PRESBYTERIAN UNIVERSITY COLLEGE, GHANA.

FACULTY OF DEVELOPMENT STUDIES.

FAECAL SLUDGE DISPOSAL AND HEALTH IMPLICATIONS IN EJURA-SEKYEDUMASE MUNICIPALITY.

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BY

OPPIAH-MENSAH JUSTICE

Dissertation submitted to the Department of Social Studies of the Faculty of Education, Presbyterian University College, Ghana, in partial fulfilment of the requirements for award of Master of Education Degree in Educational Studies

SEPTEMBER 2019.

DECLARATION

I hereby declare that, this study is my own work towards M.A International Development Studies and that, to the best of my knowledge; it contains no material previously published by another person or material which has been accepted for the award of any degree of the University.

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Supervisor	Signature	Date

ABSTRACT

Solid waste and faecal sludge management in situations of rapid mass displacement are important to public health and providing for a better environment. Despite this, both have been neglected in Water Sanitation and Hygiene programs, which tend to have a focus on water. However, increasing efforts are being made to find solutions to challenges in solid waste and faecal sludge management in difficult circumstances in humanitarian emergencies.Safe disposal of excreta, so that it does not contaminate the environment, water, food or hands, is essential for ensuring a healthy environment and for protecting personal health. Regardless of method, the safe disposal of human faeces is one of the principal ways of breaking the faecal–oral disease transmission cycle. Provision of improved faecal matter disposal systems is vital in reducing the incidence of faecal diseases. The main purpose of this study is to review faecal sludge disposal practices in the Ejura-Sekyedumase municipalityand its health implications. The study reviews faecal sludge management options used by individuals and the municipality as a whole. In addition, the study analyses the common disease profile of the community in retrospect. The study recorded 64 males with a percentage of 53.3 and 56 females also with a percentage of 46.7 all making up 120 respondents.The number of responses recorded for females in all 3 zones was encouraging, this is because most ladies are concerned about the kind of toilet facilities they use when it comes to where they defecate. Recommendations were made, one being that landlords should make toilet facilities available in their homes thus curbing open defecation and reducing the pressure on public toilets.

DEDICATION

My research work isdedicated to Almighty God for the strength and knowledge.

ACKNOWLEGEMENT

First, I am very grateful to the Almighty God for making this thesis a success.

I acknowledge the numerous contributions of Dr. Richard Amful-Otu, my supervisor and a lecturer at the Presbyterian University College, Ghana for his constructive criticism and invaluable supervision and support throughout the entire period of this thesis.

I also dedicate it to my beloved family, loving and caring wife and children, friends and parents for standing by me through this period of my academic pursuit. I am very grateful.

Finally, I highly indebted to the participant for the survey. I would also like to thank each and every one who through his or her diverse support has made this thesis a success. I say may the good Lord bless them all in this regard.

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CHAPTER ONE

INTRODUCTION

Background of study

Access to basic sanitation is considered a fundamental human right, one that safeguards human health, protects human dignity and promotes economic and social development. Sanitation which refers to public health conditions related to clean drinking water and adequate treatment and disposal of human excreta and sewage.Faecal Matterrefers to the waste products of the human digestive system and the human metabolism, namely faeces and urine.Faecal matter disposal has been a hectic problem in our part of the world(Africa). The World Health Organization (year) reports that nearly 2.2 million people die annually from diseases caused by contaminated water which is associated with improper faecal matter disposal (Murray and Lopez 1996; WHO 2000a).

In 2015, Thirty-nine (39) per cent of the global population (2.9 billion people)used a safely managed sanitation service; that is, excreta safely disposed of in situ or treated off-site. Estimates for safely managed sanitation were available for 84 countries (representing 48 per cent of the global population), and for five out of eight SDG regions. Two out of five people using safely managed sanitation services (1.2 billion) lived in rural areas and twenty-seven (27) per cent of the global population of 1.9 billion people used private sanitation facilities connected to sewers from which wastewater was treated(World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), 2017).

Moreover, thirteen (13) per cent of the global population (0.9 billion people) used toilets or latrines where excreta were disposed of in situ and available data were insufficient to make a global estimate of the proportion of population using septic

tanks and latrines from which excreta are emptied and treated off-site. A large size of sixty-eight (68) per cent of the global population (5.0 billion people) used at least a basic sanitation service with this 2.3 billion people still lacked even a basic sanitation service and 600 million people used a limited sanitation service; that is, improved facilities shared with other households (Joint Monitoring Program Report, 2017).

In Ghana, in the year 2017 report by Water Aid indicates that about 85.7 percent of its population without decent toilet facilities and, with an estimated population of 29.6 million, this equals about 25.6million people who experience and suffer the fear and indignity of relieving themselves in open or in unsafe or unhygienic toilets.

Problem Statement

Increasing human population and industrial activities have generated huge quantities of organic waste. Municipal Solid waste and Human excreta (faecal sludge) constitute the major components of urban waste stream in the country. Their management especially Faecal matter has become a challenge for Municipal authorities and the country as a whole (Adamtey, 2010) Safe disposal of excreta, so that it does not contaminate the environment, water, food or hands, is essential for ensuring a healthy environment and for protecting personal health. This can be accomplished in many ways, some requiring water, others requiring little or none. Regardless of method, the safe disposal of human faeces is one of the principal ways of breaking the faecal–oral disease transmission cycle and therefore Sanitation is therefore a critical barrier to disease transmission.

A majority of 2.3 billion people still lacked a basic sanitation service practice either open defection (892 million) or use unimproved facilities such as pit latrines without a slab or platform, hanging latrines or bucket latrines (856 million)(Joint Monitoring

Program Report, 2017). This figures or numbers automatically and directly put pressures on managing faecal matter disposal.

In Ghana and Ejura-Sekyedumase Municipality to be precise, plans for locating sanitation facilities, and for treating and removing waste, must consider cultural issues, particularly as sanitation is usually focused on the household. Excreta disposal may be a difficult subject for a community to discuss: it may be taboo, or people may not like to discuss issues they regard as personal and unclean. In some cases, people may feel that sanitation facilities are not appropriate for children, or that children's faeces are not harmful. In others, separate facilities may be required for men and women, and it may be necessary to locate the facilities so that no one can be seen entering the latrine building. If the disposal facilities smell and are a breeding ground for flies, people may not use them.

Health improvement comes from the proper use of sanitation facilities, not simply their physical presence but that has not been the case. Maintenance culture of inhabitants towards these facilities is still a major challenge in most Municipalities which Ejura-Sekyedumase is not excluded. Moreover, they may be abandoned if the level of service does not meet the social and cultural needs of community members at an affordable cost.

Objectives of the Study

This Research was done to achieve broad knowledge or information on faecal matter disposal and its health implications in the Municipality. These are the specific objectives of the study:

1. To examine open defecation practices in the Ejura-sekyedumase Municipality.
2. To examine the existing methods being used in managing the faecal sludge.

3. To assess the environmental and health effects of faecal matter disposal in the Municipality.

Research Questions

1. What is the practice of open defecation situation in the Ejura-Sekyedumase Municipality?
2. What are the existing methods used in managing the faecal sludge in the municipality?
3. What are the environmental and health effects of faecal matter disposal in the Municipality?

Significance of the Study

In the follow up, improving management of faecal matter disposal in the Ejura-Sekyeduamse Municipality will elevate the aim to lessen any future health implications on inhabitants and in general improve sanitation crises in the Municipality. The Assembly's contribution in managing faecal matter disposal challenges in the Municipality will be known and acknowledged by all. The findings of this study will also help to know the populace that is affected by the faecal matter disposal in Ejura-Sekyeduamse Municipal Assembly and also will show the main health and disease implications on the inhabitants of the Municipality.

Moreover, since some of the inhabitants are doubtful and unwilling to use the available toilet facilities and how to manage them, the study will aid in educating the populace in managing faecal matter and critically highlighting its serious effects which is the health implications. The Environmental Sanitation Unit together with the Respective heads of departments/unit in the Municipality maybe further informed on the measures needed to be put in place to ensure proper faecal matter Management by the Assembly.

CHAPTER TWO

LITERATURE REVIEW

Faecal sludge management is an essential part of community and country as a whole and if not handled careful becomes a big problem for the communities**.** Faecal sludge comprises all liquid and semi-liquid contents of pits and vaults accumulating in on-site sanitations installations, namely unsewered public and private latrines or toilets, aqua privies and septic tanks. These liquids are normally several times more concentrated in suspended and dissolved solids than wastewater.

On-site sanitation is a system of sanitation whose storage facilities are contained within the plot occupied by a dwelling and its immediate surrounding. For some systems (e. g. double-pit or vault latrines), faecal matter treatment is conducted on site and also by extended in-pit consolidation and storage. With other systems (e. g. septic tanks, single-pit or vault installations), the sludge has to be collected and treated off-site (WHO, 2006).Hence FS management deals with on-site sanitation systems, while wastewater management is concerned with sewered sanitation. FS may be treated in separate treatment works or co-treated with sludges produced in wastewater treatment plants. (Strauss et al., 2002).

Faecal sludge and wastewater management side-by-side in urban environmental sanitation and their potential links. (Photos sources: right: Ghana, Sandec, 2001; left: www.kamphconstruction.com/projects.html)

Basic sanitation policy in Ghana

It is estimated that literally billions of residents in urban and peri-urban areas of Africa, Asia, and Latin America are served by onsite sanitation systems (e.g. various types of latrines and septic tanks). Until recently, the management of faecal sludge from these onsite systems has been grossly neglected, partially as a result of them being considered temporary solutions until sewer-based systems could be implemented. However, the perception of onsite or decentralized sanitation technologies for urban areas is gradually changing, and is increasingly being considered as long-term, sustainable options in urban areas, especially in low-and middle-income countries like Ghana lack sewer infrastructures (Strande&Brdjanovic2014).

In April, 2010, a revised Environmental Sanitation Policy of Ghana was produced. The overall goal of this new policy is to develop a clear and nationally accepted vision of environmental sanitation as an essential social service and a major determinant for improving health and quality of life in Ghana. The policy is a necessary tool required to help shape all efforts in dealing with the overwhelming challenges of poor sanitation in Ghana.While policy makers are seen to be actively working towards a common solution, we contend that the content of the revised policy is weak. Why? The policy makes no express provision for the active involvement of young people in the processes. Arguably, the youth constitutethe largest segment influencing the sanitation situation in Ghana. When you consider who engages in: open defecation, generation of e-waste, improper disposal of waste, and indiscriminate littering of streets or environment, young people are the majority. Government's vision or overall objective may not be satisfactorily achieved if youth – a major stakeholder—are continually excluded in all decision making processes.(Environmental Sanitation Policy,Revised 2010)

Policy Framework on Provision of Toilet Facility Country-Wide

The President of Ghana, His Excellency Nana Akuffo-Addo called for a change in attitude from Ghanaians and also mentioned some policy initiatives to enforce already existing sanitation laws specifically on toilet facility. He made this statements at the launch of the National Sanitation Campaign on Monday, November 13, 2017 and it was centered on a change in attitude from Ghanaians and some policy initiatives to enforce already existing sanitation laws. The launch highlighted on Indiscipline as a major stumbling block in Ghana at the National Sanitation Campaign. The government is on a mission to ensure that Ghana becomes a clean state by providing

basic sanitation needs which includes toilet facilities and the recruitment of sanitation staff. key points from the National Sanitation Campaign initiative:

Establishment of the National Sanitation Authority, Establishment of National Sanitation Fund; adhered to Local government policy on one-house-one-toilet; Sanitation Ministry and Attorney General's office to set aside a day to try sanitation offences and The Evaluation and Monitoring Ministry is to publish MMDA's sanitation performances quarterly.

Government through the Community Water and Sanitation Agency under the Ministry of Water Resources, Works and Housing published in their annual report in 2014 that, in the area of sanitation, the sub indicators 'latrines under construction' and 'latrines completed' under institutional latrines attained 169% and 93% respectively. The other sub indicator 'latrine contracted out' achieved 40%. In relation to household latrines (VIPs) constructed, although targets were not set a lot was achieved as a result of community led total sanitation (CLTS) activities. (CSWA, 2014). This facts and figures demonstrates that every government being past or present find ways and means to tackle sanitation with its available resources.

Challenges of Improving Sanitation Management in Ghana:

Budget Constraints:

The key sources of sector financing include tariffs, government budget allocations, private sector investments and donor contributions. In the case of government there has been little or no contribution to the investment budget, and funds for administrative expenses have always been cut back by more than half (CWSA, 2009).

Limited Capacity at MMDAs' Levels:

The capacity of the Assembly to effectively manage sanitation projects under their jurisdiction is still a challenge as a result of the rampant transfer of trained staff on specific sanitation projects. This also undermines the capacity of the District Assemblies and on sanitation recruitment. There is the need to develop effective monitoring and evaluation tools on the monitoring of the fecal matter disposal services in the communities of Ejura-Sekyedumase Municipality (CWSA Annual Report (2009)

Inadequate Sanitation Staff:

The sub-district structures within the Ejura-Sekyeduamse Municipality are supposed to play some important roles in sanitation services: The management of public toilets and ensuring overall cleanliness, Arrangement for dislodging when toilets are full by contacting the transport officer for the release of the cesspool emptier, Provision of disinfectants for the toilets and Provision of waste bins for used paper and other materials. On the contrary, the involvement of the Unit Committees and the Zonal councils in the management of public latrines has not been the best as the users expressed their dissatisfaction over the management of the toilets. Also the rampant transfers without replacement of sanitation staffs contribute to the understaffing.

However, in communities where these Unit Committees/Zonal Councils have put in place structures for managing the toilets, the cleanliness of the facilities are better than those areas which have not put in place any structures for the engagement of toilet attendant (Owusu &Adjibolosoo, 2016).cleaner/sweeper and user fees are charged for the management of the toilets like in Anyinasu and Kasei. At Dromankuma for an

example, out of 5 staffs required 3 are at post and working, Ebuom 5 staffs 3 are in the community.

Health Implications of Faecal Sludge Disposal

Diseases related to indiscriminate faecal matter disposal are some of the most common causes of illness and death among the poor of developing countries. Amongst the faecal-oral diseases are cholera, diarrhoea, typhoid fever, hepatitis, and intestinal helminths (Billig et al., 1999). According to the World Health Organization (2011) diarrheal disease accounts for an estimated 4.1% of the total daily global burden of disease and is responsible for the deaths of 1.8 million people every year. An estimated 50% of cases associated with underweight or malnutrition in children are repeated diarrhoea or intestinal nematode infections (Zarocostas, 2008). Children who suffer constant faecal-related illness carry the disadvantage into school. These disadvantages include absenteeism, attention deficits and early dropout. According to the human development report (2006), children who suffer repeated bouts of infectious disease, particularly diarrhoea are likely to reach adolescence and adulthood with reduced height and mental retardation.

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Institutional Arrangements for Faecal Sludge Management

Over the years, sanitation continues to pose a challenge to the communities. Faecal Disposal costs the Assembly thousands of cedis. Hence the policy that every household should have descent toilet facility to promote safe faecal matter containment is laudable. When people have adequate, appropriate and acceptable toilet facilities, sufficiently close to their households, to allow rapid, safe and secure access at all times, it does not only enhance safe disposal of human excreta and

creates the first barrier to excreta-related disease but it also helps to reduce direct disease transmission.

Another challenge that hinders efficient management of faecal matter disposal is **finance**. There is the need for the Assembly to increase budgetary allocation for its sanitation unit. The main sources of funding for environmental sanitation services are from the Central Government allocation in the form of District Assemblies Common Fund and Assembly's Internal Generated Fund (IGF). To ensure that these funds are used for its intended purpose, there should be external independent body made up of opinion leaders and representative from Regional, Metropolitan and Municipal Departments to supervise its disbursement and do follow-up to ensure that the fund is used well.

The Assembly has enough laws to support the environmental sanitation service delivery and enforce the compliance of sanitation rules to ensure clean, safe and healthy environment. Furthermore, there is the need to resource the Environmental Sanitation Division of the Municipal Assembly with qualified sanitary engineers, environmental health technologists, Environmental Health Officers and Environmental Health Assistants as well as modern logistics. The Municipal Coordinating Director is in charge of overall monitoring of waste problems and solutions. Some functions of Municipal Environmental Health Unit (MEHU) include the following: Advices the MA on Government policies on sanitation; Collaborates with other departments and agencies like EPA, CWSA, GHS, MOFA, GES, and World Vision in dealing with issues concerning waste management and sanitation in general in the district; Supervises monitors and evaluates all programmes and activities concerning waste management and sanitation in the district. (Ministry of

local Government Rural Development and Environment, 2010-Revised Environmental

Sanitation Policy).

All these activities are done by the unit to enhance sanitation services delivery in the Municipality. However, the unit is unable to perform these functions effectively because of low human resource capacity and inadequate logistics. Finally, there is the urgent need to effect attitudinal and behavioural change in the people through extensive educational and awareness creation programmes of maintaining healthy lifestyles and good sanitary conditions with the involvement of relevant stakeholders.

Faecal sludge Emptying

Pit emptying constitutes a major problem in many places, both technically and managerially. In many countries and cities, both mechanised and manual pit emptying services are being offered. Mechanised services are rendered by municipal authorities or by small to medium-sized enterprises.

Manual emptying

Manual emptying can mean one of two things: The waste/sludge is emptied by hand using buckets and shovels or by a portable, manually operated pump system (e.g. "MAPET: Manual Pit Emptying Technology").

If a container (pit, tank etc.) pit is emptied by hand, every precaution should be taken to prevent anyone from accessing the pit. If, for whatever reason the pit has to be entered, the emptier has to be fitted with adequate protection and safely secured by a rope to the surface in the event he has to be pulled out quickly. Appropriate equipment (e. g. long-handle shovels) should be provided to avoid accessing the pit. A

MAPET system, comprises a hand-pump connected to a vacuum tank mounted on a pushcart. A hose connected to the tank is used to suck sludge from a pit. When the hand-pump is turned, air is sucked out of the vacuum tank, which in turn sucks up the sludge into the tank. Depending on sludge consistency, MAPET can pump the sludge from a max. depth of 3 m.

MAPET equipment in the D. R. of Congo. (Source: WASTE, Holland)

Health hazard through manual emptying

Individuals, small groups of individuals or micro-enterprises offer manual emptying, traditionally carried out with buckets. Emptiers step into the vault or pit to evacuate the sludge that has generally solidified to be scooped out. Hence, traditional manual emptying is associated with considerable health risks for the emptiers. The general public is also at risk as the emptied sludge is usually deposited into dwelling concessions, nearby surface drains or into lanes (Strauss et al., 2002).

Indiscriminate disposal

The haulage routes tend to be rather long as metropolitan cities usually stretch out. Traffic congestion further aggravates the problem and renders haulage to designated discharge or disposal sites uneconomical and financially unattractive. This leads to uncontrolled dumping of collected FS at the shortest possible distance from the area of collection. Where designated discharge sites or treatment schemes are available, a fee is usually charged by private collectors for each FS load delivered to the site. As a consequence, the inhabitants often prefer to dump the waste in non-designated sites to avoid paying the collection fee (Strauss et al., 2002). Mechanised emptying vehicles are more cost-intensive but also more hygienic and efficient. Due to the narrow streets in poor urban settlements, they often cannot access the pits.

Worldwide, several hundred thousand tons of faecal matter from open defecation or collected from on-site sanitation installations are disposed of every day largely untreated and totally uncontrolled into the urban and peri-urban environment. The faecal matter is either used in agriculture or aquaculture or discharged indiscriminately into lanes, drainage ditches, onto open urban spaces, into inland waters, estuaries, and the sea, thus causing serious health impacts, water pollution and eye and nose sores. In many cities, FS dumping sites are located close to squatter areas or formally inhabited low-income areas where they threaten the health of this ever-growing segment of the population. Children are especially at greatest risk of coming into contact with indiscriminately disposed and hygienically unsafe excreta. (Strauss et al., 2002)

Indiscriminate disposal of faecal sludge, Ouagadougou. (Photo: Eawag/Sandec)

Mechanical Emptying

Mechanical emptying Most pits/septic tanks, however, are emptied by vacuum trucks or tankers equipped with a pump and a storage tank. The pump is connected to a hose, which is lowered down into a septic tank or pit, and the sludge is pumped up into the tank. Generally, the storage capacity of a vacuum tanker ranges between 4 and 6 m^3. Depending on the system, the material to be pumped out can sometimes become so compacted that it cannot easily be removed. In these situations, the solids have to be liquefied with water in order to flow more easily. If water is not available, the waste will have to be removed manually. FS collection and haulage are particularly challenging in metropolitan centres with their often large and very densely built-up, low-income districts. Large trucks often have difficulty accessing pits/septic tanks in areas with narrow or inaccessible roads/lanes.

Faecal sludge treatment

Separation of the FS solids from the liquids is the process-of-choice in FS treatment, unless FS is co-treated in an existing or planned wastewater treatment plant, and if the FS loads are small compared to the flow of wastewater. Solid-liquid separation may be achieved through sedimentation and thickening in ponds or tanks or through filtration and drying in sludge drying beds. The resulting solid and liquid fractions both require further treatment. Though the technologies used for solid-liquid separation, secondary treatment and co-treatment with wastewater are often the same, their design and mode of operation vary.

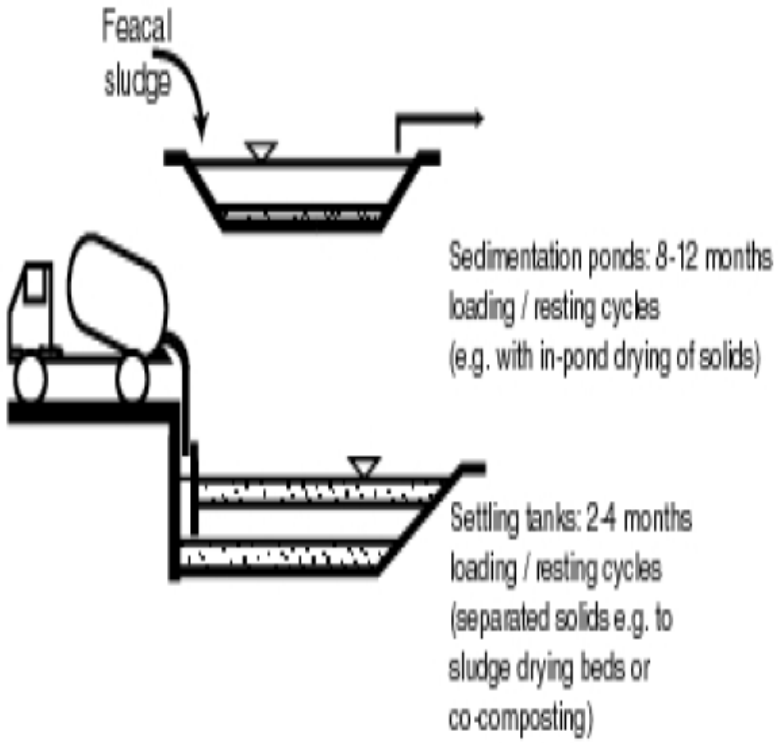
Fresh FS collected from unsewered public toilets unloaded at Buobai FS treatment plant, Ghana. (Source: Eawag/Sandec, 2003)

Discharge of untreated septage. (Source: Eawag/Sandec)

Settling tanks and sedimentation pond

Settling tanks provide a liquid retention time of a few hours (enough to ensure quiescent settling of settleable solids), while sedimentation ponds cater for several days or a few weeks of liquid retention and, hence allow for anaerobic degradation of organics. Depending on the storage volume required, both types of units are designed for a desired depth and quantity of accumulating solids. At least two parallel units need to be provided to allow for batch operation, including adequate loading and resting/emptying cycles. Non-mechanised, batch-operated settling tanks and settling ponds must be designed so as to enable easy removal of partly or fully dewatered accumulated solids, either manually or by frontend loaders (in larger plants). The solids can be further processed by drying on so-called sludge drying beds or further surface spread in thin layers by co-composting with organic solid waste or by in-pond storage in the case of settling ponds. The liquid effluent or supernatant needs to be further treated in e.g. waste stabilisation ponds prior to discharge into surface waters or infiltration beds. (Strauss et al., 2002, p. 58) The rate of accumulation of settle able solids, i. e. the required solids storage volume, is the decisive design criteria for preliminary settling/thickening units or for solids storage compartments in primary ponds. The specific volume occupied by separated solids may vary from 0.02 (thin septage) – 0.15 (septage mixed with high-strength sludge from unsewered public toilets) m3/m3 of raw FS, depending on FS type and composition and on the period allowed for solids consolidation and thickening (Strauss et al., 2002). The choice of sedimentation tanks or ponds is not only dependent on the type of sludge to be treated but also determined by the mode of operation envisaged and by the provisions made for handling the mass of solids for periodic removal from these primary treatment units. Solids quantities produced in sedimentation/thickening tanks, which will be

non-mechanised and batch-operated in loading/consolidating cycles of weeks to a few months in their low-cost version, will be much smaller than the massof solids to be removed and handled from primary ponds. These have typical operating cycles of 6–12 months, unless measures are introduced by which settled solids are evacuated at higher frequencies without stopping pond operations. Treatment plant operators might be overtaxed by having to deal with pond emptying, particularly in larger schemes, where large machinery such as front-end loaders are required for days or weeks to cope with the solid mass. Moreover, land might be lacking for natural sun drying or for sludge drying beds required to treat such large quantities of thickened sludge within short time periods.



Unplanted sludge drying beds

If suitably designed and operated, sludge drying beds can produce a solid product that may be used either as soil conditioner or fertilizer in agriculture or deposited in designated areas without causing damage to the environment. In most cities, the solids removed from the drying beds after a determined period (several weeks to a few months) require further storage and sun drying to attain the hygienic quality for unrestricted use. Where dried sludge is used in agriculture, helminth (nematode) egg counts should be the decisive quality criterion in areas where helminthic infections are endemic (Strauss et al., 2002). A maximum nematode (roundworm) egg count of 3–8 eggs/g TS has been suggested by Xanthoulis and Strauss. Xanthoulis et al. (1991) indicated that gravity percolation and evaporation are the two processes responsible for sludge dewatering and drying. Evaporation causes the mud to crack and result in improved evaporative water losses and enhanced drainage of the sludge liquid and rainwater. Strauss et al. (2002) indicated that 50–80 % of the faecal sludge volume applied to unplanted drying beds will emerge as drained liquid (percolate). The ratio between drained and evaporated liquid is dependent on sludge type, weather conditions and operating characteristics of the particular drying bed. Drying bed percolate tends to exhibit considerably lower levels of contaminants compared to settling tank supernatant. Nevertheless, this liquid will, in most cases, also have to be subjected to a suitable form of treatment (e.g. in facultative ponds) (Strauss et al., 2002). Pescod (1971) conducted experiments with unplanted sludge drying beds in Bangkok, Thailand. According to his experiments, maximum allowable solids loading rates can be achieved with a sludge application depth of 20 cm. To attain a 25 % solids content, drying periods of 5 to 15 days were required depending on the different bed loading rates applied (70–475 kg TS/m2/yr.). Results from pilot sludge

drying beds obtained by the Ghana Water Research Institute (WRI) in Accra/Ghana indicate their suitability for septage/public toilet sludge mixtures and primary pond sludge (TS = 1.6–7 %). Experiments were conducted during the dry season with sludge application depths of ≤ 20 cm.

Drying beds in Accra, Ghana (Sandec, 2000)

Composting with organic solid waste ("co-composting")

Composting is the process with which biodegradable waste is biologically decomposed by microorganisms (mainly bacteria and fungi) under controlled aerobic and thermophilic conditions. In co-composting, two or more raw materials are composted together – in this case, faecal sludge and organic solid waste. Other organic materials, which can be used or subjected to co-composting, comprise animal manure, sawdust, wood chips, bark, slaughterhouse waste, sludges or solid residues from the food and beverage industry (Strauss et al., 2003). Co-composting is practiced worldwide, generally in small, informal and uncontrolled schemes or on a yard scale. The process occurs most likely at ambient temperatures with concomitant inefficient inactivation of pathogens. In contrast, thermophilic composting, i.e. composting at 50–60 °C, is an effective process, which destroys pathogens, stabilises organic material and creates a valuable soil conditioner-cum-fertiliser (Strauss et al., 2002). Co-composting of FS and municipal solid waste is a most appropriate process, since the two materials complement each other. Human waste is relatively high in N content and moisture, whereas municipal solid waste has a relatively high organic carbon (OC) content with good bulking qualities. (Strauss et al., 2003,)

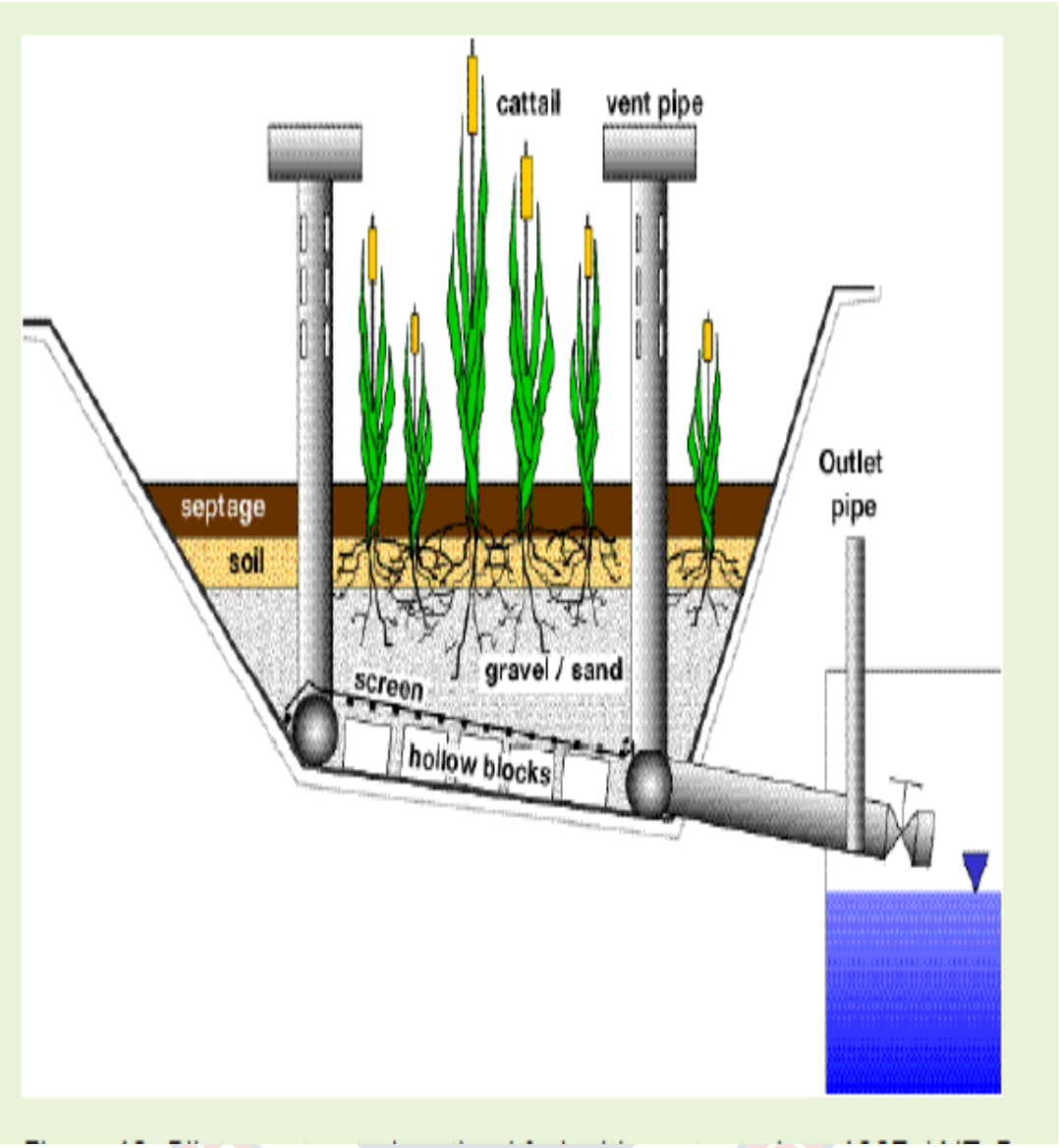
Planted sludge drying beds

Planted sludge drying beds consist of a gravel/sand/soil filter planted with emergent plants, such as reeds, bulrushes or cattails. The applied sludge is dewatered by filtration and accumulates on the surface. The liquid fraction flows vertically through the filter media and is finally collected as percolate at the bottom (vertical flow).

The advantage of planted over unplanted sludge drying beds is that the root and rhizome system of the plants used in a constructed wetland (CW) creates a porous

structure in the layer of accumulated solids, thus enabling to maintain the dewatering capacity of the filter for several years. In contrast to CWs treating wastewater, those treating sludge are equipped with a freeboard allowing dewatered solids to accumulate over several years. Removal frequency of accumulated bio solids is consequently far lower than in unplanted sludge drying beds, and operating costs thus considerably reduced. Extended storage of bio solids therefore allows for biochemical stabilisation. The plants pass through repeated cycles of growth and wilting. Sludge will have to be removed from the filters only after 5 to 6 years. The bio solids may have to be dried to a limited degree, i.e. only from 65–60 % water content at the most to ensure sustained plant growth. CW percolate will require post-treatment depending on local conditions and discharge regulations. (Strauss et al., 2002).

New installation of a constructed wetland with ventilation pipes at the Asian Institute of Technology (AIT) in Bangkok, Thailand. (Sandec, 1997)



Collection and Dislodging of Faecal Sludge

In Ghana, dislodging of toilets is the responsibility of the MMDAs who partners with private companies for service delivery. The Wa Municipal Assembly and Zoomlion Ghana Company Ltd. (a private waste management company) undertake the dislodging of toilets in the municipality. The study found that there are only four tankers in the Wa Municipality of which two are owned by the Assembly and the remaining owned by Zoomlion Ghana Company Ltd. All the four tankers have equal capacity of 6m3 and can dislodge a quantity of 6,500 litres of faecal material per a

trip. These vacuum tankers are used to empty both household toilet facilities and public toilets. Operators of the tankers said that dislodging is sometimes easy since the contents are usually mixed up with water: Majority users of the toilets are Muslims who use water to cleanse themselves when using the facility. This makes the faecal matter watery (Key Informant Interview, 2015).

The dislodging of KVIPs posed problems since users often dump in solid materials which could block the hose of the tankers. This in turn increases the time of dislodging and, sometimes, have a trickling effect on price charged for dislodging. Charges for dislodging of cesspits depend on the capacity of the vacuum tanker. Charges of GHS40.00, GHS45.00, and GHS70.00 are taken from public toilet operators, households and institutions respectively. A study by Boot (2008) in Accra revealed that private companies charge high prices for dislodging than public institutions. It was noted that In Wa, while the Assembly charges a maximum of GHS70.00, the private service provider charges a minimum fee of GHS100.00 for a trip. These charges cater for both the collection and transportation of the material. In an interview with a tanker operator, he said: Emptying of public toilets is a very daunting task. Our tanks are not that large, usually on one public toilet facility the truck will go about four times and this is done every month. Sometimes getting to the facility of most households is also not easy since there are no access roads.

There is no specific time of the day that dislodging is done. The operators only respond to demand of their clients. According to the Zoomlion Company Ltd., the company is able to meet between 80-90% of the demand for dislodging services.

Management of Public Toilet Facilities

Management of Public Toilet Facilities According to the Ghana Waste Management Guidelines, MMDAs are supposed to cede about 80% of waste collection to private managers. Most Ghanaians are of the view that governments (both national and local) are responsible for the entire process of sanitation provisioning; hence they pursue government to deliver them from unhygienic conditions (Amoah &Kosoe, 2014). This study showed that 93% of the public toilet facilities in Wa are owned by the Municipal Assembly. The Assembly, however, leases the facilities through a Public-Private-Partnership (PPP) process. With this arrangement, the assembly leaves the operation and maintenance activities of the facility to private operators. The Operators are also expected to pay a monthly amount of GHS 30.00 per facility to the the Assembly to be used for renovation of the facilities. However, according to the operators, this is not usually the case since the assembly has failed to redeem its mandate of renovating the facilities or take part in its maintenance.As a common practice, most people wake up early in the morning to ease themselves so that they can prepare and go to their various workplaces. The study, therefore, observed that public toilet facilities are opened around 4:00am and closed at about 9:00pm daily. However, the closing time could extend beyond or before the usual time depending on how busy the facility may be. This is typical of the market toilet facilities.

Users of public toilets are charged an amount of 50 Ghana pesewas per use of the latrine type and are provided with anal cleansing materials as well as water for hand washing. However, a user can pay less (10 Ghana pesewas) if he/she brings an anal cleansing material. The private commercial toilet facilities, on the other hand, charge 70 Ghana pesewas for use of the WCs and provide cleansing materials as well as water for hand washing. Cleansing is done in the privy area and the material left for

the cleaner of the facility to pick and dump daily onto the refuse skip located close to the toilet. This supports what Adjei et al.'s (2009) finding in Madina, a suburb of Accra. In Wa, majority (60%) of the respondents who use public toilet facilities are Muslims and for that reason are provided with toilet rolls as well as water to wash themselves as their religion demands. This is normally done in the privy room and the water directed into the pit.

According to users, they usually find it difficult to pay the user fees. The ability to pay largely depends, among other things, on the size of the household.

To the majority of people here, this amount is too high and for that matter we find it very difficult to pay for the use of the public toilet. For such reasons, people end up either defecating around the facility at night or go to bushes and other places to defecate. This confirms earlier studies (Adjei et al., 2009; Larbi, 2013) that unwillingness or inability of users to pay toilet fees leaves them to the unhygienic and indiscriminate defecation practices. For operation, cleaning and maintenance of the facilities, operators have employed attendants and cleaners who see to the day-to-day activities of the facilities. The cleaners are in-charge of sweeping the corridors of the cubicles, cleaning the seats (in the case of WCs), and collecting anal cleansing materials for burning or empting into skip containers and moping the immediate vicinity of pits. However, the latter is hardly done. These activities are supposed to be in line with the strategies disclosed by the Environmental Sanitation Policy (2007). It was observed that daily cleaning of the facilities as well as general cleaning on every first Saturday of each month is carried out. The inadequacy of water supply, as disclosed by a cleaner, at site pose a major challenge to them since it makes their work difficult. Some of the operators cleaned the toilet themselves and do so as and

when there is dirt. The cleaners use various types of disinfectants for thorough cleaning of the facility, especially the private toilets.

Technologies for excreta disposal

Cartage

Cartage is the most basic form of excreta disposal—faeces are collected in a container and disposed of daily. An example is the bucket latrine, in which household wastes are collected in buckets under a hole in the floor of a specific room. Each day, the bucket is emptied into a larger container and the contents disposed of. Bucket latrines should not be promoted because they pose health risks to both users and collectors and may spread disease. If cartage is considered for your community, a vault latrine (a latrine where wastes are stored in a sealed container) that is mechanically emptied on a regular basis is a better choice.

Pit latrines

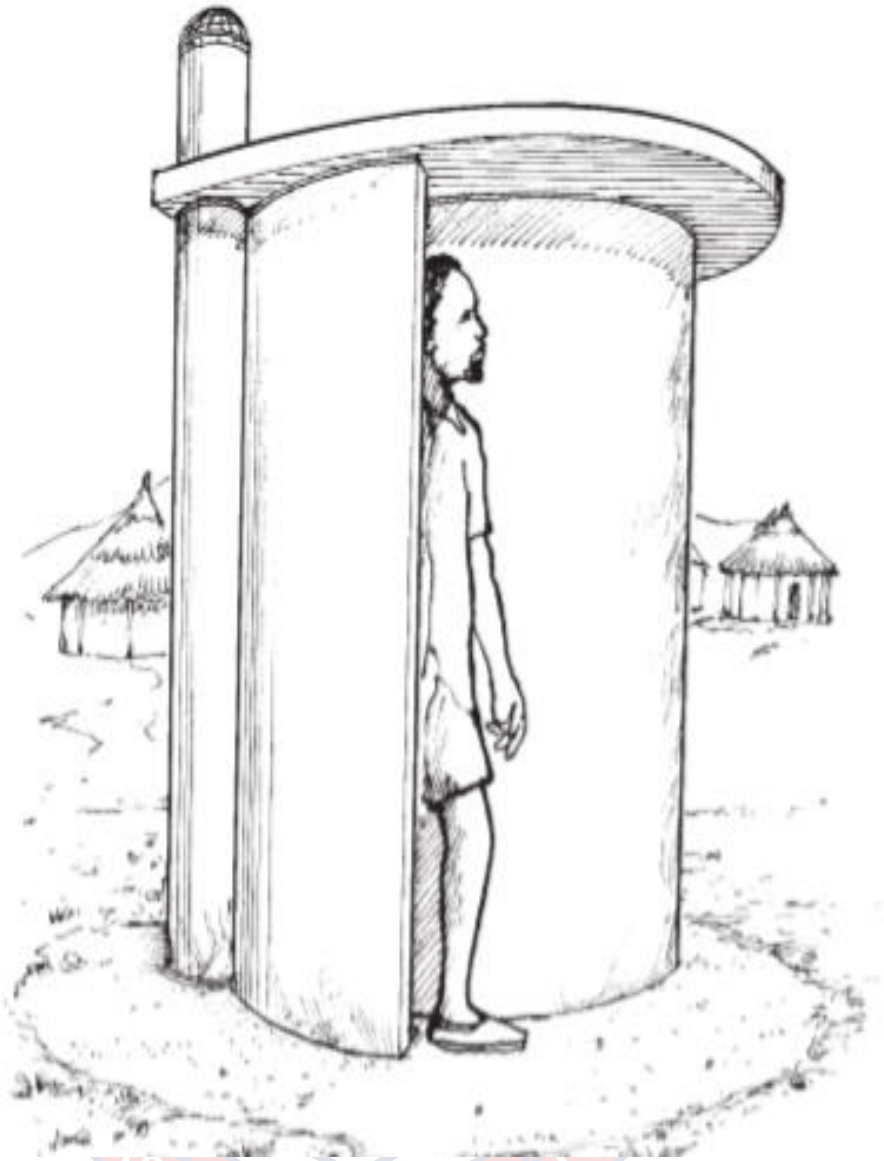
In most pit latrine systems, faecal matter is stored in a pit and left to decompose. Unless specifically designed, pit latrines do not require periodic emptying; once a pit is full it is sealed and a new pit dug. If faecal matter is left to decompose in dry conditions for at least two years, the contents can be safely emptied manually and the pit reused. Indeed, some pit latrines are designed to allow faecal matter to compost and be reused in agriculture. Other designs use two alternating pits, reducing the need for new pits. Some pit designs are meant to be completely dry, while some use small quantities of water. Ventilation to remove odours and flies is incorporated into certain designs, while others are very basic and use traditional materials and approaches. As with all sanitation designs, it is important to know what community members want and can pay for before embarking on construction

The VIP latrine

The VIP (ventilated improved pit) latrine is designed to overcome some of the problems with traditional latrine designs, but it is more expensive than a sanplat. It

has a vent pipe from the pit to above the roof of the building as shown in the diagrams below. When air flows across the top of the vent pipe, air is drawn up the pipe from the pit and fresh air is drawn into the pit from the building. Offensive odours from the pit thus pass through the vent pipe and do not enter the building. The location of VIPlatrines is important: unless a clear flow of air is maintained across the top of the vent, the ventilation system may not be effective. VIP latrines should therefore be located away from trees or high buildings that may limit airflow. A dark vent pipe also helps the air to rise. The top of the pipe is usually covered with mosquito meshing. If the inside of the building is kept partially dark, the flies will be attracted to light at the top of the pipe, where they will be trapped and die.

Twin VIP Latrine

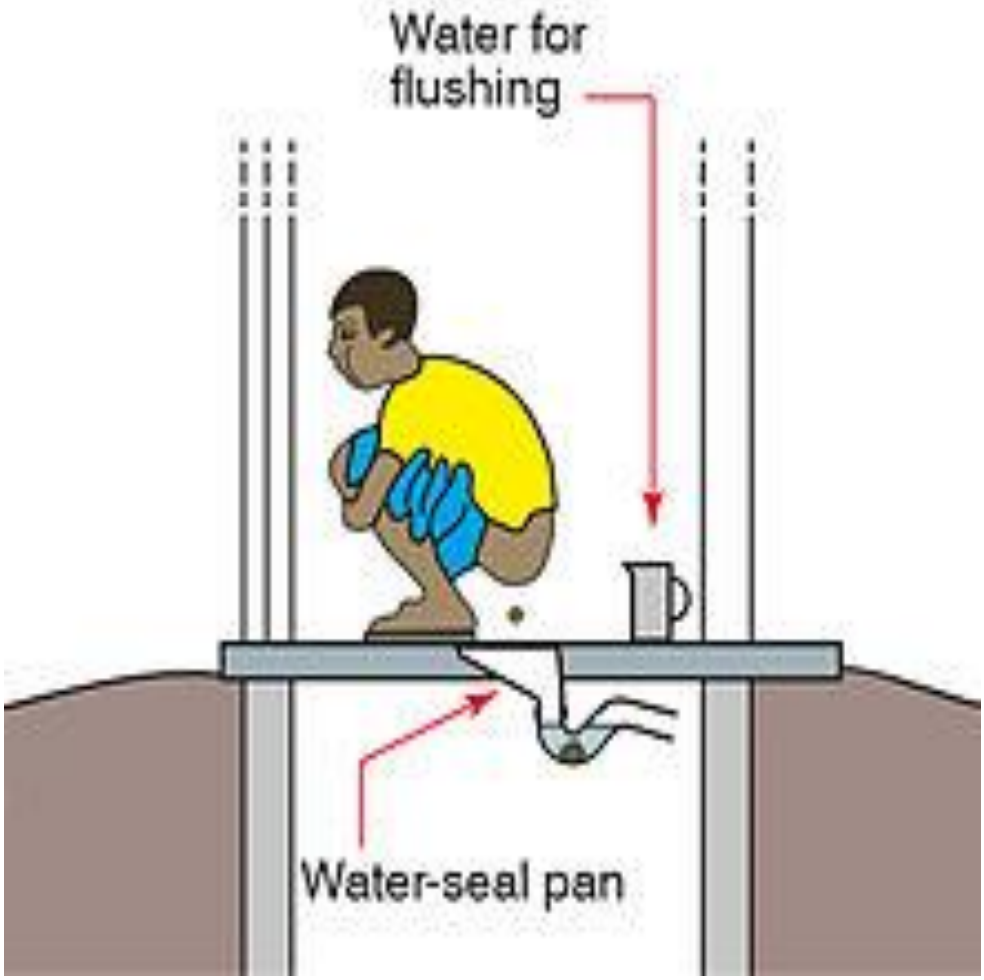


VIP latrine

Flush latrines/toilets

A pour–flush latrine is a type of pit latrine where small volumes of water (commonly 1–3 litres) are used to flush faeces into the pit. They are most appropriate where people use water to clean themselves after defecating (e.g. in Muslim cultures) and where people have access to reliable water supplies close to the home. Solid materials should not be disposed of into pour–flush latrines, as this could block the pipe and

even cause it to break. A pour–flush latrine has a small collection pan set in a slab. Wastes are disposed of through a section of pipe bent into a U shape (a U-bend) to maintain a water seal for reducing fly and odour problems. A vent pipe may also be added to the pit to help with fly and odour problems. The pit of a pour–flush latrine may be located directly beneath the slab or set to one side, but offset pits may require more water to prevent blockages. The pit is usually connected to a soak-away to allow liquids to infiltrate the soil, leaving solid waste to decompose. Pour–flush latrines can also be designed to be connected to smallbore sewers at a later date. As with VIP latrines, twin pits may be used.



Septic tanks /WC toilet

Aseptic tank is a form of on-site sanitation that provides the convenience of a sewerage system. It is usually linked to flush toilets and can receive domestic wastewater (or sullage). Since flush toilets tend to use large amounts of water, septic tanks are usually appropriate only for households with water piped into the home. The tank is offset from the house and linked to the toilet and domestic wastewater by a short drain. It is designed to hold solids and is linked to a soak away to dispose of liquid waste (effluent). Septic tanks generally require relatively large amounts of land and periodic emptying by vacuum tankers. This is often expensive and the trucks will need easy access to the tank. Septic tanks thus tend to be high-cost solutions for improving sanitation. They are commonly used only by communities whose members have access to water supply within the home, have land available and who can afford the cost of emptying the tanks. Communal septic tanks may be feasible if a large number of households close to the tank can be connected with very short lengths of sewer pipe. For such a system to work, however, each household needs sufficient water to flush faeces into the septic tank effectively. This approach will probably be effective only when water is supplied to at least one tap on each plot.

CHAPTER THREE

METHODOLOGY

Study Area

It has a large land size of about 1,782.2sq.km. (690.781sq. miles) and is the fifth largest in Ashanti Region's 43 districts. It constitutes about 7.3% of the region's total land area with about one third of its land area lying in the Afram Plains.It is located in the Northern part of the Ashanti Region and is bounded in the north by Atebubu Amantin Municipal and Nkoranza South Municipal (both in the Brong Ahafo Region), on the west by Offinso Municipal, on the east by SekyereAfram plains(drobonso) district and the south by Mampong Municipal and West AfigyaKwabre district. Its Capital is Ejura.

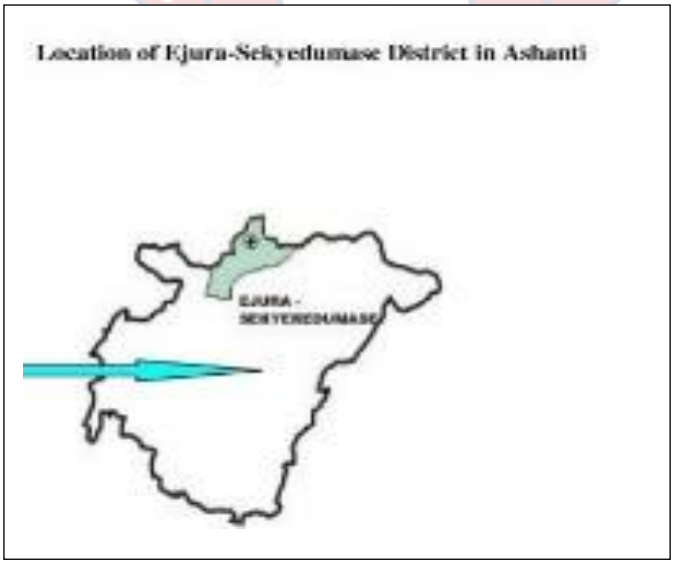
The study area comprises the Ejura-Sekyedumase District in Ashanti Region, as well as six selected settlements i.e. Ejura, Sekyedumase, Anyinasu, Dromankuma, Kasei and Ebuom for the detailed case studies. It is located in the Northern part of Ashanti Region, and is bounded on the North by Nkoranza and Atebubu Districts, in the Brong Ahafo Region, on the East by the Sekyere East District, on the South by the Afigya-Sekyere and Sekyere West Districts and on the West by the Offinso District. The district covers an area of 1782.2 sq. km. It is about 7.3% of the total land area of the Ashanti Region. Ejura is the Municipal capital.The population of the Municipality according to the 2010 Population and Housing Census stands at 85,446 with 42,892 males 42,554 females. The male Population accounts to 50.2% whiles 49.8% is for the female population.

The district lies in the transitional climatic zone, and experiences high temperatures throughout the year. Sometimes the torrential rainfall sweeps through the communities carrying all sorts waste into gutters and thereby choking the gutters. The

stagnant water becomes breeding grounds of mosquitoes which cause malaria, a sanitary related disease.

There are two distinct types of vegetation in the district. They are the **semi-deciduous forest**, which covers the South Western portions whilst the **guinea savannah** occupies the Eastern and Northern portions. Various types of wood are available for the construction of toilet facilities. The district is a heterogeneous nature with Akan ethnic group forming the majority. Other ethnic groups made up of Dagombas, Kokombas, Dagartis, Kotokolis, Bimobas (Grumas), etc. Since most of the people are not indigenes, their attitudes towards capital cost contribution for the construction of boreholes and latrines are not encouraging because of the perception. There is, therefore, the need to intensify education and community sensitization whenever water and sanitation programmes and projects are to be implemented in the district.

Ninety-one (91) Nursery schools, One hundred (101) primary schools, Forty-six (46) Junior High schools, Three 3 Senior High Schools and One (1) tertiary institution. Most of the schools do not have sanitary facilities. The District Assembly has therefore made a policy that any school block build must include sanitation facility. The district has 2 hospitals, 1 health centre, 5 clinics, and 10 CHP compounds.



Location of Ashanti Region in Ghana Location of Ejura-Sekyedumase District in Ashanti

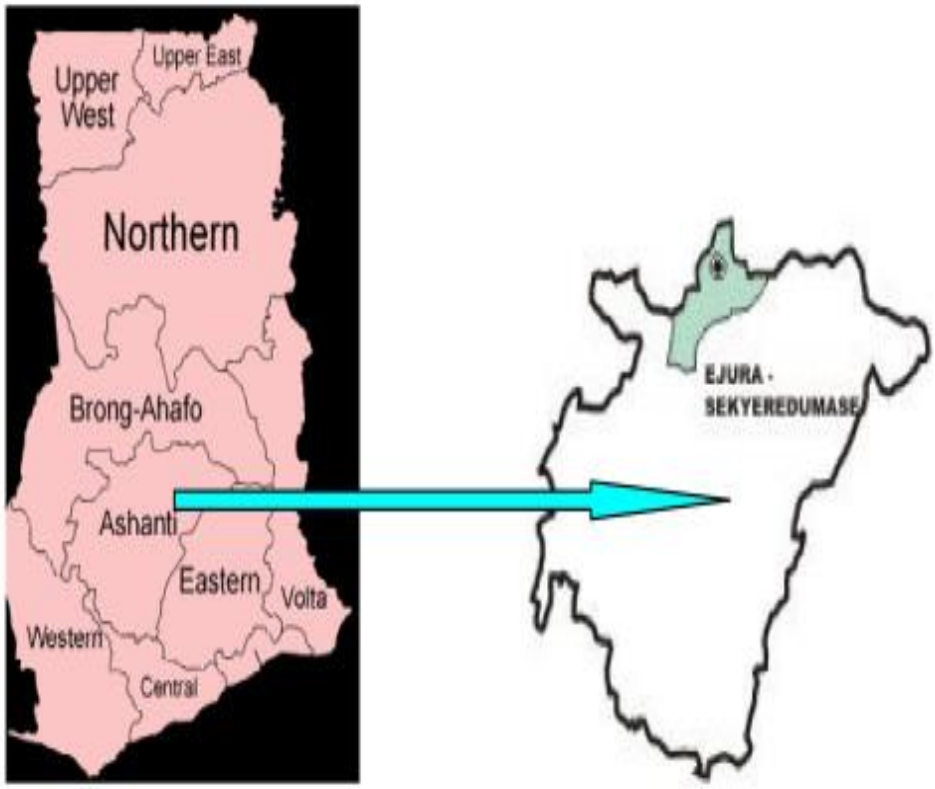


Figure 1:

Human Excreta Management in the Ejura-Sekyedumase Municipality

The Ejura-Sekyedumase Municipality is home to thousands Ghanaian residents. The types of toilet facility used in the town are public KVIP and Pit Latrines with few Water Closets in some selected households. The Municipality is divided into six sections namely, **Ejura** as the administrative capital, **Sekyedumase**, **Anyinasu**, **Dromankuma, Kasei** and**Ebuom**. Each division has at least one public KVIP with some households with pit latrines. Considering the population of the communities, public toilet facilities are often not enough for containment of fecal matter generated by inhabitants. As a result, it is not uncommon to see faecal matter on toilets floor.

Poor maintenance of the KVIP results in persistent open air defecation. Community members who stay far from the public toilets practice open air defecation. A little over half of the households in the communities' access public toilets on pay per use. Majority of the privately owned toilets (pit latrines) were however shared between two or more households. The most challenging problem in most households in the Municipality is the final disposal of faecal sludge. This has resulted in indiscriminate disposal of faecal sludge into open drains, gutters, refuse dumps and any open space. This situation has made parts of the communities, particularly the outskirts very filthy. Burying the faecal sludge close to the latrine is common practice among the most households with pit latrines in the communities.

A vacuum tanker provided by the Municipal Assembly is responsible for the conveyance of the excreta to the disposal sites. There are technical limitations, however, to the use of the vacuum tanker. These include inadequate road access to the collection points (households with toilets), frequent breakdown of the vacuum tanker due to overuse and inadequate funds to purchase fuel. Manual emptying is therefore common in many parts of the Municipality due to lack of accessibility. Population increase has also led to the match on the little available toilet facilities and on the vacuum tanker.

Another challenge that hinders effective and efficient faecal matter management in the Municipality is finance. As a result, effective implementation and evaluation of sanitation intervention programmes are executed improperly and as such the provision of sanitation facilities by the Assembly could not keep pace with increasing population. Having considered the issues surrounding communities fecal matter management.

Disease Profile of the Ejura-Sekyedumase Municipality

The records captured were limited to chart audit of those who sought help from the community's Health Clinics/CHP compounds. The audit focused on common faecal-oral disease indicators: diarrhea, nausea and vomiting, intestinal or abdominal pain and bloody stools and fever. The information gathered from Municipal Planning and Coordinating Unit (MPCU) indicated that the income levels of the people were far below the poverty line (US$ 1.25). The data from Municipal Health Directorate indicates that the major faecal related diseases affecting the people in the Municipality are Cholera, Diarrhea, Typhoid, Hepatitis and among others. Besides these faecal related diseases, malaria is also prevalent on the clinical record of the Municipality. Over 92% of the clinical cases reported are malaria. People become Typhoid infected after eating or drinking beverages that have been handled by a person who is infected or by drinking water that has been contaminated by sewage containing Typhoid bacteria (Freebase, 2011; WHO, 2011).

The incidence of typhoid fever cases on clinical recorded of communities are attributed to impact of indiscriminate faecal matter disposal system practiced in the community.

According to Bruen et al (2001) human activities contribute a significant microbial load of community water resources. These observations imply that typhoid fever prevalence in the Municipality is indeed uninhibited. Cholera, Diarrhea and Hepatitis A and E virus are the diseases that are common as stated earlier with most often through contaminated water and from person to person. Indiscriminate disposal of faecal matter in choked gutters, pools of waste water behind detached bathhouses, accumulation of water in discarded empty cans were added factors responsible for the high incidence of malaria cases in the communities.

Research Design

Quantitative and qualitative survey approach was adopted as the research design. Thecharacteristics of a research design included but was not limited to the following; It identified characteristics of an observed phenomenon; described a situation as it was without manipulation; it required the creation of an instrument since the research was looking for knowledge on the subject of study; Sample was snow balling to be representational and to be generalized; It provided a descriptive analysis of the given population or sample.

The study design was presented using the qualitative, quantitative and a combination of both types of data.

Sample Size and Sampling Procedure

A total of 120 households as respondents were selected for the study to respond to a developed household questionnaire. Six town were selected from the Ejura-Sekyedumase municipality with each town belonging to a zone that is Zone 1, Zone 2 and Zone 3. 20 respondents each were selected from the mentioned towns respectively and 40 respondents from each Zone.

A two-stage sampling methodology was adopted in the selection of households for interviews. The first stage was the clustering of residential areas into three (3) zones based on town planning and demarcations. Six communities within the District Capital were selected in participating in the study and were all part in the zones. They include Ejurafie, sabo-line, Dagomba-line, Ejuranewtown, Gonja-line and broadcasting.

Zone one covered the unplanned residential areas, which includes the central Business hub of the town and its immediate surroundings that constitute the earliest settlements

prior urbanization. Zone two is made up of the planned suburbs, including Local Government Service residential area, Health workers and Ejuraman Senior High School area which has most of government bungalows. Zone three comprises the newly developing areas, part which is made of the surrounding villages which have been absorbed into the urban mass as a result of urban spread.

Simple random sampling was employed to select the six (6) communities from Zone one, Zone Two, Zone three. The second stage of the sampling comprised a systematic selection of houses within the residential zones using a sampling interval of 6, 10, and 14 houses respectively. The questionnaires were administered to household heads (either a male or female) or their representatives in the selected houses using the interview method.

Type and sources of Data

Both primary and secondary sources of data were used. The primary data were generated from the field as first-hand information whereas secondary data was gathered from documented sources such as books and published articles from journals. Primary data were collected from the household who were the respondents using the developed data collection tools. Method and complemented with key informant interviews such as sanitation officers and personal observation.

Data Collection instrument

Household questionnaire survey was developed and used as for primary data collection from representatives of the selected households. Key informant interview was conducted to complemented the data collected from the households as well as some personal observation that were made on the field using interview guide and

observation checklist. The questionnaire captured information such as demographic information in addition to the various items in the questionnaire based mainly on specific objectives of this study.

Data Collection Method

In a house where there were multiple households, only one household was interviewed, i.e. the household willing and ready of the data collection. In each selected house, where the household head being interviewed was not the owner of the house, the house owner was interviewed since the questionnaires included questions that bothered on ownership of houses. In addition to the household surveys, in-depth interviews were held with key informants at the Ejura-sekyedumase municipal assembly, private toilet operators, and officers from the Environmental Health and Sanitation unit of the assembly alongside some zoomlion officers (A private waste firm). This was as a results of the high populace concentrated in these communities or suburbs. Using this approach, one hundred and twenty (120) households from the Municipal Capital where the six (6) communities were selected from, has almost the features of all other communities mentioned. Twenty (20) Houses were selected from each of the Six (6) communities. In Ejura, as an Administrative capital, the two main religious groups are Christians and Muslims and over thirty (30) ethnic backgrounds belongs to these religious groups. This in turns makes the Municipal highly cosmopolitan in nature and as a results various views on faecal matter disposal and its management will be varied.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter deals with the presentation of the result from the raw data collected from the field. It examines responses from the 120 respondents interviewed. The responses were collected from people from the Ejura-Sekyedumase municipality in the Ashanti region. There were three (3) zones and it each zone two (2) towns, so in all the survey was taken from six towns with two (2) belonging to each zone.

Demographic Characteristics of Respondents

The study recorded 64 males with a percentage of 53.3 and 56 females also with a percentage of 46.7 all making up a 120 respondents.

The number of responses recorded for females in all 3 zones was encouraging, this is because most ladies are concerned about the kind of toilet facilities they use when it comes to where they defecate. Hence they partaking in this study with really shed light on a few things concerning the study.

Table 1: Sex of Respondent

Response	No.	%
Male	64	52.9
Female	56	47.1
Total	120	100

Source: Field Survey, 2019

It was noted that most of the people selected from all 3 Zones and 6 towns were literates, with the least literate being those who attended primary school. With the

highest education achieved selected respondents were given the following options that is illiterate, Primary, JHS, SHS and Degree. Illiterates recorded 19 (15.8 %) and the others 15 (12.5 %), 25 (20.8), 28 (23.3%), 33 (27.5 %) respectively. Due to the significant education the researcher did not have much trouble with the questionnaire administration. The study found out that most of the respondent were workers be it Government workers or self-made workers (small business owners and street vendors).

According to the study government employees ranked first with 33 (27.5%) responses followed were Street vendors with 29 (24.2%), Small informal business with 26 (21.7) Unemployed with 19 (15.8 %) and people who owned business had 14 (11.7 %).

The study found that most of the unemployed respondents were university graduates and diploma nurses awaiting posting with only a few unemployed respondents being those with the lack of literacy. Most of the respondents were eager to take part in the study because some of them were living in rented houses, some of which did not have household toilet facilities.

Table 2: Employment status of respondents

	Frequency	Percent
illiterate	19	15.8
Primary	15	12.5
JHS	25	20.8
SHS	28	23.3
Degree	33	27.5
Total	120	100.0

Table 3: Highest Education Achieved

Employment status	Frequency	Percent
Unemployed	19	15.8
Street Vendor	29	24.2
Small informal business	26	21.7
Government employee	32	26.7
Own Business	14	11.7
Total	120	100.0

Source: Field Survey, 2019

Open Defecation Practices in the Ejura-Sekyedumase Municipality

The study realized that the public toilet facility appeared to be the most used and most accessible in the Ejura-Sekyedumase Municipality with 97 (80.8%) of the respondents using public toilet. It also realized that Flush toilets recorded the least responses making it the least used with 2 (1.7%). Wc (water closet toilet) and pit latrines also had a fair share of responses that's 13 (10.8%) and 8 (6.7%) respectively

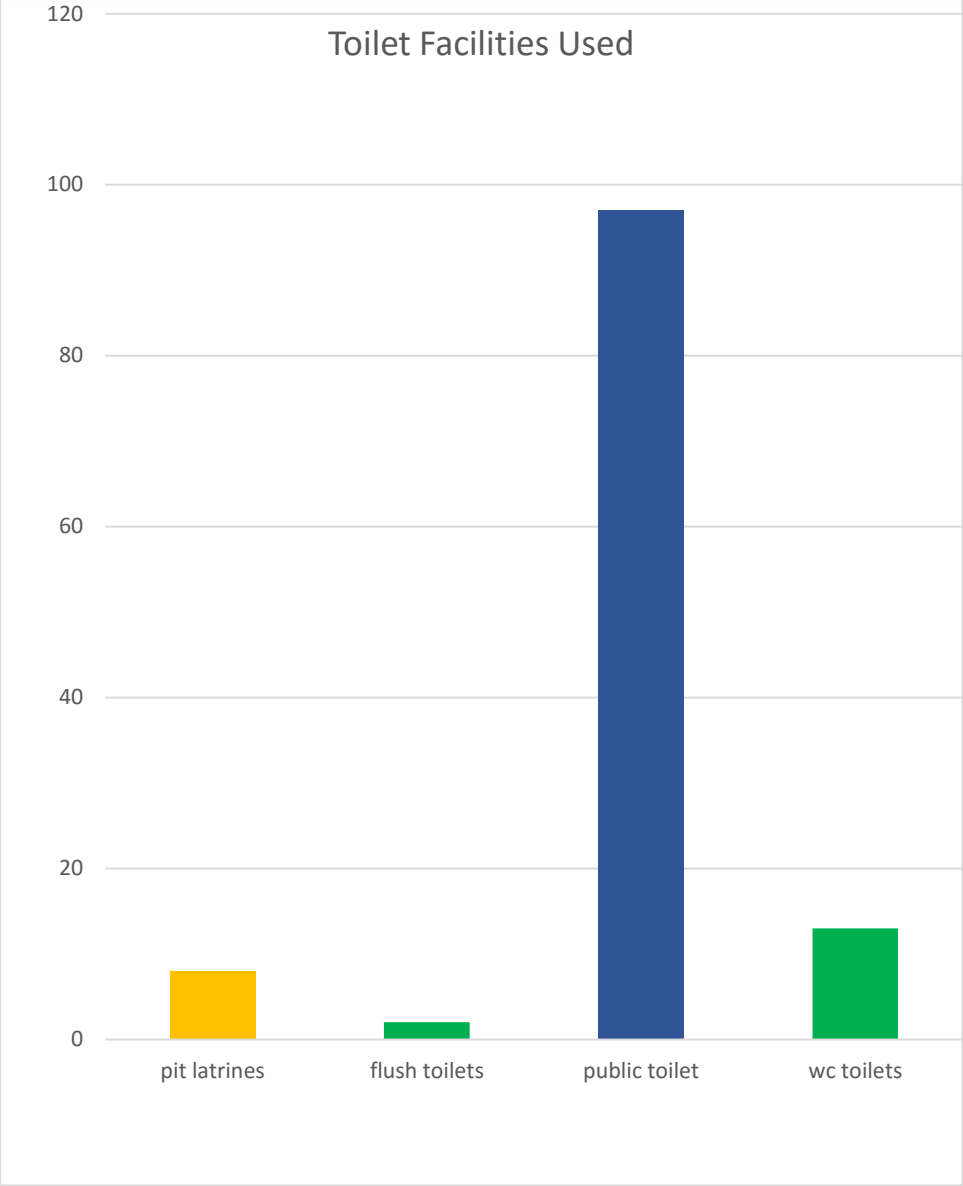
According to study we can agree that the flush toilet facility is outdated and communities would build public KVIP toilet facilities for public. Some toilet facility managers explained that flush toilets eat up the little resource they had, because they would always have to provide water for the numerous people that come there during the day. And they also lamented to not taking much other than 0.50 Ghana pesewas. So then why use little they make to provide water.

Table 4: Type of toilet facility mostly used By Respondents

Type of Toilet used	Frequency	Percent
pit latrines	8	6.7
flush toilets	2	1.7
public toilet	97	80.8
wc toilets	13	10.8
Total	120	100.0

Source: Field Survey, 2019

According to the table below, 86(71.7%) respondents agreed to having toilet facilities at home whiles 34(28.3%) had no toilet, and so had to resort to the use of other means of defecating. The study found out that respondent who said yes to having toilet facilities at home had Water Closet toilets, pit latrines and flush toilets with 52, 21 and 13 responses respectively.The study realized that people with flush toilets at home have unlimited access to water for flushing and moreover since it is being used at home, it might have just a few people using it. Hence making it much easier to manage.



Graph depicting toilet facilities used

Table 5: Respondent with toilet facilities at home

			flush toilet	pit latrine	public toilet	wc toilet
Does respondent have	yes	0	14	21	0	52
toilet at home?	no	33	0	0	1	0

Source: Field Survey, 2019

The respondents who said "no" to having toilets at home specified the kind of facility they used or where they defecate as shown in Table 6. The study realized that those who disagreed to having toilets at home only had two options, that's the public toilet facilities or the bush.the Study recorded 32(26.7 %) for public toilet and 1(0.8 %) for bush or open defecation.

Table 6: Defecation facilities for respondents without toilet facilities at home

	Frequency	Percent
bush	1	.8
public toilet	32	26.7
Total	120	100.0

Source: Field Survey, 2019

The health implication and diseases caused by faecal matter disposal

From Table 8, the study found out that children below the age of 4 were made to defecate into mostly chamber pots 57 (47.5 %) and polythene bag 46 (38.3%), with just a few respondents allowing their children to defecate in the open (bare floor) and on refuse dumps. Faecal matters from chamber pots would either be disposed into

other toilet facilities or thrown out to refuse dumps or gutters. The same goes for the usage of polythene bags, but these are mostly thrown into gutters, refuse dumps or bushes. This, if done for a long period of time begins to emanate foul stench that could bread flies or mosquitoes who would easily carry diseases around.

Table 7: Toilet Facilities used by children under 4 years

Toilet facilities	Frequency	Percent
bare floor	7	5.8
chamber pot	57	47.5
flush toilet	1	.8
polythene bag	46	38.3
refuse dump	7	5.8
Total	120	100.0

Source: Field Survey, 2019

Responses collected from the 3 zones concerning the condition of public toilets,the study found out that most public toilets were either in very bad state (5.8 %) or bad state (55 %) with just 47(39.2 %) of them being good based on users perception (see Table 9). People living in communities with bad toilets facilities would resort to going to bushes to defecate or use means that would not involve going to these toilet facilities.These practices tend to make them prone to some diseases like diarrhea or cholera or even malaria. There's an assumption that communities with bad toilet facilities turn out to be appalling at waste management either.

Table 8: Hygiene condition of the public toilets used by Respondents

State of Public Toilet	Frequency	Percent
very bad	7	5.8
bad	66	55.0
good	47	39.2
Total	120	100.0

Source: Field Survey, 2019

When being asked whether these toilets had containers into which used tissue papers **were disposed, 77 respondents said Yes and 43 said no.**

Table 9: Are there containers for tissue papers after use?

Response	**Frequency**	**Percent**
yes	**77**	**64.2**
no	**43**	**35.8**
Total	**120**	**100.0**

Source: Field Survey, 2019

The study found out that almost a half of respondents who participated in this research agreed to people in their house hold or community ailing to common sickness. And the study believes that it is due to the unpleasant living conditions they find themselves in e.g. bad toilet facilities, bad waste management, bad water conditions amongst others. Table 11 indicate that, 51 (42.5 %)respondents said “yes” to whether there was a common disease ailing the community or house hold and 69 (57.5 %) respondents said “no” .

Table 10: Common diseases gotten by community or house

Response	Frequency	Percent
yes	51	42.5
no	69	57.5
Total	120	100.0

Source: field survey 2019

Those who said yes stated the common diseases that ailed the community or household. These diseases were Cholera, Diarrhea and Malaria. These diseases are mostly caused by poor sanitation, and in an environment where people defecate in bushes and on refuse dumps, it is entirely possible for a community to be stricken by **these common diseases.**

Table 11: Disease Specification.

	Frequency	Percent
cholera	10	8.3
diarrhea	17	14.2
malaria	23	19.2
Total	60	41.7

Source: Field Survey, 2019

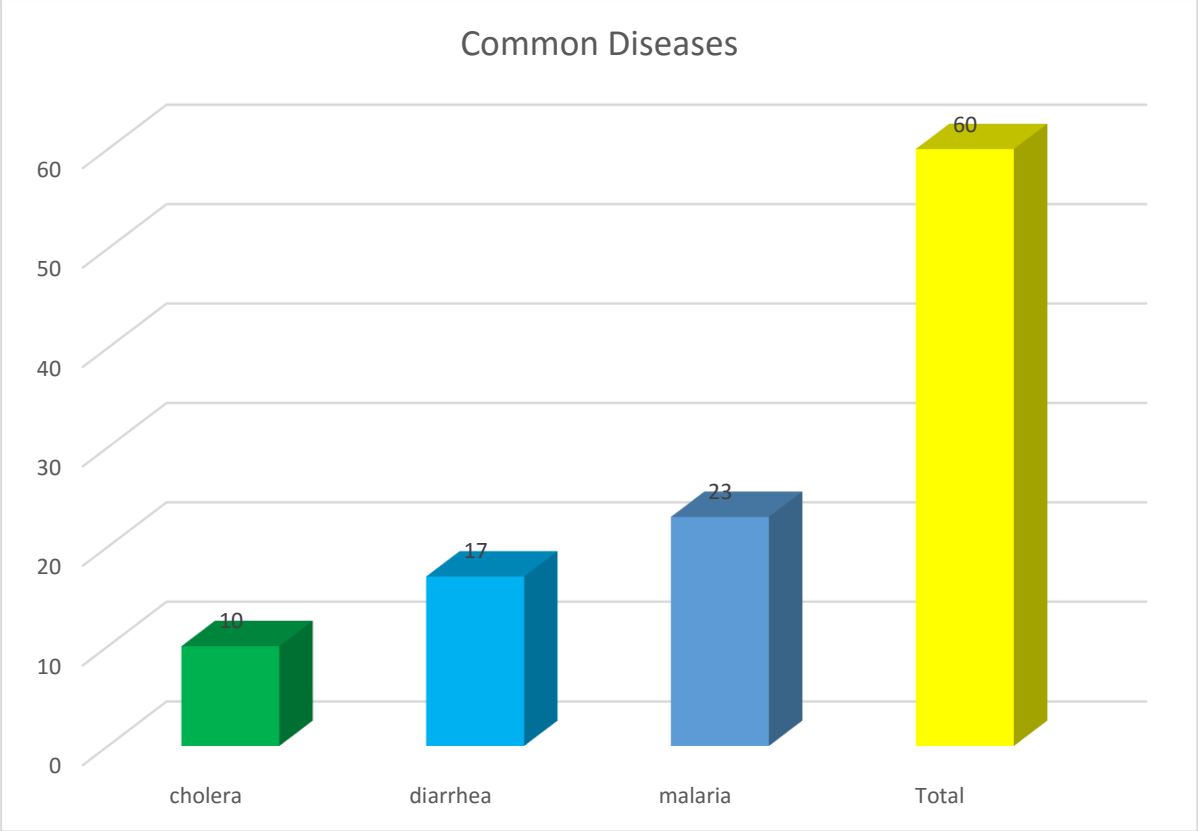


Figure 2.0 common disease by community or household

Methods being used in managing the faecal sludge

How often toilet facilities are dislodged turns out to be an essential part of toilet facility management in the sense that the longer toilets stay before being dislodged the more insanitary it becomes. Since faecal matter tends to overflow, sometimes reaching the holes of the toilet facility, it creates nuisance for users and the general public. Respondents when asked how often their toilets were dislodged, 47(39.2 %) respondents selected yearly whiles 44 and 29 selected more than a year and every two months respectively.

Table 12: How often are toilets dislodged

Method of Dislodging	Frequency	Percent
sludge drier	19	15.8
vacuum tanker	101	84.2
Total	**120**	**100.0**

Source: Field Survey, 2019

Now the methods most respondents stated were vacuum tanker and sludge drier (chemicals) and 101 respondent went for vacuum tanker and a 19 went for sludge drier or the usage of chemicals for the dislodging process. Most of them stated that they use other toilet facilities when dislodging theirs with some people clearly stating to defecate in bushes during the dislodging process.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter seeks to draw conclusions on the research and also make recommendations for the way forward, having thoroughly gone through all necessary proceedings concerning the research.

Summary

The aim of this study was to talk about the faecal matter disposal and health implications in Ejura-Sekyedumase Municipality. This research aim at enlightening people in the municipality with objectives of examining open defecation practices in the Municipality, examining the existing methods used in managing faecal sludge and lastly assessing the environmental and health effects of fecal matter disposal. A survey was conducted in 3 zones in the municipality, with each zone having two 2 towns. Respondents of 120 were selected for the study, that's 20 from each town with which they successfully participated.

Conclusion

The objectives of this research were to examine open defecation practices in the Ejura-Sekyedumase municipality, examine fecal sludge management methods and lastly asses the environmental health effects of fecal sludge disposal.

Now at the end of the research is was realized that open defecation was still done by just a few people in the municipality, it was actually being done by people in the community without toilet facilities, and mostly by children between the ages of2 and 4 who are not equipped to use any of the toilet facilities available. In terms of Faecal sludge management or dislodging, the people used the vacuum tanker method

whenever their toilet facilities got full. A few of the people managed their sludge by using the sludge driers or chemicals, whiles others actually reused faecal waste that is using it as compost. Across all the zones, questionnaires were administered. It was realized that the public toilet facilities were the most accessible in the three (3) zones where the surveys were taken and since improper management were being taken, there were common sickness/diseases ailing the people. Most of them were Malaria, cholera and diarrhea. These were likely caused by the insanitary living conditions with open defecation and improper faecal waste management as stated earlier are playing a major part, thus being the health effect of improper fecal sludge disposal.

Recommendations

At the end of the study these recommendations would like to be made or shared.

- The District Assembly should enforce bye-laws on provision of toilet facilities in the houses by Landlords and Landladies since most of the respondents did not have toilets in their homes.
- The district Assembly should desist from building public toilets for communities and facilitate construction of household toilet facilities to reduce pressure on public toilets and its potential to contribute to disease transmission since most people uses public toilet in the District.
- The Assembly should provide proper faecal sludge treatment facility to treat the dislodged materials from the houses before disposal into the environment so that it will have any adverse effects on receiving water bodies and the environment.
- Landlords and Landladies should make it a priority to provide toilet facilities in their houses to make it easy and safe to access toilet facilities and contribute to the reduction of open defecation.

- Community members should be ready to protect their health by avoiding and reporting the practice of open defecation in their communities and neighborhood.

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