Addressing Open Defecation Sanitation Problem: The case of Dry Toilet Implementation in the WA Municipality, Ghana

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Summary:

Although Ghana ranks 152 out of 182 on the Human Development Index, it has the 4th lowest rate of sanitation coverage worldwide (UNICEF/WHO 2010). The Wa municipality is no exception. Lack of toilet facilities in many homes in the municipality is something that cannot be ignored, and as a result, people form long queues early in the morning to have access to the few existing public toilets, whereby putting extreme pressure on these facilities. The worst part of the sanitation problem is that some people also prefer the water bodies, bushes, and uncompleted buildings as places of convenience.

Specifically, investigations on whether there are existing dry toilet facilities within the municipality, how beneficiaries are going to cope with and adapt to a new dry toilet facility, and the socio-cultural issues that can affect the sustainability of dry toilet facility were examined. Non Probability-accidental sampling technique was used to select respondents for the study. Simple descriptive statistics such as frequencies and percentages were employed in the data analysis. The study revealed that the main cause of sanitation problem is the open defecation practices. Poverty, illiteracy and lack of public education are all factors leading to poor sanitation. It was recommended that Government through the municipal authority should construct more decent public toilet facilities in the municipality. The facility cost of usage should be subsidized and be made free for children and the aged.

Language: English Key words: Ecological-sanitation, Excrement, Sanitation, Open defecation and Dry Toilet.

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1. GENERAL INTRODUCTION

1.1 Background to the Study

The challenge of achieving global sanitation targets is that it requires application of both technology that is appropriate and a supporting organizational structure. According to the World Health Organization (WHO), sanitation generally refers to the provision of facilities and services for proper disposal of human waste (urine and faeces). Open defecation on the other hand is the practice of removing waste from the body through the anus; outside in and around one's local community or public as a result of no access to toilets, latrines or any kind of improved sanitation. The United Nations Conference on Water (UNCW, 1977), declared the decade of (1981-1990) as International Drinking Water and Sanitation Decade with a target of water and sanitation for all (Black & Fawcett, 2008). Despite the aim to improve both water supply and sanitation, most of the attention was put on water supply and at the end of this decade there were 300 million more people without sanitation than at its beginning (Black & Fawcett, 2008).

Globally, there are approximately 2.6 to 3 billion people without proper sanitation. The worst situation is in Southern Asia and sub-Saharan Africa, where the demand for sanitation is rising due to the growing population especially in the urban areas (WHO/UNICEF, 2012). Recently updated report; Progress on Drinking Water and Sanitation by the United Nations Children's Fund (UNICEF, 2012) shows that there are 2.5 billion people in the world without access to improved sanitation. 1.1 billion People are practising open defecation and the rest are using shared or unimproved sanitation facilities. If such trends continue, the world will miss the sanitation target by 600 million people (United Nations, 2007). There is an increasing need for improved sanitation systems in many areas in the world, particularly in West Africa. West Africa specifically is struggling to meet the demands for sanitation. This region has witnessed relative stagnation in sanitation coverage since 1990, when total access to basic sanitation was 32% (WHO & UNICEF, 2006a). Improvements in sanitation coverage have been targeted by the United Nations Millennium Development Goals (MDGs) because of their strong links to issues of environmental and public health, economy, and human dignity. An estimated 1.6 billion people must be able to access improved sanitation services before 2015 in order to meet the

MDGs target of halving the percentage of people without access to improved sanitation (United Nations, 2007). However, many countries in the world are not on track to meet these goals due to compounded problems of population growth, urbanization, and historically inefficient service provision. The inability of sanitation efforts to keep pace with population growth has resulted in an increase of over 110 million people in West Africa without access to sanitation. Over half of the Ghanaian population is sharing their sanitation facilities and only 14% is using improved facilities and 27% still practises open defecation (WHO/UNICEF 2012). Since 1995 8% of the population has gained access to improved sanitation and with current pace the MDG sanitation target will not be reached by 2015 (WHO/UNICEF 2012). The MDG report by National Development Planning Commission (NDPC) of the Government of Ghana and the United Nations Development Programme (UNDP) states that with the current trend of sanitation development, the proportion of the population with access to improved sanitation will reach 21.2% by 2015 instead of the target of 52%, which indicates that there must be approximately five times increase in coverage to be able to achieve the set target (NDPC/UNDP 2010). Although Ghana ranks 152 out of 182 on the Human Development Index, it has the 4th lowest rate of sanitation coverage worldwide (UNICEF/WHO 2010).

1.2 Statement of the Problem

A survey conducted in public schools across Ghana by WASH revealed that about 10,000 schools do not have toilet facilities. The number is half the estimated 20,000 public schools in Ghana, apart from the thousands of privately owned schools that may not have toilet facilities (WASH, 2014). The survey is evident in Wa municipality, for instance the Wa Senior High Technical School have only one eight-sitter toilet and one-urine pit serve both sexes in the school which has a population of 2,200 students. Ironically, though the school is located directly opposite the Regional offices of both the Ghana Water Company Limited and the Community Water and Sanitation Agency, water supply to the school is erratic. Apart from that, the entire municipality have only 12 public toilet facility (KVIP) and just one (1) Water Closet against a population of 127, 284 (TTFPP, 2013). The pressure involved in accessing these limited facilities has forced many residents to end up defecating openly and indiscriminately. The cost involved in accessing the facility has also forced many vulnerable women and children to end up defecating around their houses and sometime in the bush because they cannot afford a cost of 50 pesewa in

accessing the facility. Most often, children become victims of snake bite and scorpion sting while defecating in the bush (TTFPP, 2013). Hence, the crux of this study is to address the environmental sanitation problem leading to open defecation through a holistic approach of integrating an alternative sanitation technology that is compatible with local setting for community development and proper sanitation. Therefore, dry toilet implementation in the Wa municipality, Ghana.

1.3 Location & Size

The Wa Municipality is one of the eleven administrative areas (District Assemblies) that make up the Upper West Region (UWR) of Ghana. It shares administrative boundaries with the Nadowli District Assembly to the North, the Wa East District Assembly to the East and South and the Wa West District Assembly to the West and South. It lies within latitudes 1º40‟N to 2º45‟N and longitudes 9º32‟ to 10º20‟W. It has a total land mass of 234.74 sq km. (Modern Ghana 2010).

Figure 1: Map of Ghana. (http://wa.ghanadistricts.gov.gh/y) 08.11.2014

The above map demonstrates the administrative detachment of Ghana. The arrow indicates Upper west-WA Municipality.

1.3.1 Population

Total estimated population is127, 284 (GSS-Wa, 2009).It is the highest populated local administrative area with the largest affluent population in the region. By implication business will have a very large market because of the high and wide variety of demand for goods and

services. The growing population therefore beacon for investment opportunities. Market and labour is therefore available for production in all sectors.

1.3.2 Climate/Weather

The municipality falls within the Guinea Savannah climatic zone, hence experiences the greatest climatic influence of one seasonal rainfall followed by a severe dry spell. The rainy season starts from April/May to September/October giving way to the dry season which sets in from November to March when relative humidity is at its lowest and the vegetation dried up under the influence of the Hamattan winds characterized by ravaging bushfires.

1.3.3 Environment and Sanitation

The Municipal Assembly lacks the capacity and financial resources to ensure maximum environmental sanitation standards. Skills, technologies and funds from the private sector are required for the development of waste management systems, particularly in providing final disposal site services, composting, recycling and treatment of waste, Biogas production.in the absent of these facilities has affected the sanitation state in area. The sanitation situation in the project area is certainly nothing to write home about. Nearly 80% of the populations do not have access to a toilet (Wa Municipality composite budget 2013). Many households for instance, do not have any kind of toilet facilities or they may be in bad condition. Open defecation is increasingly becoming alarming in some sections of the Municipality putting residents at the risk of sanitation related diseases such as cholera, diarrhoea and typhoid among others. The few available public toilets are constantly abused by some users and to those who cannot withstand the sight of the filthy looking facilities resort to open defecation. Children below ten years are often seen defecating around the premises of these public toilet facilities and waste containers freely without any reprimand thereby giving a very bad smell to residents within that vicinity. The Municipality which is fast developing into a Metropolis must resort to the use of household toilet facilities, but this had constantly been overlooked by landlords because of the increasing demand for accommodation by students of the tertiary level. The municipality as at 2008 had about 8,505 residential buildings. With this number of residential buildings, the municipality can currently boast of only one Water Closet (WC), 12 KVIP's, 31 septic latrines and one Ventilated

Improved Pit (VIP) as its public places of convenience. Private and institutional toilet facilities include 1,511 WCs, 36 KVIP's, 227 VIP's, 35 pan latrines and six pit latrines without any single private septic tank latrine in the municipality. In a bid to help solve the problem of open defecation, some private individuals constructs places of convenience and tend to collect user fees of 50 Ghana pesewas and this is believed to contribute to the problem of open defecation because users complain of the fee being too much for them to afford.

Table 1: Access to Safe Water and Sanitation Facilities.

Indicator	**2010**	**2011**	**2012**
% of population served with safe water	0	35	35
% of population served with safe excreta disposal facility	0	24.3	19

Source: *Wa Municipal Assemble* (http://wa.ghanadistricts.gov.gh/y) 08.11.2014

The table indicates the percentage of population served water and safe excreta disposal facility in the municipality. In 2010, both water and excreta disposal facility was not encouraging. However, there was some improvement in 2011 and 2012. There was no reason why nothing on water and excreta disposal facilities in 2010.

1.3.4 Legislation and Regulation

The main legislation in Ghana regarding environmental sanitation is the National Environmental Sanitation Policy which was adopted in May, 1999. It seeks to re-examine and deal more effectively with issues that have led to the persisting underlying causes of poor environmental sanitation and its vital link to health. Environmental sanitation is aimed at developing and

maintaining a clean, safe and pleasant physical environment in all human settlements, to promote the social, economic and physical well-being of all sections of the population. It is made up a number of complementary activities, including the construction and maintenance of sanitary infrastructures, the provision of services, public education, community and individual action regulation and legislation. It is therefore important to adopt the modern method that fit in addressing open defecation in rural communities in Ghana (Environmental Sanitation Policy, Revised 2009).

1.3.5 District Health Status

According to the Municipal Health Service 2010 annual report on sanitation related diseases, a total of 73,903 cases were recorded. Out of this, typhoid and diarrhoea diseases which were closely linked to the problem of open defecation accounted for 624 and 5,300 cases respectively. Open defecation did not only make the environment messy and smelly but also pollutes water bodies which some parts of the Municipality depended on downstream for their domestic use. (Municipal Health Service 2010, annual report)

Table 2: Top 5 Diseases in the Municipality

2010	**2011**	**2012**
Malaria OPD cases- clinical and confirmed	Malaria OPD cases- clinical and confirmed	Malaria OPD cases- clinical and confirmed
Acute respiratory tract Infections	Acute respiratory tract Infections	Acute respiratory tract Infections
Diarrhoea	Diarrhoea	Diarrhoea
Acute eye infection	Acute eye infection	Acute eye infection
Skin diseases and ulcers	Skin diseases and ulcers	Skin diseases and ulcers

Source: *Wa Municipal Assembly*. http://wa.ghanadistricts.gov.gh/ (retrieved: 18.09.2014)

1.3.6 Agriculture and Trade

According to the Wa municipal composite budget 2013, agriculture sector provides more than 60% of the municipal population sources of jobs, livelihood and business. It is a sector crucial to the local economy, because it is currently the major provider of jobs. Despite its strategic role in fighting poverty, it is under modernized. Traditional technologies still dominates agriculture production, processing, storage and marketing. Programs are therefore required to enhance development of sustainable agriculture production systems e.g. irrigation systems, enhanced farmer education and training, enhanced technology transfer in agriculture production, storage and enhance corporate development for marketing. In respect to trade, Wa is the only community that may be described as urban area with the rest of the communities being rural. Rain-fed agriculture is the main pre-occupation of those in the rural areas. The rural communities are engaged in peasant farming, livestock rearing and small scale fishing in a few communities, which have water sources such as dams and dug-outs. Crops mostly cultivated include food crops such as maize, millet, sorghum, groundnuts, yam, and beans. Other subsidiary economic undertakings are charcoal burning and Pito liquor brewing as sources of income to mostly women. Shea nut picking and processing into butter also serve as alternative livelihood sources for women in the rural areas. Among the animals also reared are cattle, sheep, goats, poultry, and pigs.

2. Research Objectives

2.1 General Research Objective

To address environmental sanitation problems through dry toilet implementation in the Wa, municipality and base on the literature review and results, the researcher will give recommendations on the research findings to the key stakeholders in the municipality.

2.1.1 Specific Research Objectives

- To investigate whether there are existing dry toilet facilities within the municipality.
- To understand how beneficiaries are going to cope with and adapt to the dry toilet facility in the first time.
- To examine the socio-cultural issues that can affect the sustainability of the dry toilet facility.
- To devise strategies on the best management practices that than sustain the project.

2.2 Research Questions

2.2.1 General Research Question

Is the implementation of dry toilet the best alternative for addressing environmental sanitation in the WA municipality?

2.2.2 Specific Research Questions

- What are the existing dry toilet facilities within the municipality?
- How are beneficiaries going to cope with and adapt to the dry toilet facility for the first time?
- What are the socio-cultural issues that can affect the sustainability of the facility?
- What are there suitable strategies for best management practices that can sustain the project?

3. LITERATURE REVIEW

3.1 Introduction

This chapter seeks to set the parameters of the study and also to extensively review scholarly literature with respect to the research objectives. Sanitation, ecological sanitation, global state of sanitation and its impacts, sanitation in Ghana, experience of dry toilet elsewhere as well as the benefits and importance of dry toilet shall be reviewed and discussed.

3.2 Definition of Concepts

This section of the study tries to properly define the various terminologies and concepts used so as to put them in their proper contexts for a comprehensive understanding of the study. Attempts have been made by several authors and authorities to define the term sanitation. The word "sanitation" can have different meanings depending on the speaker, context or location. In this context, sanitation refers to the disposal and treatment of human waste and by human waste I refer to urine and excrement. In other words, the word 'sanitation' refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal (WHO, 2002). Open defecation on the other hand is the practice of defecating outside and in public, in and around your local community, as a result of no access to toilets, latrines or any kind of improved sanitation (WASH, 2013).

3.3 Ecological Sanitation/ (EcoSan)

When discussing sanitation it is important to understand the term "ecological sanitation" or "eco-san". Winblad& Simpson-Hébert (2004) in the publication "Ecological Sanitation" defined the ecological sanitation as an approach, which promotes a sustainable, closed-loop system, where human excreta is treated as a resource, not waste. Ecological sanitation is based on the idea that urine, faeces and water are resources in an ecological loop. It is an approach that seeks to protect the human health, prevents pollution of the environment, reduces the use of water in sanitation systems and recycles nutrients to help to reduce the need for artificial fertilizer in agriculture. The key features of ecological sanitation approach are prevention of pollution and diseases

caused by human excreta, management of human urine and faeces as resources rather than as waste, and recovery and recycling of the nutrients (Winblad & Simpson-Hébert, 2004). The emphasis of the ecological sanitation approach is on the closed nutrient cycle, which copies the nature's way of recycling. In the ecological sanitation approach the nutrients of human waste are utilized as fertilizer in food production, whereas conventional approaches to sanitation misplace these nutrients and break the cycle (Winblad & Simpson-Hébert, 2004). There are several benefits in the recycling of the nutrients as it prevents the pollution of the waters, reduces the need for chemical fertilizer, improves the soil structure and enhances the productivity of agriculture (Esrey et al, 1998). The fertilizers derived from human excreta can remarkably improve the food security in the future due to the finite nature of natural resources used in chemical fertilizers. For example the relatively inexpensive phosphorus we use today will likely cease to exist within 50 years (EcoSanRes 2008). Ecological approach to sanitation does not strictly determine the suitable technology to be used, but there is a wide range of options, appropriate for both poor and rich livelihoods, and rural and urban population (Rockström et al, 2005). For example, Mattila (2005) has defined ecological sanitation in his doctoral thesis as an approach that "allows all possible technical alternatives of wastewater and toilet waste treatment as long as the nutrients are recovered and used as fertilizers in food production". Rockström et al (2005) add that in addition to protecting human health and the environment, ecological sanitation addresses a wide range of cultural needs such as indoor and outdoor installations, anal cleansing by using paper or water, and provides practical solutions to deal with odour arising from urine and faeces.

3.3.1 Advantages and Disadvantages with EcoSan

EcoSan has many advantages when compared with Ventilated Improved Pit (VIP) latrines. Firstly, pit latrines cannot be used in many areas due to high water tables and groundwater pollution potential, seasonal flooding, a hard, rocky surface, lack of space, and potential for groundwater infiltration. This is not the case with above-ground dehydration or composting toilets.

Secondly, VIP latrines require regular, expensive, and often unhygienic emptying, whereas the removal of the small, dehydrated volume of faeces from the dehydration toilet is much easier and more hygienic. If pit emptying is not possible, as is often the case in rural areas, the structure IP

latrines will need to be relocated. Lastly, EcoSan toilets can also provide valuable fertilizer material. However, there are major barriers to successful implementation of Ecological Sanitation, including behavioural change and cost (McCann, 2005). Some communities are more accepting to the idea of reuse of human waste, and in some regions availability of materials can affect the total costs to construct an EcoSan latrine. Jonathan Lau, mentioned in his Master's thesis on Designing Sanitation Projects in Rural Ghana "EcoSan projects in developing countries have failed to achieve long-term sustainability because of misuse of facilities and poor maintenance". Materials from EcoSan toilets are often not reused even when composted/dehydrated properly due to a lack of training and education (McCann, 2005). Pilot projects need to be conducted in order to assess the viability of EcoSan in that region. However, use of Dry Compost Toilet (DCTs) has been limited by: perceived operating problems (odour, difficult operation, health risk), residue disposal opportunities and restrictions, significant additional cost to the household compared to installation of a standard toilet, difficulty of retrofitting in existing buildings, cultural acceptability and institutional discouragement. This paper demonstrates that these issues can be overcome and that the technology is appropriate, marketable, and environmentally beneficial, can reduce greenhouse emissions and is economically feasible.

3.4 Global State of Sanitation and its Impacts

The United Nations (UN) Conference on Water, held in Argentina in 1977, declared the decade of 1981-1990 as the International Drinking Water and Sanitation Decade with a target of "water and sanitation for all" (Black & Fawcett 2008). Despite the aim to improve both water supply and sanitation, most of the attention was put on water supply and at the end of this decade there were 300 million more people without sanitation than at its beginning (Black & Fawcett, 2008). In the UN Millennium Declaration in 2000 global commitment was made to eradicating extreme poverty and increase the health and well-being of all peoples (United Nations 2007). Eight globally important development targets called Millennium Development Goals (MDGs) were set with the aim of eradicating extreme poverty and hunger, achieving universal primary education, promoting gender equality and women's empowerment, reducing child mortality, improving maternal health, combating HIV/AIDS, malaria and other diseases, improving environmental sustainability and developing a global partnership for development. In September 2002, the

World Summit on Sustainable Development in Johannesburg reaffirmed these goals and added access to basic sanitation as a centrepiece of the poverty eradication commitments (United Nations 2007).

According to WHO/UNICEF (2012) reported that the global drinking water target has been met in 2010, five years ahead of the schedule Despite the welcoming drinking water news the sanitation development is still inadequate and the world is not on track to meet the MDG sanitation target. 1.8 billion People gained access to improved sanitation facilities between 1990 and 2010, but 2.5 billion people still lack improved sanitation.(Global Monitoring Report 2013, p.96) If the current trends continue, 2.4 billion people will still lack access to improved sanitation facilities in 2015 and the reached coverage will be 67% instead of the targeted 75% (WHO/UNICEF, 2012) Rockström et al. (2005) stress the importance of the seventh MDG by saying that environmental sustainability is not an isolated goal in itself, but instead forms an integral goal for all the MDGs. The sanitation target of environmental goal has connections to other MDGs as well. The UN Millennium Project Task Force on Water and Sanitation (2005) emphasize the importance of water and sanitation management for meeting the MDGs and says that improved water and sanitation will promote the achievement of all eight MDGs. This indicates well the broad influence area of the sanitation and the benefits from the investment to sanitation management with suitable sanitation technology, not only to promote environmental sustainability, but also to the other development goals.

3.5 Sanitation in Ghana

The MDG report by National Development Planning Commission (NDPC) of the Government of Ghana and the United Nations Development Programme (UNDP) illustrates that with the current trend of sanitation development, the proportion of the population with access to improved sanitation will reach 21.2% by 2015 instead of the target of 52%, which indicates that there must be approximately five times increase in coverage to be able to achieve the set target (NDPC/UNDP 2010). In Ghana the low coverage of improved sanitation is partly caused by the fact that the Joint Monitoring Programme (JMP) does not classify improved facilities as such if they are shared and as noted earlier, over half of the Ghana's population are using shared facilities. The reason why JMP does not classify shared toilet facilities as improved is because they may not be hygienic, convenient and private enough for users (WSMP, 2008b). Many

stakeholders in the sanitation sector in Ghana have said that many shared toilet facilities in Ghana provide all the necessary parameters that characterize an improved toilet facility (WSMP, 2008b). It must also be noted that there is a wide difference in access to sanitation between the regions and also within the regions between rural and urban areas. For example in the Greater Accra region of Ghana 25% of the population have access to improved sanitation while in the Northern region the corresponding proportion is 3%. Sanitation development has concentrated on urban centres and southern areas, while the poorest coverage is in the northern regions and rural communities (NDPC/UNDP, 2010).

According to JMP (WHO/UNICEF, 2012) Ghana has the highest proportion of population using shared sanitation facilities in the world with the record of 58%. If compared to Bolivia, who has the second highest record in shared sanitation category, the difference is 22 percentage points, which illustrates the exceptionally high usage of shared facilities in Ghana. Globally the sharing of the sanitation facility is an urban phenomenon and also in Ghana it is more common in urban than rural areas: 73% urban population is sharing the sanitation facility whereas in rural areas the corresponding proportion is 43%. Instead of sharing the toilet facility, the problem in rural areas is the open defecation as 33% of the rural population is practising open defecation (WHO/UNICEF, 2012). The predominant use of shared sanitation facilities in urban areas is principally due to residence patterns of several households living in compound housing, but a more worrying development is the heavy reliance by many on public toilets (WSP, 2010).

3.6 Experience of Dry Toilet Elsewhere

Internationally there have been several trials of elements of the proposed technology in Scandinavia, which have been closely monitored, including urine separating toilets with conventional sewer disposal of faecal matter (Crockett, 2000). In Canada, DCTs were installed in a multilevel office building at the University of British Columbia. Conclusions of a post-occupancy survey of users of the building were reviewed and these were encouraging. There has been considerable work done on use of DCTs in Australia (Maher & Lustig 2002, Mitchell et al 2002) but it has not been reported to the level of detail of this feasibility study. CSIRO's Urban Water Program has reached similar conclusions to those of this feasibility study (Mitchell et al, 2002). There are many small and private single installations and public toilet installations of

DCTs around Australia. The design and performance of some of these installations has been reviewed and observations from site inspections were favourable. At an inner-urban environmental park in Brunswick, Melbourne (CERES), several manufactured and site-constructed DCTs have been used for about four years. Urine separation at CERES was being tried with good success in that it appeared to aid composting. The composters were not heated and appeared to work well. Worms have been added to some of the composters and appear to assist the process and not be affected by the environment within the composter. There was no odour in the toilet rooms, which are used by the public. Leachate and urine are discharged to wetlands and compost is buried on site Crockett (2000). The Charles Sturt University campus at Thurgoona, near Albury, NSW, has around 300 staff and students (including some 40 residential students) and several years ago installed 47 pedestals connected to 25 ClivusMultrum composters. Urine from one waterless urinal and compost leachate is discharged to a wetland system and compost is buried on site. The toilet rooms are odour-free and bowls are easily kept in a very clean state. Midges are plentiful within the composters but not externally or in the toilet room. Flies have not been a problem. The composters and air vents are colonised by spiders because of the plentiful supply of midges. The spider webs require regular removal to maintain airflow. Both an older staff member and a young student commented that, since they have been using the DCTs, they find wasting and polluting clean water in a flush toilet repugnant. This is an interesting reaction and the reverse of expectations of many people not familiar with properly designed DCT systems. Odour problems have only occurred at this installation when fans have broken down or have been undersized. Some composters serve up to four pedestals spread over two floors. Maintenance staffs at the campus were enthusiastic about the DCTs and did not find the tasks they undertook (and demonstrated) of raking the top of the compost pile, removal of compost and cleaning of the chutes and vents objectionable (Crockett et al, 2000). The first composting toilets in Sri Lanka were introduced in 2001/2002 by NWSDB and Eco-solutions, UK. Implementing partners were SEVENATHA and SARVODAYA. Sevenatha and Sarvodaya did not build any other compost toilets after the pilot project. Currently the main implementing agencies involved in ecosan are Action Contre la Faime (ACF), Practical Action (PA) and Australian Red Cross. The basic design of the compost toilets built by the different agencies is the same - a double chamber system with an evaporation bed (mainly built by PA) or soil infiltration bed (mainly built by ACF, Australian Red Cross). Besides international literature the

Sri Lankan documents *Manual on LatrineConstruction* (Herath, 2005) and *Sanitation Guidelines* developed by World Toilet Organisation (HubaPanzerbieter, 2006) provide further design options. So far there is no urine collection in Sri Lanka. Storage facilities are therefore not considered in the cost estimate below. Urine collection on a small scale is possible with inexpensive plastic containers of different sizes. On a large scale, storage facilities are a major expenditure which is justified by the cost benefit of the gained fertilizer (Evaluation of the Appropriateness of Ecological Sanitation in Relation to the Social, Cultural and Economic and Financial Context of Sri Lanka (2009). UNICEF-Ghana has recently been promoting their Community Led Total Sanitation (CLTS) campaign in Chirifoyili in Northern Ghana as a big success. UNICEF worked with the local community and motivated them to build simple pit latrines using local materials and labour through the CLTS method (Williams, 2010). After the initial pilot project at the house of the chief of the village, it was reported that many villagers in the community are now building similar latrines.

According to UNICEF, This safe, simple innovation was built for villagers, by villagers. Besides being practical, the latrines will go a long way to helping Ghana meet the United Nations Millennium Development Goals targets related to safe water and sanitation (UNICEF, 2010). From practical experience and reports from local Ghanaian NGOs, locally made pit latrines without ventilation and reinforced pit walls usually do not last long and will not be used continually. Without ventilation pipes, odour is likely to surround the pit, the interior of the low 34 cost superstructure is likely to deteriorate, and flies and mosquitoes will be attracted to the pit unless the covering slab is well designed and sealed. Once the unlined pit collapses during the rainy season in Ghana, or the conditions of the latrine become unbearable, the local community may stop using it. Can this project be considered as contributing to meeting any sanitation target? On the other hand, the implementation of more upscale designs, such as Dry toilet (DT), can reduce some of the negative aspects of using an unimproved, local design seen in the UNICEF campaign. Unfortunately improved designs are costly. Given budget constraints, it is often unrealistic to expect a widespread implementation of these latrines. Without extensive coverage of an entire community, simply building a few DT here and there will not help improve the public health of that community. Simply providing a few VIPs in a community with hundreds of

villagers (which is frequently observed!) without the plan for scaling up cannot be considered as contributing to meeting a sanitation target.

3.7 Cost Benefit Analyses

To estimate the cash benefit of a compost dry toilet system a comprehensive Cost Benefit Analysis (CBA) should be conducted. The initial results of a pilot project (costs and benefits experienced by beneficiaries) are used to estimate the net benefit values of different future scenarios theorized by the analyst. Benefits and cost of a project are determined and given a numerical value estimate. The net benefit is the difference between the total amount of cost and the total amount of benefits (Gabucan, 2006). Projects with a positive NPV should be undertaken. The net benefit should account for all the benefits and costs from the project that affect society, including those that do not have a direct impact on individual beneficiaries, such as environmental impacts (Gabucan, 2006). Not every benefit could be quantified. If quantification proves impossible, the remaining benefits and costs must be considered qualitatively. A Cost Benefit Analysis should be based on a data collection indented for the application in a CBA model. Dry Compost Toilets (DCTs) have become the technology of choice for permanent public toilet facilities in national parks and for many isolated roadside rest areas and houses. However, the technology has wider application and is already being adopted more broadly in other countries.

The advantages of DCTs over conventional water-flush toilets include: a 15% to 25% saving in household indoor water use over 80% reduction in nutrient loads to sewer 25% reduction in BOD to sewer a 50% reduction in salt load to sewer. (Crockett 2000).

They are compatible with other water saving technologies such as grey water recycling, waterless urinals and rainwater capture. Dry Composite Toilets, have the potential to extend the life of existing capacity in sewerage systems and reduce overall lifecycle and economic cost of new centralised systems, which essentially become grey water-only sewers. In addition DCTs, especially with urine separation, can provide a safe-to-handle, nutrient rich replacement for manufactured agricultural fertilizer. DT has its ecological advantages over Kumasi Ventilated Improvement Pit (KVIP) and Water Closets (WC) as it offers more sustainable alternative to toilet waste management with on-site treatment and re-use of the toilet waste. The biggest environmental impacts of KVIP and WC occur from the disposal of untreated waste and from the

leakages from the facilities. In DCT the diversion of the urine keeps the pathogenic solid waste dry and the watertight vault prevents the leakages to the soil and groundwater. The waste is treated in the facility, which destroys the pathogens and prevents the indiscriminate spread of pathogens to the environment. The treated waste is re-used as a fertilizer, which prevents the nutrient run-off to the water bodies. By utilizing the nutrients of the toilet waste in food production, the need for centralized wastewater management is minimized.

3.8 Importance of Dry Toilet

3.8.1 Composting

In a composting toilet, human excreta and sometimes urine, along with additional substances such as vegetable scraps, peat moss, or wood shavings, are deposited into a processing chamber where microorganisms decompose the solids. The humus produced by the process is an excellent soil conditioner (better than simply dehydrated and stored faecal material), free of human pathogens. A composting toilet requires many conditions to work: Sufficient oxygen should be able to penetrate the compost heap to maintain aerobic conditions; the material in the composting vault should have a moisture content of 50 to 60%; the Carbon: Nitrogen (C: N) ratio should be within the range 15:1 to 30:1; the temperature of the composting vault should be above 15°C. The composting process can take anywhere from several weeks to several years, depending on the design and local climate (SEI, 2004).

3.8.2 Soil Composting

In a soil composting system, faeces, in some cases faeces and urine, are deposited in a processing chamber. Soil and wood ash are added after each use. Most pathogenic bacteria are destroyed within 3–4 months as a result of competition with soil-based organisms and unfavourable environmental conditions (SEI, 2004). The material is then removed and can be subjected to secondary treatments, and in some cases can be directly spread on fields and worked into the existing soil (SEI, 2004).

3.8.3 Urine as Fertilizer

Most of the plant nutrients in human excreta are found in the urine. Based on data from five countries (China, Haiti, India, South Africa and Uganda), it is estimated that on average each person produces about 5 kg of elemental Nitrogen, Potassium and Phosphorus in excreta per year, about 4 kg in the urine and 1 kg in the faeces (SEI, 2004). When urine is collected for use as a fertilizer, it is important to store it in such a way as to prevent odours and the loss of nitrogen to the air. Uno Winblad&Mayling Simpson-Hebert (2004, p.74) describe in their research that most of the nitrogen in urine, which is initially in the form of urea, is quickly converted to ammonia within a collection and storage device. However, ammonia loss to the air can be minimized by storage in a covered container with restricted ventilation (SEI, 2004). When urine is applied on open soil it can be undiluted; if used on plants it must be diluted to prevent scorching, typically one part to 2–5 parts of water. In a series of experiments carried out in Harare, Zimbabwe, during 2002, it was shown that by periodically adding a 3:1 water: urine mixture 25 to different vegetables planted in 10-litre containers, crop yield was vastly improve, compared to irrigation with water only (SEI, 2004).

3.8.4 Human Faeces as Fertilizer

Human faeces consist mainly of undigested organic matter such as fibres made up of carbon. The total amount of faecal material per person per year is estimated to be 25-50 kg, containing up to 0.55 kg of nitrogen, 0.18 kg of phosphorus and 0.37 kg of potassium (SEI, 2004). After pathogen destruction through dehydration and/or decomposition the resulting inoffensive material may be applied to the soil to increase the organic matter content, improve water capacity and increase the availability of nutrients. Humus from the decomposition process also helps to maintain a healthy population of beneficial soil organisms that protect plants from soil-borne diseases.

4. METHODOLOGY

The chapter presents the research procedure that was used in the collection and analysis of the data. It includes the research design, sample and sampling technique, sources of data, data collection instruments and method of data analysis and presentation.

4.1 Research design

Mixed method research was used for the study to identify existing dry toilet facilities and also examine the socio-cultural issues that can affect the sustainability of the dry toilet facility as well as devise strategies on the best management practices that can sustain the project. Mixed method research is the process and procedures for collecting, analysing and inferring both qualitative and quantitative data in a single study or in sequential studies based on priority and sequence of information (Green & Caracelli, 1989). A case study was employed to provide in-depth understanding which cannot be achieved from a structured questionnaire. The case study method is an approach to studying a social phenomenon through a thorough analysis of an individual case. The case study provides a different sort of data that can supplement other methods of research. Walter (2004) states that the use of case study aids the capturing of a process; case study provides a sequence and structure that is often omitted in surveys or interviews, they are means by which, to chart ideas and develop themes for analysis. The limitation to this design however, is the fact that the findings cannot be generalised.

4.2 Sample and sampling techniques

Non Probability-accidental- sampling technique was used to select respondents from Bamahu, community and the Wa municipality. Community members, students and key authorities of Wa municipality were selected for the interview. They form the key informants to situation and have the best information about open defecation and the objectives of this study. In all, 63 respondents formed the sample size for the study.

4.2.1 Sources of data

The study used both primary and secondary sources of data. Primary data was collected through the use of in-depth interview. That is both Semi-structured and personal interviews was employed . The interview schedule constituted the primary source. Relevant books, journals, news items, newspaper articles and information from the internet served as the secondary data.

4.2.2 Data collecting instruments

Interviews were used to solicit in-depth information of what respondents make of the sanitation issues in Wa, municipality. In-depth interview is also directed towards understanding informant's perspectives on their life experiences or situations as expressed in their own words (Taylor & Bogdan, 1984). The municipal authorities were interview about the kind of problems they face regarding open defecation, the kind of policies they have in dealing with such problems and challenges they face in solving these problems.

Online questionnaire was sent to students of University for Development Studies Wa campus-Ghana, these was done to know their views on the main objectives of the research. Community members in the municipality were also assisted to answer the same questionnaire which was printed. (See appendix 1 and 2)

4.2.3 Data presentation and analysis

The data obtained were first sorted and edited. The data was described and analysed according to the responses from the various categories of the respondents. A simple describe statistical measures such as frequencies was employed. In addition graphs and tables were used for the description of the responses.

5. RESULTS AND DISCUSSIONS

This chapter presents the results and discussion of the data. Results include characteristics of sex structure, age, availability of toilet facility, the uses of toilet facility and the preference to the use of toilet facilities. The existing dry toilet facility, socio-cultural issues and best management practices have been examined.

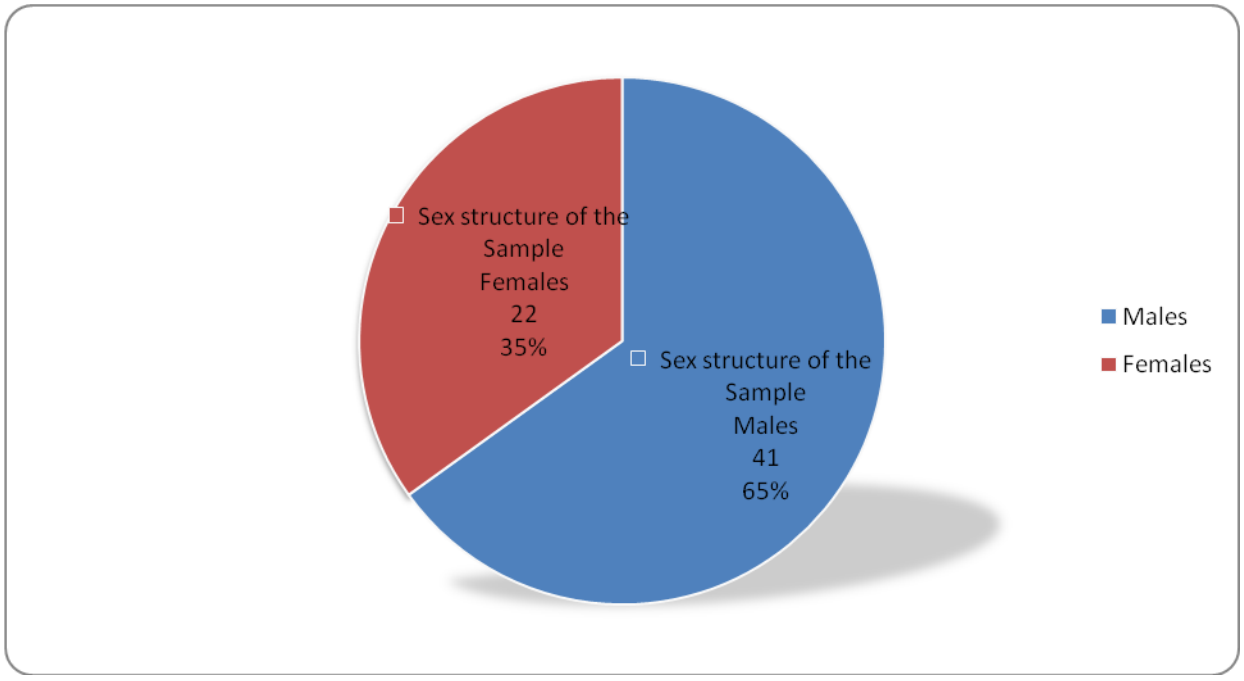

Figure 2: Characteristics of respondents

Figure 2 above shows the sex structure of respondents selected for study. The males are more than the female because some of the females were not willing to take part in the study. 22 females constituting 35% whiles 41 males constituting 65%. As at the time of the data collection those were the available people.

Data collected indicated that out of the 63 respondents selected, 53 were between the ages of 21 to30 years, 5 were between 15 to 20 years and 4 were between 31 to 40 years. None of them were in their 40's since most of them were students of University for Development Students. This is shown in figure 3.

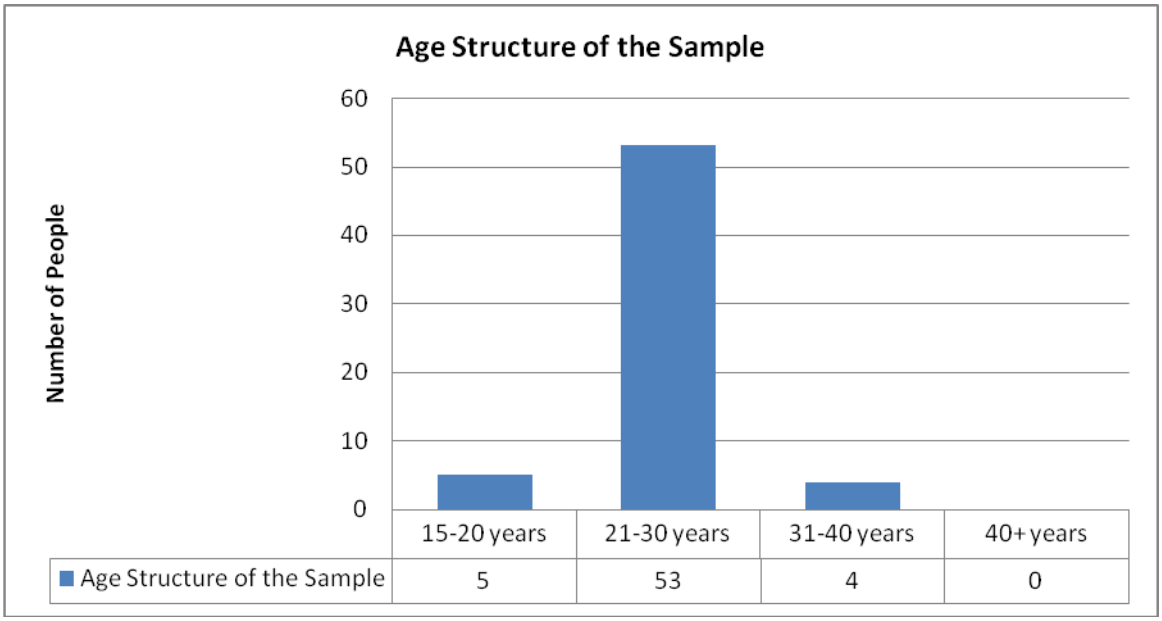

Figure 3: Age structure of respondents. Source: Field survey, 2014

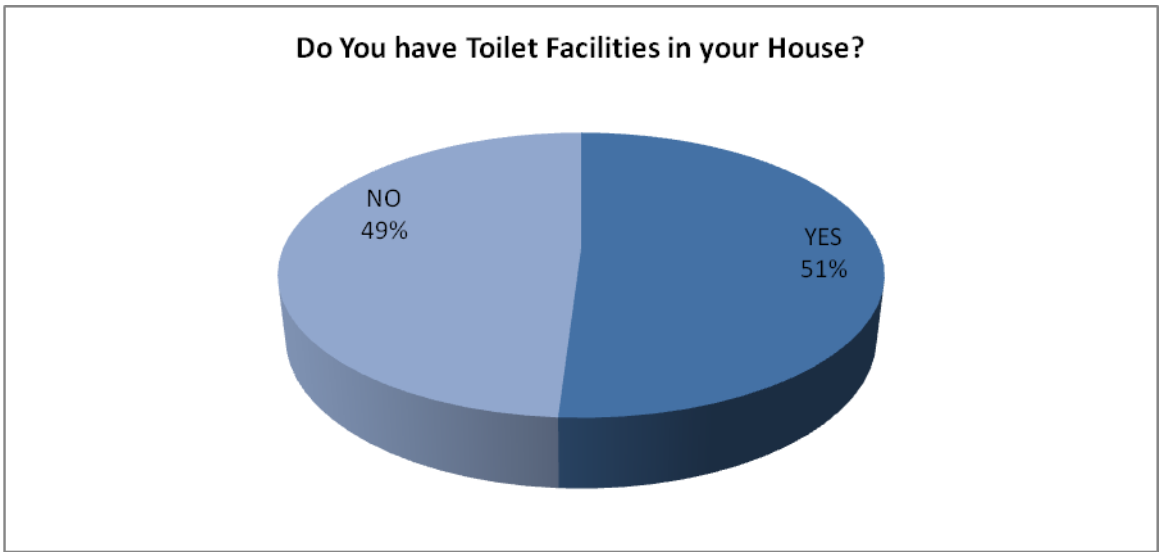

Figure 4: Toilet facilities in respondent's houses. Source: Field survey, 2014

As shown in figure 4, 32 respondents constituting 51% had toilet facilities in their houses while 31 respondents constituting 49% did not have toilet facilities in their houses. The reason behind them not having the toilet facilities in their houses was entirely attributed to the landlord's unwillingness to construct toilet facilities due to financial problems and ignorance.

Out of the 32 individuals who had toilet facilities in their homes, 3 of them had dry toilet facilities constituting 9.3% and 10 of them had Kumasi Ventilated Improves Pit (KVIP) constituting 31.3%, 9 people had Water Closet constituting 28.1% and 10 individuals had other toilet facilities consisting 31.3%. The number shows that Dry Toilet is not well known in the community. This is shown in table 1.

Table 3: Shows the kind of toilet facilities

Water Closet	**31.3%**
KVIP	31.3%
Dry Toilet	9.3%
Others	28.1%

Source: Field survey, 2014

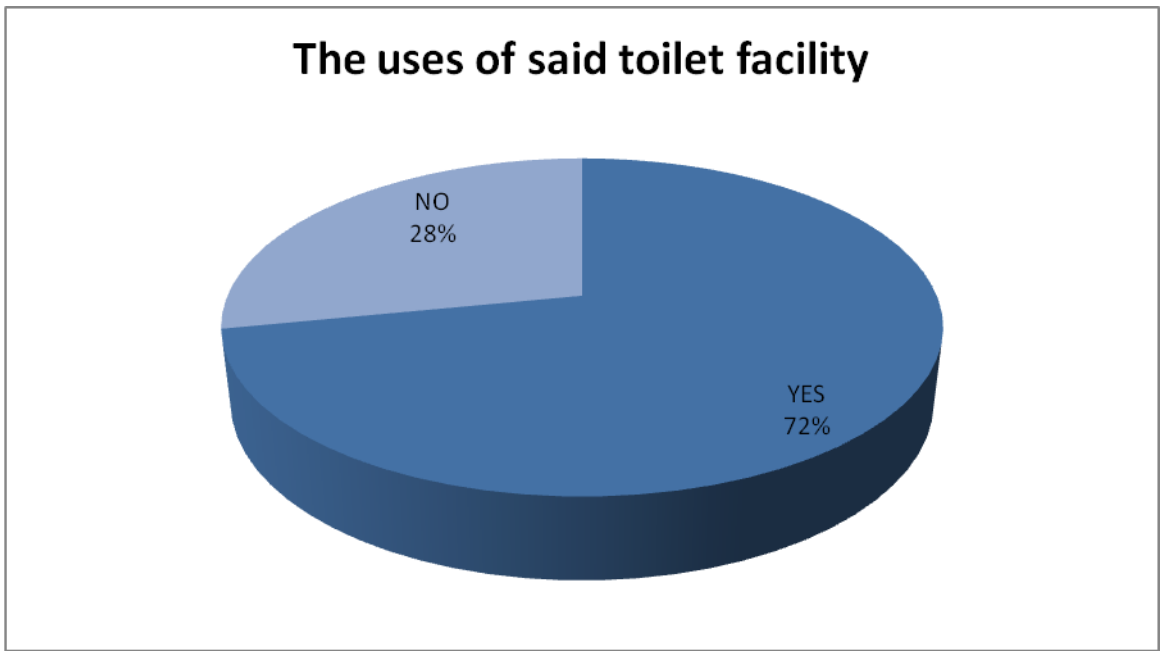

Figure 5: Use of the said facility. Source: Field survey, 2014

The research revealed that out of the 32 individuals who had the toilet facilities, 23 of them constituting 72% uses the said facility, while 9 of them constituting 28% do not use the said facility. The reason behind the facility not being accessed by the individuals who had them was as a result of the facility not being convenient and environmentally friendly.

Even with those who used the facility, 7 out of the 32 individuals shared the facility with 11 to 20 more people, 14 individuals shared the facility with 20 or more people, 17 individuals shared the facility with 1 to 5 people and 10 individuals shared the facility with 6 to 10 people. Their reaction towards the situation indicates that over 50% expressed negative feelings towards the situation. More importantly, 80% of the entire sample size expressed negative feelings towards open defecation and insisted that it was not a good practice, unhygienic and not environmentally friendly. 70% of the sample size also expressed bad feelings towards public toilet for the reason that it is not hygienic and often times dirty as observed in figure 5

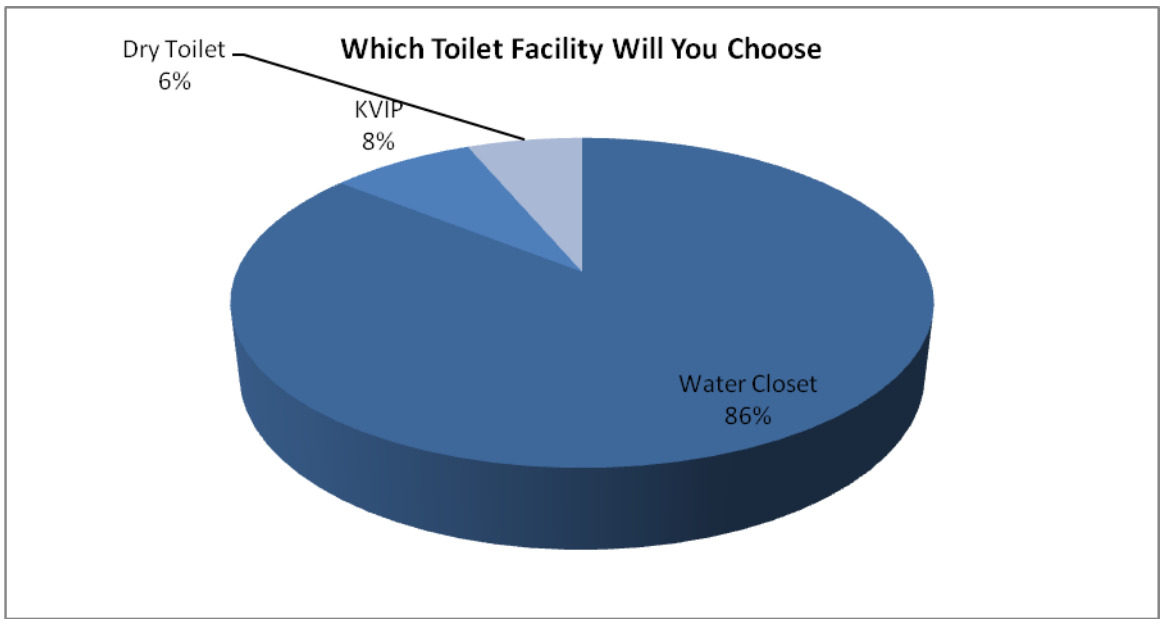

Figure 6: Toilet facility that respondent chose. Source: Field survey, 2014

When 63 respondents were given the opportunity to choose between the kinds of toilet facility, 54 of them constituting 86% chose Water Closet because they believed it was convenient and environmental friendly. 5 individuals chose the KVIP and 4 of them chose the dry toilet facility because both facilities are easy to use. Out of the sample size of 63, 58 individuals constituting 92% of them knew faeces can be used for fertilizers and 5 individuals consisting 8% of them knew nothing about it. Meanwhile, 35 of the individuals consisting 56% responded 'Yes' to the question if they will eat a foodstuff fertilized with faeces and the remaining 28 consisting of 44% responded 'No' to the same question.

5.1 Discussion

The research revealed that one of the important factors which have led to open defecation in the municipality is the lack of toilet facilities and inadequate public toilets. As it shows in Fig. 4, out of 63 individuals selected for the survey, 31% representing 49% do not have toilet facilities in their houses. The reason entirely attributed to landlords unwillingness to construct toilet facilities due to the cost involved in building it and ignorance.

The responses from both students and the community members in the municipality are the same. All of them are aware of the problems associated with open defecation; the result indicates that lack of toilet facility, cost of building the toilet, landlords unwillingness to provide toilet facility for student residents and public toilet by the municipality are also not convenience due to lack of maintenance. All these factors have contributed to open defecation in the Wa, Municipality. It was revealed in the study that the high population growth in the municipality without the corresponding increase in public and household toilets has also led to open defecation. The problem of open defecation was as a result of the refusal of landlords to comply with the directives of the assembly to put up household toilets facilities for their tenants. It was observed in the study that the indiscriminately defecating openly have negative health implications in the lives of the people especially women and children.

The acting municipal environmental health officer, Mr Bangs in the interview process revealed that "to him the problems they face regarding open defecation is outbreak of disease such us diarrhoea, malaria and also pollution of water bodies which some parts of the municipality depended on downstream for their domestic use". He also posited that, in order to have a sustainable toilet facility it must be compatible with local setting and cultural beliefs. The UN-Water, Deputy Secretary-General, Mr. Jan Eliasson also affirmed in his address during the World Toilet day in November 2014, stated that success at ending open defecation goes beyond infrastructure; it requires the understanding of behaviors', culture attitudes and social norm (Eliasson, 2014).

6. RECOMMENDATIONS AND CONCLUSIONS

6.1 Recommendation

Based on the main findings of the study, the following recommendations have been made for consideration to all direct and indirect stakeholders concerned about proper sanitation in the municipality. First of all, government through the municipal authority should construct more decent public toilet facilities in the municipality. The facility cost of usage should be subsidized and be made free for children and the aged to have easy accessibility.

Secondly, indirect stakeholders such as donor agencies, civil society organizations, NGOs, and the academia should assist in supplementing government's efforts of ensuring proper sanitation in Ghana and the Wa municipality specifically through public education, awareness creation and sensitisation. Thirdly there must be an unambiguous and strict framework for punitive and incentive measures to encourage acceptable behavioural practices and discourage unhealthy lifestyles. This means laws must be enforced by the regulatory agencies to thereby prosecuting any households whose members are found of defecating openly. Finally, there must be conscious efforts to include youth leaders and leaders of women groups in all decision-making processes of developing, planning and implementing policies in relation to sanitation and community development.

6.2 Conclusion

The study sought to address open defecation sanitation problem through a dry toilet implementation to help solve sanitation challenges in the Wa municipality, Ghana. Based on the findings it can be concluded that the remote causes of sanitation problem in the municipality is open defecation. The immediate causes are poverty, lack of public education, illiteracy, unwillingness to provide the toilet facility by landlords, poor management. As the study indicated, the health implications of open defecation need importantly for the whole community to be educated on the problems associated with poor sanitation. In recent times, the support and efforts of leaders of religion, education and opinion leaders on the need to end open defecation

habits are on-going but not adequate because a holistic approach of pragmatic stakeholder analysis is needed to ensure sustainable and proper sanitation.

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Appendix

QUESTIONNAIRES FOR RESPONDENTS

The research is conducted in partial fulfilment of academic requirement by Novia University of Applied Science. Information provided therefore, is for academic purpose and shall be treated in the strictest sense of confidentiality.

Please tick {√} the appropriate response from the opinions provided and in some cases you may be required to share your view and experience

1. Gender a. Male { } b. Female { }
2. Age a. 15-20years { } b. 21-25years { } c. 26-30years { } d. 31-35+ years { }
3. Marital status a. Married { } b. Single { } c. Divorced { } d. Separated { }
4. Educational Background a. Basic level { } b. Senior High level { } c. Tertiary level { } d. none of the above { }

5. Occupation a. Farming { } b. Fishing { } c. Trading { } d. Teaching { } others, specify……..

6. Do you have toilet facility in your house? a. Yes { } b. No. { }

7. If no, Why…….

8. If No, how do you defecate a. Open defecation { } Public toilet { }

9. How do you feel about open defecation ……...

10. How do you feel about public toilet……..

11. Which of the following toilet facility do you use in your house a. dry toilet { } b. KVIP{ } c. Water Closet { } Others,

Specify……...

12. Do you use the said toilet facility? a. Yes { } b. No { }

13. How many people use the said toilet facility a.1-5{ } b. 6-10 { } c 11-20{ }

14. How do you feel about the number of the facility users? a good { } b. bad { } c. nothing{ }

15. Are there any problems in the use of the said toilet facility? a. Yes { } b. No { } c Don't know{ }

16. If yes what kind of problems…….....

17. If you could choose, which toilet facility would you select a Dry toilet { } b. KVIP { } c. Water closet { }

18. Why do you prefer the chosen facility? a convenient{ } b environmental friendly { } c. not expensive{ } d. easy to use{ } e culturally and religiously compatible{ } *Tick as many as you can*

19. Do you know faec can be used as fertilizer? a. Yes { } b. No{ }

20. Would you eat foodstuffs which were fertilized with compost from your toilet? A.Yes{ } b. No{ }

Interview Questions for authorities in Wa, Municipality

- What kind of problems do you face regarding open defecation?
- Do you have any policies to handle these problems?
- What are some of the challenges you will face in solving these problem?