}	8 _c	0 _{a,b}	0 _{a,b,c}	15
	% within HHsize	0.0%	8.5%	0.0%	40.0%	0.0%	0.0%	6.7%
Kpumale	Count	8 _a	2 _b	0 _b	1 _{a,b}	0 _b	0 _{a,b}	11
	% within HHsize	15.4%	2.4%	0.0%	5.0%	0.0%	0.0%	4.9%
Wasambo	Count	0 _a	8 _b	0 _a	3 _b	7 _b	0 _{a,b}	18
	% within HHsize	0.0%	9.8%	0.0%	15.0%	22.6%	0.0%	8.0%
Macheliyili	Count	4 _a	1 _a	0 _a	0 _a	0 _a	0 _a	5
	% within HHsize	7.7%	1.2%	0.0%	0.0%	0.0%	0.0%	2.2%
Kubbagmado	Count	5 _a	5 _a	2 _a	0 _a	4 _a	0 _a	16
	% within HHsize	9.6%	6.1%	5.4%	0.0%	12.9%	0.0%	7.1%
Frigmagdo	Count	3 _{a,b}	6 _{a,b}	2 _{a,b}	0 _b	6 _a	0 _{a,b}	17
	% within HHsize	5.8%	7.3%	5.4%	0.0%	19.4%	0.0%	7.6%
Tuya	Count	0 _a	4 _{a,b}	0 _{a,b}	0 _{a,b}	3 _b	0 _{a,b}	7
	% within HHsize	0.0%	4.9%	0.0%	0.0%	9.7%	0.0%	3.1%
Namoni	Count	0 _a	12 _{b,c}	1 _{a,c}	0 _{a,c}	6 _b	1 _b	20
	% within HHsize	0.0%	14.6%	2.7%	0.0%	19.4%	33.3%	8.9%
Binagmando	Count	4 _a	4 _a	3 _a	0 _a	2 _a	2 _b	15
	% within HHsize	7.7%	4.9%	8.1%	0.0%	6.5%	66.7%	6.7%
Motondo	Count	14 _a	4 _b	6 _{a,c}	7 _a	2 _{b,c}	0 _{a,b,c}	33
	% within HHsize	26.9%	4.9%	16.2%	35.0%	6.5%	0.0%	14.7%
Nanyinku	Count	6 _a	0 _b	5 _a	0 _{a,b}	1 _{a,b}	0 _{a,b}	12
	% within HHsize	11.5%	0.0%	13.5%	0.0%	3.2%	0.0%	5.3%
Bungbali	Count	2 _a	5 _a	9 _b	0 _a	0 _a	0 _{a,b}	16
	% within HHsize	3.8%	6.1%	24.3%	0.0%	0.0%	0.0%	7.1%
Total	Count	52	82	37	20	31	3	225
	% within HHsize	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 5: Relationship between Household Size and the Communities

Next, the study investigated the relationship between the ages of respondents and the communities of residents. The study indicated that there was open defecation in a community where children under 5 years were dominant. Similarly, the aged and the sick could not use household toilets but practice open defecation. This is because the design and construction of household toilets were not conducive to the aged, the sick, and the physically challenged persons. Persons above 60 years were dominant at Motondo with 25.0%. The Chi-square analysis suggests that there was a strong relationship between the ages of respondents and the communities they reside at a Pearson Chi-square of $p=0.00$.

Furthermore, the study investigated the relationship between sex and the ownership of toilets. The percentages for male and female residents who owned household toilets were the highest at Motondo, with 14.7% and 14.5%, respectively. There was no relationship between ownership of household toilets and sex ($p>0.05$).

In addition, the study investigated the relationship between religion and the ownership of household toilets. The majority of the respondents were Muslims (30.0%) at Jibilago and the majority of Christians (23.1%) at Motondo. The percentage of Traditional believers at Jibilago was similar to those at Motondo, with 12.8%. Those who practiced the

Abrahamic religions had more household toilets than those who practiced African Traditional Religion. This is because sensitization and education of residents on open defecation is done in the churches and mosques. The study showed that there was a relationship between religion and the communities of residents with a Pearson Chi-square of $p=0.02$.

The study showed that 93.8% of the respondents were engaged in farming. Other sectors of the economy of Mion District were the service and the sales sector. There was a relationship between the occupation of respondents and the ownership of household toilets. Those who were economically sound were able to construct their own toilets compared to those who were unemployed.

The study indicates that education was key to sanitation management. Those who were educated or had a form of education managed both liquid and solid waste better than those who had no education. It was observed that respondents bury, burn or dispose of their waste at designated places earmarked for waste disposal in the communities. Furthermore, the study looked at the presence of water for washing hands at the household toilets. Most people (13.8%) at Motondo and Jibilago had water for washing their hands. Also, 16.2% of the residents of Motondo had no water for hand washing at their toilets. The differences in percentages show that there was a relationship between water presence at household toilets and the income of respondents. The Pearson Chi-square shows a $p<0.05$ and indicates a relationship. Those who were employed could afford to buy soap for washing their hands when they visited the toilets. In the absence of soap, the residents used ash to wash their hands after visiting the toilets.

The sources of water in the communities were streams, boreholes, and dugouts. It was indicated that:

- Most people (18.4%) of households in Motondo depend on stream water,
- 17.9% of households in Jibilago depend on boreholes, and
- The percentage of those who depend on dugouts at Jibilago and Motondo was similar (12.7%)

Water availability was key in maintaining sanitation, but the residents were challenged during the dry season when the streams and dugouts were dry. During these periods, the residents competed with animals for drinking water, so some households did not have water in their toilets.

3.7. Sustaining CLTS in the Mion District

According to the WHO (2018), a toilet should not be used by more than 20 persons, but more than 15% of households had more than 20 people using household toilets in the Mion District. This puts pressure on the toilets and reduces their lifespan. Larger households should have more toilets in their homes to increase the lifespan of household toilets. In addition, separate toilets must be built for children below five years. Drop holes and chamber pots were given to children to cover the defecate, but this was not so in the study district. Hand-washing facilities, water, and soap for washing after defecation are mostly absent, defeating the essence of CLTS in the district. Also, drop holes were mostly not covered and exposed residents to the relevant transmission pathways of excreta-related diseases. Policies encouraging the safe disposal of excreta, especially child faeces, should include the promotion of supporting products such as nappies/diapers, potties, and sanitary scoops (Sultana et al., 2013) and behaviour change strategies to overcome barriers to the disposal of child faeces and water used for child bathing after defecation. Building local capacity and engaging local leaders have been reported as enabling factors for WASH behaviors, such as the sustainability of household-water treatment and storage practices (Ojomo et al., 2015) and toilets. This is influenced by the level of rural participatory appraisal during triggering and implementation (Malebo et al., (2012). The local chiefs, opinion leaders, and the youth are trained by the district environmental health officers. Trained local actors influence the behavior change of their peers (Hoque et al., 1996; Rogers, 2003). According to Foster (2013), water and soap or ash at household toilets is important for disease control. CLTS is a good intervention to control open defecation, but poverty and unemployment is a hindrance (Chambers, 2009). Residents of the Mion District must therefore be given alternative livelihoods to enable them to construct and maintain household toilets.

Water management in Ghana is regulated by the Water Resources Commission (WRC). The WRC of Ghana was established by an Act of Parliament (Act 522 of 1996) to regulate and manage Ghana's water resources and co-ordinate government policies in relation to them. Act 522 of 1996 has vested ownership and control of all water sources in the President on behalf of the people of Ghana (WRC Ghana, 2015). Ensuring an adequate supply of quality water and making it available for human use is essential (Oki & Kanae, 2006) to sustain CLTS (United Nations, 2015).

The study found out that even though most households had household toilets, they lacked soap and running water in the vicinity of toilets. This defeats the purpose of good hygiene practices since those who patronize the toilets cannot wash their hands before going to the house. Again some did not see child excreta to be harmful. So they left the excreta in chamber pots to be poured into the toilet drop holes at a time that was convenient to them. Faeces of children are tolerable to parents. As noted earlier, a mother, for instance, will experience little or no dislike in dealing with the faeces of her baby. As explained by UNICEF, the issue is not so much about closeness but the idea of innocence on the part of the child who has not yet grown fully into adulthood (UNICEF, 1999).

4. Conclusions and Recommendations

The impact of CLTS in the Mion District can be achieved if pragmatic steps are taken to ensure that household toilets are used and maintained by an adequate supply of water and soap at toilet facilities. The design and construction of toilets must be user-friendly for children, the aged, and the sick. Local materials should also be used to construct toilets to reduce costs. Some households could not construct household toilets because of the cost involved, and lack of technical support made household heads wait for external support. Soap for washing their hands is almost absent because it is expensive. The district depends on surface and groundwater, which are not treated and often dries up during the dry

season. Bush fires and tree felling for firewood and charcoal production, clearing of land for farming and development have almost depleted the vegetation cover and contributed to erosion and siltation of water sources. This has resulted in the drying up of streams, rivers, wells, and boreholes. The study recommends that materials needed for toilet construction be subsidized even though this will defeat the purpose of CLTS. Further education on sustaining CLTS and WASH services is necessary to ensure that household toilets are preserved for a longer time. Collaboration between government, non-governmental organizations, and traditional leaders is important to enforce bylaws developed by the local communities and the Mion District Assembly.

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Appendix

Indicator	Sub-Indicators
Construction, use of latrines, and cases of faecal related diseases.	<ul style="list-style-type: none"> • Number of communities signed the declaration to stop open defecation • Number of households with an improved latrine • Household utilizing improved toilets • Number of households with no toilets • Number of households with unimproved toilets • Availability of sanitation supplies • Availability of modern sanitation supplies in the area • Availability of artisans in the campaign area • Number of households with the toilet still practice open defecation • Number of cases of faecal related diseases
Hand washing at critical moments	<ul style="list-style-type: none"> • Availability of hand washing facility outside of the toilet • Availability of running water at the hand washing facility • Availability of soap at hand washing facility
Knowledge of implementers in campaign design	<ul style="list-style-type: none"> • Number of staff trained in campaign design • Number of staff trained with the ability to describe procedures • Number of artisans trained • Number of community leaders trained on data collection and follow-up
Housing and housing standards	<ul style="list-style-type: none"> • Number of households (Wall, roof, floor) built with permanent materials

Table 6: Indicators and Sub-Indicators