

Spatial Analysis of Open Defecation Sites and the Utilization of Public Toilets

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Abstract: Nearly one billion people worldwide still practice open defecation. In 2020 about 59.3% of households in Ghana had household toilets while 23% used public toilets (PTs) and 15% did not have toilets. Nearly all homes (98% of the 15%) without access to toilet facility defecate outside in bushes, fields, or gutters. About 100,336 residents of Wa town do not have household toilets. The inadequacy of both public and household toilets has resulted in the creation of several open defecation sites across the length and width of Wa. This research assessed the spatial distribution and use of PTs, and how these influence the spread of open defecation sites in the Wa township. Using a purposive sampling technique, all forty-four public toilets within the study area were included in the study. Questionnaire survey (structured) was used to collect data from respondents. Geographic coordinates of the public toilets were collected using a handheld Global Position System (GPS). The study showed that there were about 184 open defecation sites and forty-four public toilets. All the forty-four public toilets were used by an average of 8,022 persons per day. About 191 clients use each facility per day. The people without toilets in their houses had to travel about 0.1 km to 4 km to access the nearest PT if they wanted to use toilet facilities. The study therefore recommends that the Wa Municipal Assembly or the Local Authority should enact and enforce the appropriate laws that would prosecute people who practice open defecation. Finally, the Assembly should immediately construct temporary public toilets in communities with high open defecation sites.

Keywords: Household, Open Defecation, Public Toilet, Sanitation, Township

1. Introduction

According to United Nations Children's Fund [UNICEF] (2018), 892 million people still defecate in the open on a global scale [1]. It went on to say that between 2015 and 2030, at least 60 million people must give up the habit for it to be successfully eradicated. An estimated 367 million students are thought to attend schools without any sort of sanitary facilities, and over 673 million individuals still defecate in the open on a global scale [2]. Again, thirty-six (36) nations still have open defecation rates between 5% and 25% in 2022. More than one in four people continue to use open defecation in 13 nations [3].

Many nations in sub-Saharan Africa struggle with the serious environmental health issue of open defecation.

Although open defecation rates have been steadily declining since 2000, target 7.C of the Millennium Development Goals (MDGs), which called for cutting in half the proportion of the population without sustainable access to basic sanitation by 2015, was not achieved by all countries in sub-Saharan Africa [4]. According to certain projections, this can only be accomplished by 2026 at the current rate [5].

Environmental squalor has been identified as a condition that depletes a nation's resources. Poor sanitation cost the world economy US\$222.9 billion in 2015, according to Oxford Economics (2016) [6]. According to the World Bank (2012), inadequate sanitation costs Ghana's economy 420 million Ghanaian Cedis (US\$290 million, or 1.6 percent of GDP) annually. This demonstrates how a country's resources can be severely depleted by poor hygiene and sanitation [7].

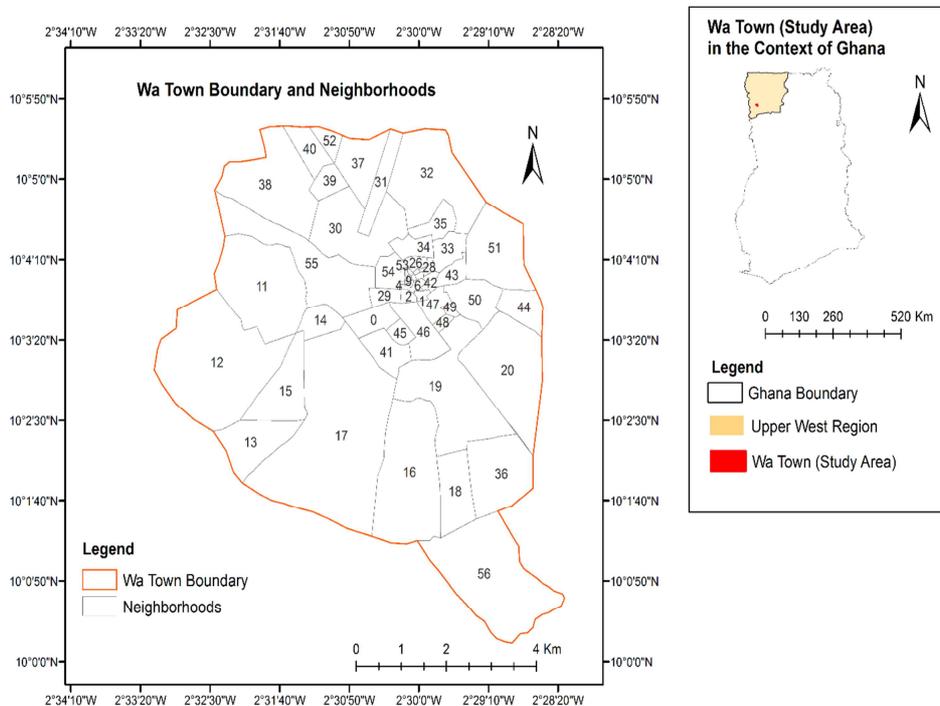
Except for sub-Saharan Africa, where rapid population growth caused open defecation to increase from 204 million to 220 million people, and Oceania, where it increased from 1 million to 1.3 million people, all sustainable development goal (SDG) regions saw a decline in the number of people who practiced open defecation [8]. Studies like those by Osumanu & Kosoe (2013), which reveal that open defecation in Ghana has increased over the years leading to many environmentally endemic health concerns, validate this knowledge. In addition to being linked to infections, malnutrition, and poverty, open defecation is typically viewed as a violation of one's dignity [9]. In addition to having the highest rates of undernourishment, poverty, and wealth inequality, the nations with the highest rates of open defecation also have the highest rates of fatalities among children under the age of five [5]. The act of open defecation (OD) contributes to the spread of the bacteria that cause diarrheal illnesses [10]. Approximately 9% of all fatalities among children under the age of five globally in 2019 were due to diarrhea, making it one of the major causes of mortality among children. Despite the existence of a straightforward treatment option, this equates to more than 1,300 young infants dying per day, or nearly 484,000 infants annually. Developing countries have the highest rates of pediatric diarrheal deaths [2].

The Ghana Statistical Service estimates that in Ghana, 59.3% of households have domestic toilets while 23% use public toilets and 15% do not have toilets. Nearly all homes (98% or more) without access to a toilet defecate outside in bushes, open fields, or gutters. In the Upper West Region, there are no toilets in about 50.5% of houses. The 50.1% who do not have household toilets defecate in chamber pots, polythene/plastic bags, beaches/water bodies, etc. [11].

In Ghana, children practice open defecation because

household or public toilet facilities are typically not made to accommodate children's requirements [12]. According to Anand (1999), low-income households don't spend more than 2–5% of their income on excreta disposal. Families can't build toilets for their homes because of financial restrictions [13]. It also contributes to people's incapacity to pay the fees levied by operators of public latrines. As a result, households that cannot afford to build a toilet facility or pay for the use of a public restroom would practice open defecation [9]. Osumanu et al. (2019) estimate that 49.8% of homes in Wa Municipality lack any kind of toilet facility and either utilize shared or public restrooms or engage in open defecation [14]. According to the 2010 Ghana Population & Housing Census, about 60,247 residents of Wa town do not have household toilets. Again the 2021 Ghana Population & Housing Census estimates that there are about 200,672 residents in the Wa township. This explains why there are consistently long queues of people waiting to use public toilets in the morning.

The inadequacy of both public and household toilets has resulted in the creation of several open defecation sites across the length and width of Wa. There are several households without household toilets within Wa Township. Therefore, this study is to spatially assess the distribution and use of public toilets, and how these influence the spread of open defecation points in the Wa township. This study is significant because it will expose and reveal all the open defecation sites, the number of people the public toilets are serving, and the consequence on the environment. This would enable the Wa Municipal Assembly (Local Government) to formulate and implement appropriate policies and strategies that will eliminate open defecation and improve public health.



Source: Ayereka et al., (2020)

Figure 1. Diagram illustrating the township of Wa.

2. The Study Area and Methodology

2.1. Study Area

The research was carried out in Wa township, the Upper West Region's capital. According to Figure 1, Wa is located between the meridian 2°33'20"W and the parallels 10°5'50"N and 10°0'0"S. Wa has a total area of 56.2 km², it is the leading and most advanced area in the Region, making up 2.6% of the nation and 32% of the region. Wa has a population of 200, 672 people (98,493 males and 102,179 females), with an annual growth rate of 2.7 percent, according to the 2021 population and housing figures. Around Wa Township are several smaller villages and towns. Wa is the capital of the region with the highest concentration of people. The city's water and sewage systems are below an average level. During the dry season, severe water shortages affect 41.3 percent of the population. Small urban water systems, wells, borehole facilities, and rainwater are the main sources of drinking water in the city [15-17].

2.2. Study Design

A cross-sectional survey was used as the study design. This design was chosen since the study was conducted over a very short period of time, and this design was chosen because it takes a methodical approach to gathering and presenting data in order to accurately reflect the circumstances of the study period. Therefore, in order to meet the study's goals, pertinent data were collected from a cross-section of populations.

2.3. Data Collection and Study Instrument

Visits were made to each PT in the Wa Township. When a PT was visited, a GPS tool known as etrex SUMMIT GARMIN was deployed to record the location of the site. To capture the coordinates, the Global Position System tool was positioned near to all the public toilets. The public toilet's coordinates both latitude and longitude were translated to decimal degrees from seconds, minutes, and degrees. The study assessed the PTs maintenance structure including the management structure, construction details, PT type, and state of the PT. These visits aided in evaluating the cleanliness and hygienic conditions of public restrooms. Additionally, it was to comprehend and feel what it was like to use these restrooms. Each time, Sony ZV-1F Vlog camera was used to snap pictures of the PTs' locations and environs. Structured questionnaires were used to collect data from respondents. These respondents included public toilets attendants and public toilet managers. The research assistant read a set of questionnaires to each participant, who then responded, and recorded their responses. This was done to make sure that all the respondents understood the questions.

All PTs within the study area were included in the study. Interviews with every PT attendant was also conducted. Interviews were conducted with officials and organizations involved in Wa Township's sanitation management. The supervisor of each division within the local government was also chosen for the study. Each supervisor's immediate

assistant was chosen in his or her absence. Eight division supervisors were interviewed as part of the study.

Using an interview outline, officials from institutions in Wa responsible for maintaining hygiene were interviewed. The research assistants read questions and recorded responses. The following officials were interviewed, the planning officer from the local government, municipal engineer, and the municipal sanitation officer. In the absence of the officer, the officer's assistant or representative was interviewed. Two (2) qualified research assistants assisted in conducting the interviews. First, they received a full day of instruction and orientation. The data was gathered over three months. The study questionnaire and interview guide were pre-tested in similar settings, with many traits with Wa Township after the research assistants had been trained. All potential issues were found and fixed before the study started.

2.4. Data Analysis

The decimal degrees of geographic coordinates were transferred onto excel template, entered onto the Arc-Map program, finally transformed into points. The transformed points received attribute data, these include the categories of public toilets, the seat quantities, etc. The projected Universal Transverse Mercator Zone 30 North replaced the normal World Geographic System 1984 (WGS 84) projection parameters. After overlaying it with existing national shapefiles, layout maps were created displaying the spatial distribution of the different public restrooms in Wa Township.

Statistical Product and Service Solution was used to analyze field data. To make the raw data easier to enter the computer software, responses were coded by allocating numbers. Simple answers to non-close ended inquiries were sorted into a common group until every conceivable type was collected, in order to establish a nominal scale category for the variables under study. Then, the data was cleaned up and modified to make sure that the data entry was accurate and free of any code errors. When applicable, descriptive statistics like tables and frequencies were used to present the results. The study's goals, themes, and categories were created using the information gleaned from the in-depth interviews. The emerging narrative elements were listed, and dialogue examples that illustrated each subject were shown. This was carried out following the transcription and translation of the field data. Following that, issues discovered during the interviews were presented and examined.

3. Results and Discussions

3.1. Socio-Demographic Profile of Respondents (PT Attendants)

This section of the report presents the socio-demographic profile of respondents. These include the sex distribution, religious distribution, ethnic distribution, and marital status of

respondents in the study area. This section is important in respect of the fact that it provides the researcher with the opportunity to establish if there is a relationship between these characteristics and their behavior concerning the subject matter.

Table 1. Socio-Demographic profile of Respondents.

| | No. | Percentage |
|-------------------------|-----|------------|
| Sex | | |
| Men | 26 | 59 |
| Women | 18 | 41 |
| Total | 44 | 100 |
| Ethnicity | | |
| Wala | 22 | 50 |
| Dagarti | 20 | 45 |
| Other (s) | 2 | 5 |
| Total | 44 | 100 |
| Educational Status | | |
| No formal education | 26 | 56.8 |
| Primary | 3 | 9 |
| Junior High School | 4 | 9.1 |
| Senior High School | 4 | 9.1 |
| Middle School | 7 | 16 |
| Total | 44 | 100 |
| Religious Association | | |
| Christians | 21 | 49 |
| Moslems | 22 | 50 |
| African Tradition (ATR) | 1 | 1 |
| Total | 44 | 100 |
| Age | | |
| 18 – 30 | 10 | 23 |
| 31 – 50 | 13 | 30 |
| 51+ | 21 | 48 |
| Total | 44 | 100 |
| Marital Status | | |
| Single | 4 | 8 |
| Married | 33 | 75 |
| Divorced | 2 | 5 |
| Widowed | 5 | 12 |
| Total | 44 | 100 |

Source: Field survey, (2020)

3.2. Gender of Public Toilets Attendants

Interviews were conducted with forty-four respondents; 26 of them were male representing 59%, and 18 of them were female representing 41%.

3.3. Educational Status of Respondents

Twenty-six (26), representing 57% of the respondents, did not have any formal education. Eighteen (18) attendants representing 43.2% had basic to high school education.

It should be noted that none of the workers or toilet attendants had any training in the management of the facility.

3.4. Marital Status of Respondents

Many of the respondents—approximately 33 representing 75% — were married, followed by five (5) widows representing 12%, four (4) never married representing 8%, and finally two (2) divorced respondents representing 5%.

3.5. Location of Public Toilets

According to the map below (figure 2), the geographic spread of the Public Toilets indicates that a significant number of them were in economically disadvantaged local communities, the central business district, or at 'hybrid locations' serving households, market men and women, and the traveling population. Communities that are located within this geographical area include Wapaani, Zongo etc. There were few public toilets in affluent neighborhoods and newly constructed areas like the Danko Extensions, Catering Rest Houses, Social Security Insurance Trust (SSNIT) apartments, and others. This is because these communities/areas are well-planned, and each household had a toilet.

The study discovered forty-four public toilets within the study area. There are two water closet public toilets which were constructed and operated by businessmen and women. The remaining forty-two are Kumasi Ventilated Improved Pits (KVIP) and are owned by the Wa Municipal Assembly. Two of the 42 KVIP public toilets were under renovation and not functional. The Assembly has, however, sub-leased these public toilets to individuals who pay monthly fees to the Assembly based on the Memorandum of Understanding (MOU) signed. Unfortunately, both parties do not honor their part of the agreement. The public toilets are mostly hijacked by members of the ruling government’s political party. They do not often pay the monthly sub charges while the Assembly also does not honor its annual maintenance duties.

These public toilets are mostly located within the central business district and low-income communities. Most of the low-income communities do not have household toilets and the Assembly provided these public toilets to reduce the rate of open defecation. According to van Welie et al., (2018), the lack of public toilets is mostly reflected in spatial disparity in many low-income nations and areas [18]. Figure 2 shows how the public toilets are densely located within certain areas or communities. Some communities do not have any public toilets but there are some households within these communities who do not have household toilets. There is an inequality in demand matching due to the mismatch between the population and the number of public toilets in densely populated areas of developing nations [19].

Additionally, there are still numerous outdated habits associated with using toilets in public places. Some people do not take good care of public facilities because they are provided by the government [20]. There are some communities without public toilets because they mismanaged the one provided for them. Some community members sometimes refuse to pay for using the facility. Others break into the facility in the night when no attendant is available. These practices and bad habits have destroyed public toilets within some communities. The attendants depend on payment from clients to hire people to clean the facilities. They also use part of the money to repair broken walls, windows, doors and rent the cesspit emptier to drain the overflowing pits. The lack of payment by users forces the attendant or manager out of business. The attendant is not able to do this maintenance work

and finally the facility breaks down.

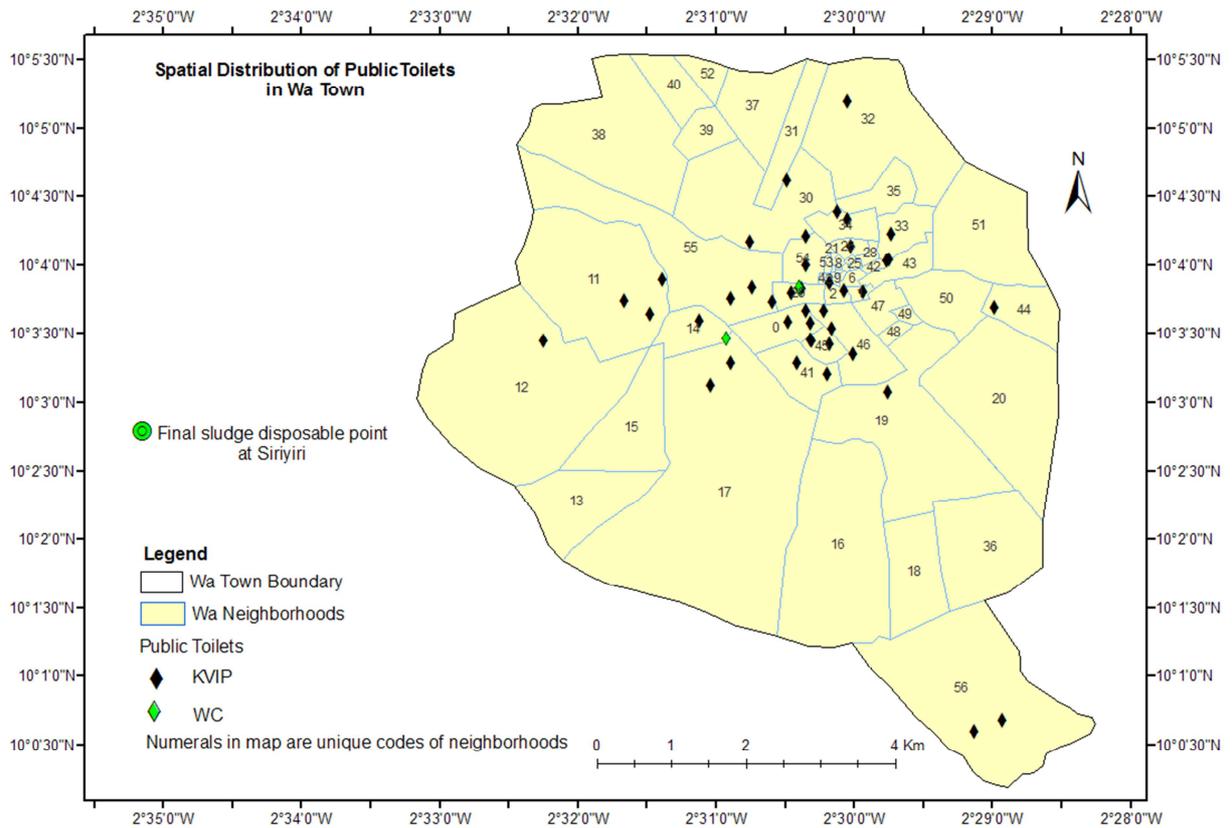


Figure 2. Locations and types of PTs.

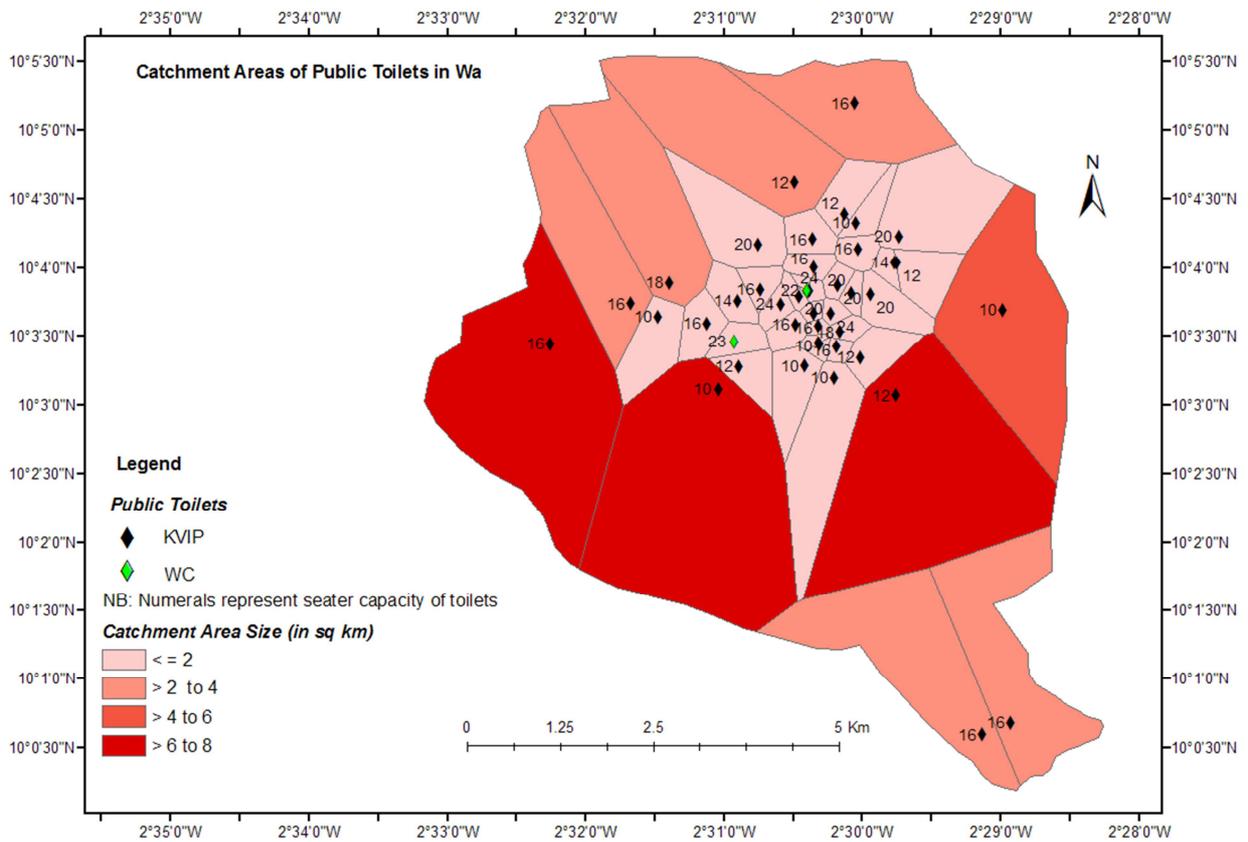


Figure 3. PTs locations with their number of squat holes and the geographical area it serves.

Upon closer inspection of some of the public toilets, the wire mesh that was supposed to be at the vent pipes' ends was clearly missing. Vent pipes and cubicle door locks were also broken. One could see lizards and rodents playing around the public toilets. Some of the pits and squat holes were overflowing with feces attracting flies. People living near these public toilets could smell the bad odor coming out from these facilities. One would ask how are these people living here able to survive with these flies and bad odor? The Public toilets are a health risk to the people using them and those living close to them. People using toilets in public places in towns and communities face health risks. When evaluating toilets in

public places, cleanliness ought to be the priority [21].

3.6. Calculation of Average Fecal Sludge Collected in a Year by 41 Public Toilets in Wa Township

Formula:

$$Q = S \times N$$

Where Q is the average quantity, S is the average size of a cesspit emptier, and N is the number of times draining is done in a month. NB: the average size of a cesspit emptier in Wa is 9.1m³.

Table 2. The calculation of average fecal sludge.

| Frequency | Average size of a cesspit emptier (S) | Number of times in a year (N) | Average quantity (Q)=T*S*N |
|-----------|---------------------------------------|-------------------------------|----------------------------|
| 5 | 9.1 m ³ | 1 | 45.5 |
| 1 | 9.1 m ³ | 2 | 18.2 |
| 2 | 9.1 m ³ | 4 | 72.8 |
| 2 | 9.1 m ³ | 6 | 109.2 |
| 15 | 9.1 m ³ | 12 | 1,638 |
| 12 | 9.1 m ³ | 24 | 2,620.8 |
| 4 | 9.1 m ³ | 36 | 1,310.4 |
| TOTAL 41 | | | 5,814.9 |

Source: Field survey, (2020)

An average of 484.575 m³ of fecal sludge was drained by 41 public toilets every month. Therefore, in a year, an average of 5,814.9 m³ fecal sludge is collected from these 41 public toilets.

3.7. Drainage of Fecal Sludge

Only two institutions have septic trucks within the study area. Zoomlion Company, which is a private company, has

one truck whiles the Local Government also have one truck. About 79% of all public toilets rely on the local government septic truck to drain all their fecal sludge when they are full. The sludge of the other public toilets (16%) is drained by a private company known as Zoomlion company. Only 5% of the public toilets convert their fecal sludge into bigas. The table below shows the number of times public toilets were drained in the various public toilet facilities in Wa Township.

Table 3. Number of Times Toilets Are Drained.

| No. | Name Of Toilet | Community | Freq of Drainage Annually | Freq of Drainage Monthly |
|-----|------------------|---------------|---------------------------|--------------------------|
| 1 | Dobile Dopiani | Dobile | 1 | |
| 2 | Dobile | Dobile | 10 | 1 |
| 3 | Kpaguri | Kpaguri | 12 | 1 |
| 4 | Dokpong | Dokpong | 2 | |
| 5 | Wapaani | Wapaani | 6 | |
| 6 | Limanyiri Model | Limanyiri | 36 | 3 |
| 7 | Sandamuni | Sandamuni | 24 | 2 |
| 8 | Bamaho Somboyiri | Bamaho | 1 | |
| 9 | Bamaho | Bamaho | 1 | |
| 10 | Tampaal Paani | Tampaal Paani | N/A | N/A |
| 11 | Dodoli Limanyiri | Dodoli | 6 | |
| 12 | Sombo | Sombo | 1 | |
| 13 | Dodoli | Dodoli | 12 | 1 |
| 14 | Jeijeiriyiri | Jeijeiriyiri | 4 | |
| 15 | Kpaguri Yiziiri | Kpaguri | 12 | 1 |
| 16 | Kambale Paani | Kambale | 36 | 3 |
| 17 | Mangu 2 | Mangu | 2 | |
| 18 | Mangu 1 | Mangu | 12 | 1 |
| 19 | Kpaguri Ganya | Kpaguri | | |
| 20 | Nuuriya | Nuuriya | 12 | 1 |
| 21 | Tindamba Primary | Tindamba | 12 | 1 |
| 22 | Konta | Konta | 12 | 1 |
| 23 | Kabanye 3 | Kabanye | 24 | 2 |
| 24 | Zongo 1 | Zongo | 24 | 2 |
| 25 | Zongo | Zongo | N/A | N/A |

| No. | Name Of Toilet | Community | Freq of Drainage Annually | Freq of Drainage Monthly |
|-----|-----------------|-------------|---------------------------|--------------------------|
| 26 | Zongo 2 | Zongo | 24 | 2 |
| 27 | Kabanye 1 | Kabanye | 24 | 2 |
| 28 | Sokpariyiri 1 | Sokpariyiri | 24 | 2 |
| 29 | Sokpariyiri 2 | Sokpariyiri | 24 | 2 |
| 30 | Kabanye 2 | Kabanye | 24 | 2 |
| 31 | Nayiri | Nayiri | 24 | 2 |
| 32 | Limanyiri | Limanyiri | 12 | 1 |
| 33 | Tagreyiri | Tagreyiri | 24 | 2 |
| 34 | Wapaani 3 | Wapaani | 12 | 1 |
| 35 | Wapaani 2 | Wapaani | 36 | 3 |
| 36 | Wapaani 1 | Wapaani | 24 | 2 |
| 37 | Central Mkt | Kejetia | N/A | N/A |
| 38 | Sokpariyiri 3 | Sokpariyiri | 12 | 1 |
| 39 | Kumbiehi | Kumbiehi | 1 | |
| 40 | Banugoma | Banugoma | 12 | 1 |
| 41 | Mangu | Mangu | 12 | 1 |
| 42 | Fadama | Fadama | 24 | 2 |
| 43 | Wapaani 4 | Wapaani | | |
| 44 | Dobile-Low Cost | Dobile | 12 | 1 |

Source: Field survey, (2020)

3.8. Wa Township's Projected Average Population of Users of Public Toilets

About 8,022 individuals used PT within the study area on a daily average, with 191 individuals using each PT. In places with a lot of everyday human activity, there was a high level of patronage of PTs. The large volume of usage from visitors as well as locals may be the reason for the high patronage.

Examples of people who use the PTs in these areas are market vendors, drivers, and passengers.

The KVIP recommended limit is one squat hole per 50 persons [22]. According to the research, the number of squat holes in public toilets within the study area ranges from 10 to 24, with an average of 12 squat holes accommodating 600 individuals. This suggests that the population in many communities outgrew the capacity of the PTs.

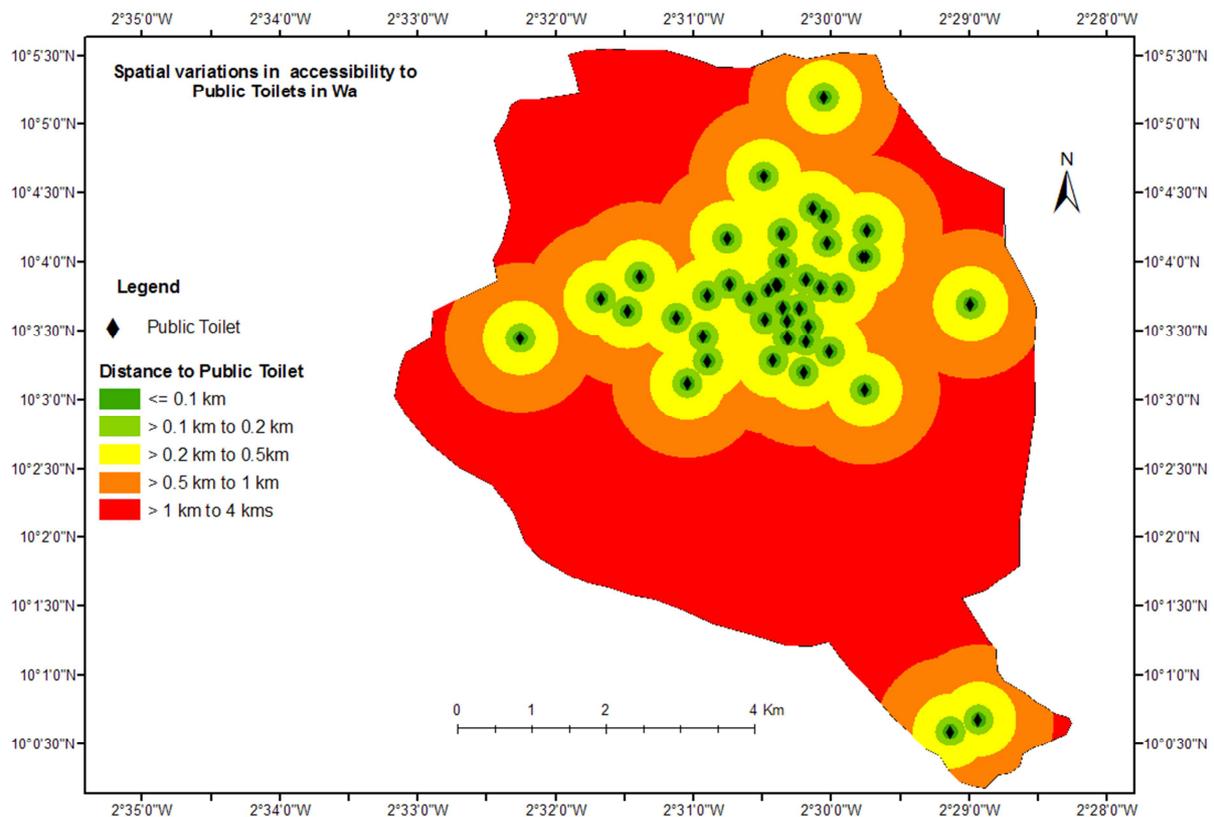


Figure 4. Projected number of people within travel distance to the nearest Public Toilet.

Toilets in public places should be placed where people basically and simply anticipate them to be (walkable

distance); as a result, people must easily be able to locate them. The standard of living may be raised if there were an appropriate supply and distribution of public toilets with better sanitation. According to Standard DB11/T 190-2016, the distance between public toilets in residential areas should be between 300 and 500 meters, and each pedestal or squatting pan should have a daily capacity of at least 25 to 30 people, depending on the density of the local resident population [21]. Therefore, there is an unequal distribution of public toilets within Wa township. Ameyaw and Odame (2017), Musa (2015), and O'Connell (2014), among others, claim that open defecation is caused by lengthy walking distances from the facility, insufficient public toilets, people's behavior, and cultural norms, the expense of user fees, and the filth of the public toilet environment [23-25]. Moreira et al., (2021) state that it is presumed that availability was not taken into consideration while planning if the user feels that the distance to a nearby public restroom is significant. The accessibility of a public toilet is an essential component [26].

The public toilet should be accessible to any member of the public with no distance or physical barriers [27, 28]. Serviceability and distance, which are primarily represented in the balanced geographical distribution and the alignment with population demands, is the key feature of public toilets [29]. Open defecation and other practices that have a detrimental influence on public health may be avoided if public toilets are easily accessible and well-maintained [30].

According to Oduro-Kwarteng (2009), many homes were built without consideration for the provision of household toilets. Because of this, some households struggle to find enough room to build a toilet, which contributes to the practice of open defecation [31]. These results imply that a wide range of factors affect the practice of open defecation. Therefore, it necessitates that different social actors develop an all-encompassing strategy [32].

Table 4 shows an estimation of the population within each distance range.

Table 4. A projection of people within travel distance from household to the nearest PT.

| Distance to Public Toilets (a) | Area within each range (b) | The density of Population without toilets in 2012 (c) | Population without toilet within each distance range (b*c) |
|--------------------------------|----------------------------|---|--|
| <= 0.1 km | 1.3 sq km | | 2321 |
| > 0.1km to 0.2km | 3.3 sq km | 1,785.3 persons per sq km | 5892 |
| >0.2km to 0.5km | 10.1 sq km | (100,336/56.2) | 18032 |
| >0.5km to 1km | 14.2 sq km | | 25352 |
| >1km to 4km | 27.3 sq km | | 48739 |
| Total | 56.2 | | 100,336 |

Source: Field survey, (2020)

From the above, it shows that people without toilets in their houses had to travel about 0.1 km to 4 km to access the nearest public toilet if only they wanted to use toilet facilities. Many impatient people are forced to use neighboring bushes or unfinished constructions as defecation sites. While waiting for their parents every morning, several kids defecate near these public toilets. Due to these practices, open defecation is highly common both in the Wa Township and throughout the country [33]. One of the contributing factors to open defecation is the unavailability of both private and public toilets. Other contributing causes are lack of finance, failure to enforce open defecation laws, and lack of knowledge about open defecation laws [32]. Another area of concern is economic difficulty, such as the expense of building a toilet in their homes and the token fee they must pay to use PTs [32].

The limited number of PTs provided could not accommodate the large number of individuals who do not have personal toilets and would like to use the nearest PT. For instance, the 16-seater capacity of a public toilet could not meet the demand of 1,785 persons per sq. km as shown in Table 4 above, if all these people were to use these public toilets. This explains why people practice open defecation in the township. People who could not travel this far and/or wait in long queues had to resort to open defecation. It was a common practice to see people defecating in the open, especially at night and early morning when the area was still

dark. Children, the physically challenged and the aged defecate in the open field even in the daytime, others use the 'chamber pot' and later pour the feces into open gutters etc. For example, there was a big drain/gutter around the Suuriyiri area where residents used to defecate when the place is dark or during mid-night. This was due to the fact that the nearest PT was far from home, making the usage of the drain the favored option. According to Knight and Bichard (2011), women, children, the handicapped, and the elderly are frequently overlooked when it comes to PT establishment. Ensuring that citizens have access to public toilets is critical to eliminating a significant obstacle to greater involvement in social life or engagement [34]. The demand for public toilets from particular populations including women, children, and the disabled is also rising dramatically as a result of the population's fast aging and the greater openness of human socioeconomic activities [35-38]. Children do not use public toilets, which suggests that a sizable portion of the population in these neighborhoods are defecating in inappropriate places since people without access to toilets at home have no other choice but to use public toilets [39].

However, the law enforcement agencies in Wa township are not enforcing the law by prosecuting offenders. The practice of open defecation is becoming normalized within the township because no one is interested in enforcing the laws. According to Marfo et al., (2019), banning open

defecation will lessen fly nuisance and eliminate the foul odor that is permeating the township. Because open defecation contaminates the environment's air and water. The

air becomes foul-smelling and unsightly as a result. Additionally, it degrades the environment's natural beauty and causes it to smell [32].

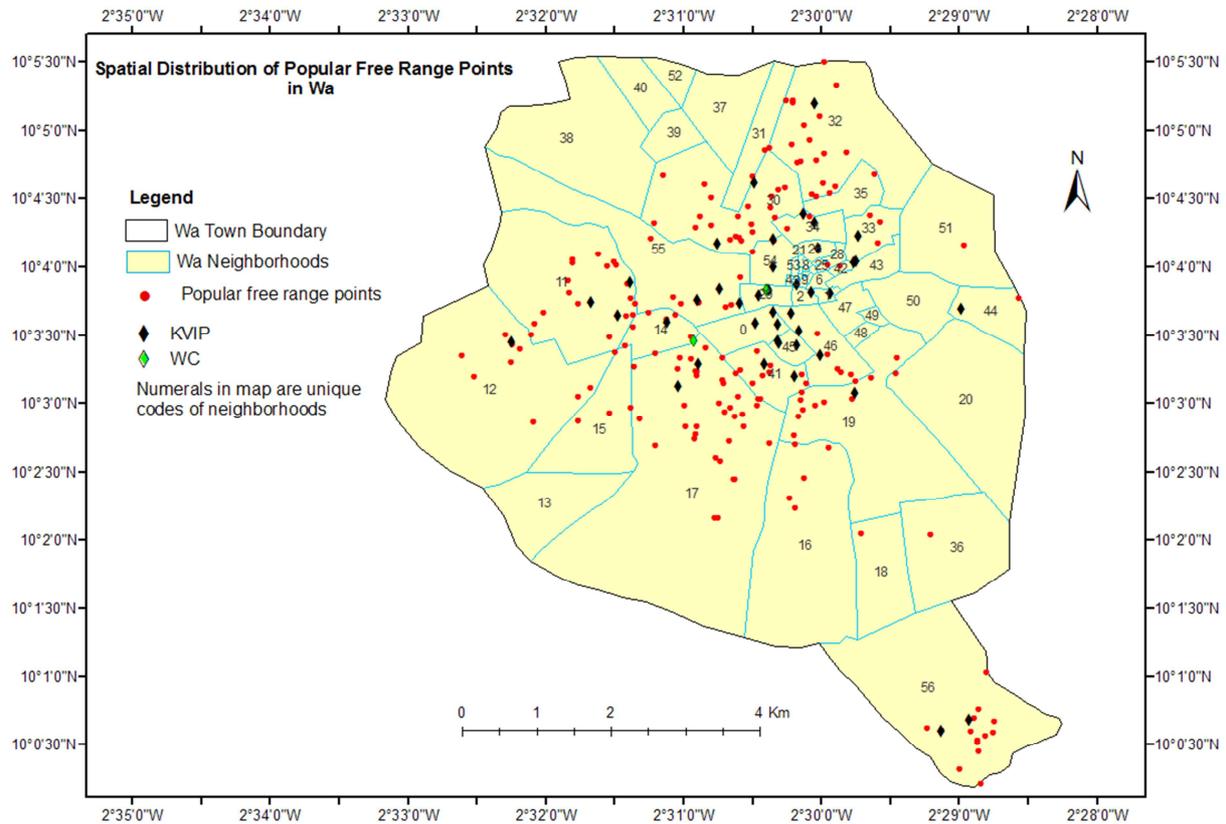


Figure 5. Locations of popular 'free range' areas and the types of PTs.

The 184 red spots show the open defecation sites in Wa Township. There are several communities within the township without public toilets even though most of the households in these communities do not have household toilets. These households without toilets rely on open places, uncompleted buildings, gutters, etc. for defecation. A visit to all these open defecation sites revealed that the local people practiced open defecation at any time of the day. This corroborates with Selby [39] that the act of defecating indiscriminately in bushes, valleys, and ridges is practiced in broad daylight or at night, despite the numerous hygiene educational campaigns. Open defecation is a major challenge in Wa municipality [24]. Open defecation is an issue in every neighborhood, and it has been stated that factors including cost and hygiene discourage people from using public toilets. Families with more children and those suffering from diarrheal disorders are said to find the costs to be particularly onerous [30].

The study revealed that in communities such as Zongo, Limanyiri, Nayiri, Sokpayiri, etc. where there were no spaces such as open fields and uncompleted structures for open free defecation, residents without toilets heavily relied on public toilets. Because these were areas of very brisk commercial activities people made use of every available space for

constructing shops, banks, and private offices. People in these areas used the public toilet facilities during the daytime hence open defecation was minimal compared to other areas such as Mangu, Kumbiehi, Bamaho, Sombo, Konta, Napogbakoli, Kpaguri, etc. as shown in table 6 below, where there were spaces (open field, uncompleted structures, etc.) that promoted open defecation. In addition to the above, these were also areas where there were more students from the SD Dombo University of Business and Integrated Development Studies and Wa Technical University. Most Landlords in these areas took advantage of the high demand for rooms, converted household toilets into bedrooms, and rented them out to students. People in these houses had to resort to public toilets. This put pressure on the few available public toilets. Thereby increasing the number of 'free range' points in these areas. According to Amato *et al.*, (2022), increased access to public toilets will reduce the number of people who practice open defecation and therefore will reduce the number of open defecation spots [47].

In high residential areas such as SSNIT Guest Houses, SSNIT Flat, Catering Rest Houses, Government Bungalows, Nurses Bungalows, Ministries, and Security Services, there were no 'free range' points because there were household toilets found in every household in those communities.

Table 5. Category and number of Popular 'Free Range' points in Wa Township.

| NO. | Categories of Popular 'Free Range' points | No. of points within each category |
|-----|---|------------------------------------|
| 1 | Uncompleted building | 43 |
| 2 | Refuse dump | 13 |
| 3 | Open field | 63 |
| 4 | Bush | 46 |
| 5 | Gutter | 12 |
| 6 | Forest reserve | 2 |
| 7 | Around public toilet | 5 |
| | TOTAL | 184 |

Source: Field survey, (2020)

The research showed that open defecation sites were 184 within the Wa Township. World Bank (2015) corroborates these findings that even though open defecation is mostly a rural occurrence, 8.22% of the urban population in sub-Saharan Africa is thought to engage in the practice [8]. The practice of open defecation in urban settings requires attention since studies have shown that it has negative health effects that are more pronounced when there is a large population density (especially for early life health). For instance, open defecation is twice as problematic in areas with higher average population densities as in areas with lower average densities [40].

In the Wa Township, open defecation is alarmingly prevalent, placing locals at risk of cholera, diarrhea, and other sanitation-related illnesses including typhoid. According to a recent study by Kosoe and Osumanu (2018), 52% of families in the Wa Municipality lack a toilet facility at home and must instead use nearby bushes, unfinished structures, and open areas. Human waste, some of it wrapped in black polythene bags, is discovered in open areas and between houses, where it attracts flies and gives off an unpleasant odor. The presence and smell of human waste in residential areas degrades the visual appeal of the area and humiliates both locals and tourists who visit the town [12]. For instance, the World Health Organization's Country Office in Ghana reported that as of December 2014, 243 deaths (a case fatality rate of 0.8%) from 130 out of 216 districts in all 10 regions of the country were the result of the cholera outbreak in Ghana, which began in June 2014 [41]. The research went on to say that there was a significant possibility of cholera spreading given the ongoing existence of risk factors such as a lack of access to potable water, poor dietary and personal hygiene, and improper handling of liquid and solid waste [32].

Open defecation again has a bad impact on both people and the environment. Nations cannot risk allowing open defecation because the social consequences are too great for the general populace to bear. By contaminating water sources, open defecation threatens environmental security [42]. Most water sources are contaminated with human excreta during floods which is common in some communities in the northern parts of Ghana [49]. Human existence depends on water, which must be free of harmful bacteria. About 400,000 children under the age of five still perish each year or 1,000 everyday due to a lack of safe water, sanitation, and hygiene facilities. The main causes of diarrheal illness, the fourth most common cause of mortality in children under five worldwide, are contaminated drinking water, inadequate sanitation, and poor hygiene. In addition to being

lethal, persistent diarrhea prevents kids from absorbing nutrients, exacerbating malnutrition. Stunting, which affects about one-quarter of young children worldwide and harms long-term cognitive and physical development, can eventually arise from this. With access to safe water, sanitary conditions, and good hygiene in homes, healthcare facilities, and educational institutions, many deaths including those caused by diarrheal illness and soil-transmitted intestinal worms can be avoided [43].

The bacterial disease cholera, which is fatal but treatable, is typically spread by contaminated drinking water and can be fatal if left untreated in just a few hours. The condition affects young children most severely, especially those under the age of five. Cholera is particularly dangerous and deadly for the millions of children throughout the world who already deal with comorbidities related to malnutrition and other disorders. Cholera outbreaks have erupted after 2021 in numerous nations that had not seen them in years [43]. Prioritizing water conservation, environmental protection, and improving toilet conditions should be done. According to Farahani et al., (2010), a 10% increase in public health spending was shown to lower the average death rate by 2%. Empirical research conducted in India has demonstrated that increasing toilet use has a substantial impact on reducing infectious diseases [44].

Table 6. Popular 'free range' points within the areas in Wa Township.

| NO. | Areas / Community | No. of Popular 'Free Range' Points within the area |
|-----|-------------------|--|
| 1 | Tindamba | 11 |
| 2 | Jejeidayiri | 2 |
| 3 | Kabanye | 1 |
| 4 | Wapaani | 5 |
| 5 | Dobile | 15 |
| 6 | Kpaguri | 26 |
| 7 | Bamaho | 15 |
| 8 | Napogbakoli | 11 |
| 9 | Danko Extension | 1 |
| 10 | Kambali | 11 |
| 11 | Konta | 17 |
| 12 | Dodoli | 9 |
| 13 | Tampaal Paani | 3 |
| 14 | Kumbiehi | 17 |
| 15 | Airstrip | 6 |
| 16 | Sombo | 11 |
| 17 | Mangu | 18 |
| 18 | Airport West | 3 |
| 19 | Fadama | 1 |
| 20 | Sawaaba | 1 |
| | TOTAL | 184 |

Source: Field survey, (2020)

The inadequacy of both public and household toilets within the Wa township has resulted in the creation of several open defecation points [48]. These open defecation points are popularly known as ‘free range’. The communities with high numbers of open defecation points (free range) are communities with very low numbers of household toilets. These communities are also low-income communities.

Communities with high numbers of open defecation sites are mostly inhabited by low-income families and students from the University for Development Studies and Wa Technical University. These schools do not have enough residential facilities to accommodate all their students. Those who do not get accommodation on campus have to rent from low-income households within the Wa township. Most of these students find themselves within communities such as Dobile, Kpaguri, Bamaho, Konta, and Mangu. They stay in low-income communities because these communities charge very low house rent but these houses lack basic social amenities such as toilets and water. These students must manage with houses without toilets because they are not able to afford the expensive houses with toilets and therefore must resort to open defecation every day. This is corroborated by Norén (2010) and Stanwell-Smith (2010) that the unavailability of PTs promotes defecation and urination in unauthorized places, creating issues about public health and inconvenience [45, 46].

4. Conclusions

The study revealed that there were about 184 open defecation sites, 42 functional public toilets, and 2 unfunctional toilets. About 8,022 individuals used all PT within the study area on a daily average, with 191 individuals using each PT daily on average. In places with a lot of everyday human activity, there was a high level of patronage of PTs. The large volume of usage from visitors as well as locals may be the reason for the high patronage. Examples of people who use the PTs in these areas are market vendors, drivers, and passengers.

Again, the people without toilets in their houses had to travel about 0.1 km to 4 km to access the nearest public toilet, if only they wanted to use toilet facilities. The capacity of the limited existing PTs could not support the increasing demand of residents without household toilets who depend on these facilities. For instance, the 16-seater capacity of a public toilet could not meet the demand of 1,785.3 persons per sq. km.

The 44 public toilets within the Wa township are not able to accommodate all the people who do not have household toilets and the transient population. This has resulted in the creation of a lengthy line-up of clients waiting to utilize the facilities when it is their turn, especially early morning. People who cannot wait resort to any neighboring uncompleted or abandoned structures, refuse dumps, open spaces, big gutters, etc. for defecation. Again, walking a long distance to the nearest public toilets can sometimes be stressful for some people, especially children, the aged, physically challenged people, the sick, etc. Most of these

people are compelled to practice open defecation. It is a common practice to see people engaging in open defecation during the evenings and early morning. They like these periods because visibility is normally poor at those times and people are not able to identify them when they are engaging in the practice. Open defecation is a common phenomenon, and it is causing a significant nuisance within the township. It is common to see several human excreta in bushes, uncompleted buildings, gutters, etc. It is difficult to walk by gutters, uncompleted buildings, open fields, etc. because of the bad odor emanating from these places. This could affect visitors or tourists who visit the town. These could also lead to oral faecal transmission which could lead to the outbreak of diseases if the phenomenon is not controlled. Open defecation pollutes the air and water bodies. All these human excreta are washed into rivers, lakes, etc. anytime it rains.

5. Recommendations

The research, therefore, suggests that the Local Government Authority should enact and enforce appropriate laws that would prosecute people who practice open defecation. It should also enforce already existing laws that punish landlords who build houses without private toilets. The Local Government Authority should partner with private sanitation companies to bring in more septic trucks to promote frequent dislodging assistance when the septic tanks of toilets are full. Finally, the Assembly should immediately construct temporary public toilets in communities such as Bamaho, Sombo, etc. with high open defecation sites to curb open defecation practices in these communities to prevent the outbreak of diseases.

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Conflicts of Interest

The authors declare no conflict of interest.

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