UNIVERSITY FOR DEVELOPMENT STUDIES

MANAGING HUMAN EXCREMENT IN THE WA MUNICIPALITY

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THESIS SUBMITTED TO THE DEPARTMENT OF PLANNING AND MANAGEMENT, FACULTY OF PLANNING AND LAND MANAGEMENT, UNVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF PHILOSOPHY DEGREE IN DEVELOPMENT MANAGEMENT

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DECLARATION

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Albert Beni

Candidate's Signature…….. Date…09/11/2012…

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University for Development Studies.

Naa Dr. Ernest Y. Kunfaa

Supervisor's Signature…….. Date…09/11/12…..

ABSTRACT

Managing human excrement in the Wa Municipality was the focus of this study. The main objective for the study was to determine how human excrement was managed in the Wa Municipality. Questionnaires, interview guide and observation were the main tools used to collect data for the study.

The study revealed that there was only one public toilet facility in each of the five communities studied. There was accumulated human excrement around homes, especially homes that were located near the bushes and refuse dumps. Up to 67.29% of the respondents had no toilet facilities in their homes and so defecated in open spaces and bushes. Others excreted into polythene bags and threw them into refuse containers. Houses in the Wa Municipality had on the average, one (1) or two (2) toilet facilities implying an average ratio of 1 toilet facility: 10 household members. The sanitary condition of the facilities in the houses was also affected because of the number of people who patronized them. The KVIP facilities were not adequate, located over longer distances and people had to spend between 10 and15 minutes queuing to access them. For facilities that enhance effective management of the human excrement in the Wa Municipality, one could only talk of septic tanks and water closets (W.C). Forty per cent of the study respondents graded the municipality as being poor in terms of the availability of toilet facilities and management. Poor educational background, people's personal lifestyle, the inaction of the concerned agencies in ensuring sanity in the home and its environs and the lack of educational campaigns on the possible threats of open defecation also encouraged open defecation in the Municipality.

On the basis of the above, the study concluded that the management of human excreta in the Wa Municipality remains poor and unhealthy. As part of its recommendations, the study challenged the Wa Municipal Assembly to enforce the by-laws that require that landlords provide adequate toilet facilities for their tenants and to also provide adequate public KVIPs for population without home toilet facilities.

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DEDICATION

I dedicate this thesis to all my loved ones, especially my wife and children

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LIST OF ACRONYMS

AALC……Australian Alp Liaison Committee
CLTS ……Community-Led Total Sanitation
CIS……Centro de Ingeniería Sanitaria
DoC……...Department of Conservation
EAWAG……Swiss Federal Institute for Environmental Science and Technology
EcoSan ……...Ecological Sanitation Project
FS……... Faecal Sludge
FAOSTAT…….. Food and Agricultural Organization of the United Nations Statistics.
GDHS…… Ghana Demographic and Health Survey
GLSS……..Ghana Living Standard Survey
GSS……Ghana Statistical Service
HEV……... Hepatitis E virus
HPC……Housing and Population Census

HAV.....Hepatitis A virus

HDR.....Human Development Report

IYS..... .....International Year of Sanitation

IDS.....Institute of Development Studies

KVIP.....Kumasi Ventilated Improved Pit

MDG.....Millennium Development Goal

NZ... .....New Zealand

NGO .....Non Government Organization

OSS .....On-Site Sanitation

ODF.....Open Defecation Free

PRB.....Population Reference Bureau

SANDEC.....Water and Sanitation in Developing Countries

SSNIT.....Social Security and National Insurance Trust

SPSS .....Scientific Package for the Social Scientist

UBOS.....Uganda Bureau of Statistics

UDDT.....Urine-Diversion-Dehydration-Toilet

UNDP.....United Nation Development Programme

UN.....United Nations

USA .....United States of America

USEPA..... United States Environmental Protection Agency

VERC.....Village Education Resource Centre

WC.....Water closet

WHO.....World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Back ground of the study

A cursory look at sanitary conditions throughout the developing world shows how vast and important the problem of sanitation is (Lionel et al, 1975). Poor sanitation is a major cause of diarrhea that kills 2.5 million young children every year (W.H.O, 1994). About 3.3 billion people worldwide lack adequate sanitation (equivalent to 70% of the population of developing countries). In addition, about 80% of all morbidity in developing countries is due to human excreta and water-related diseases (UNDP, 2002). These diseases account for some 12 million deaths per year (World Bank, 2002).

Excrement collection, treatment and disposal is an important part of environmental sanitation. In large areas of the world and indeed in parts of every country, proper excreta disposal is among the most pressing public health problems. Poor excrement collection, treatment and disposal is often associated with inadequate water supplies and other sanitary facilities. It is more pronounced among the low economic rural population. These conditions, all of which affect health, make it difficult to assess the role played by each component (water supply facilities and sanitary facilities) in the transmission of diseases. Such group of diseases includes cholera, typhoid and paratyphoid fevers, the dysenteries, infant diarrhoea, hookworm disease, ascariasis, schistosomiasis, and other similar intestinal infections and parasitic infestations (Daily Graphic, 5th September, 1995). Indeed, it is well known that there is a relationship between excrement disposal and the state of health of the population. The relationship is both direct and indirect in character.

Human excreta is a health risk if not disposed off properly. In different parts of the world, different modes of transmission of diseases may assume various degrees of importance; in some areas, water, food, and milk may be most important; in others, flies, cockroaches, mice and insects; and, in still others, direct contact with the disease pathogens may assume a major role (Watters, 1986). It has also been discovered that contaminated water and the domestic environment contribute to the contamination of food.

According to the (UNDP, 2002) both solid and liquid waste disposal have been a source of concern as they contribute to a great deal of unsanitary conditions in cities in Ghana. Nationally, about 58% of households dispose of their solid waste at public dump sites, with about quarter of households disposing of their solid wastes elsewhere into valleys, pits, bushes, streams, river - sides, open gutters or on undeveloped plots of land. About 8% of the households burn their solid waste with about 4% of them burying their solid waste. Only 5% of the households have their solid waste collected in an organized way.

Data from the Ghana Living Standard Survey (Ghana Statistical Service, 2005) point to the fact that nationally, 19.6 percent of households do not have access to toilet facilities. About 10% of households use flush toilets and 1.3% use KVIP, while most households still use the pit latrine (31.5%). and pan/bucket (37.4%). In the rural areas, less than (1.5%) have access to flush toilets compared to 31.4% in Accra and 22.9% in urban coastal areas. In the rural savanna for example 69% do not have access to toilet facilities compared to 1.1% in Accra and 3% in urban forest areas.

Sanitation has been equated with latrines, to the exclusion of improving upon the methods of waste disposal based on the communities' ability to afford (Lucas and Gilles, 1990). Households that use the sewerage system to dispose-of their liquid waste constitute about 4.5%

compared to those that use the street-39%, gutter-21.1% and compound -34.6%. About 8% of households in the urban areas have access to a sewerage system compared to 1.3% in rural households. The Greater Accra Region has the highest proportion of households with the sewerage system due to its urban influence. Thus, in terms of liquid waste disposal, no region or geographical area could be said to be better off hence the situation in the whole country needs to be salvaged immediately.

The environmental health burden imposed by this unsanitary disposal of solid and liquid waste coupled with inadequate services such as the availability of safe drinking water is huge. The 2003 Ghana Demographic and Health Survey (GDHS) indicated that more than half of mothers (55%) reported that their children's stool is disposed off in the latrine or buried in the yard. Another 36% of mothers reported that their children's stool was uncontained, that is it was thrown outside the dwelling or yard, rinsed away or not disposed off in latrine. This depicts their exclusion from the use of latrine as a social amenity (Ghana Statistical Service, 2003). The prevailing situation is unacceptable to human health, hence the need to seek proper means of managing human excreta for the good of mankind.

1.2 Problem Statement

The excretion of human wastes, although a natural phenomenon, can be disastrous to the lives of human beings and the environment if not properly managed. Indeed, a clean environment has a direct relationship with the socio-economic development of a nation. A contaminated environment on the other hand, creates unhealthy conditions that have negative impacts on the human resource base and on the economies of countries including Ghana (WHO, 1994).

The magnitude, dimension and alarming rate at which indiscriminate defecation has assumed in most parts of Ghana has made it difficult for one to realize the effects of various approaches employed to combat the situation; and Wa, the only Municipality in the Upper West Region of

Ghana is no exception. Hence, at least one in four people may be infected with worms - and will continue to be re-infected throughout their lives if the unsanitary attitudes do not change (WHO, 1994).

The diseases associated with this habit are among the top ten diseases in the hospital records (Daily Graphic, 5th September, 1995). At a Technical Advisory Group meeting on "Rural Latrines" which took place in Kumasi it was realized that rural people are often not aware of the significance of sanitation. Most people including the urban dwellers are, moreover, ignorant of the fact that the most widespread diseases, especially in tropical developing countries, are those transmitted by human excreta and contaminated water (Daily Graphic, 5th September, 1995).

Sanitation means more than the building of latrines. It includes motivating people to practice good hygiene such as hand washing with soap and to ensure that human excreta are disposed of safely. Sanitation has been equated with latrines, to the exclusion of improving upon the methods of waste disposal based on the communities' ability to afford (UNDP, 2002). As of the year 2005, the Wa Municipality with a total population of 81,243 and 7,267 houses had 32 public toilets (Septic Tank Latrines/KVIPs), 1 public water closet and 86 domestic toilets. In sum, only 17.5% of the total population had access to safe toilet facilities (Wa Municipality Assembly, 2006).

Moreover, the lack of proper developmental control has led to encroachment of designated sanitary areas that have been developed for residential or commercial purposes. Additionally, flouting building regulations by not providing toilet facilities in every house and poor enforcement of sanitary regulations further compounds the problem of managing human excrement in the municipality. The rate of population growth is not commensurate with the rate of increase in sanitary facilities thereby exerting more pressure on the available limited ones. The situation is made worse by indiscriminate defecation. The aesthetic beauty of Wa Municipality

has thus been under a serious threat due to the improper ways of managing human excrement. This has been made worse with the rapid growth of students' population in the Wa Municipality with its consequent increasing volumes of waste including human excrement generated.

1.3 Research Questions

1.3.1 Main Research Question

How is human excrement managed in the Wa Municipality?

1.3.2 Sub-Questions:

- what are the existing facilities for the collection, treatment and disposal of human excrement in the Wa Municipality?
- how effective is the existing human excrement collection, treatment and disposal systems in the Municipality?
- what are the circumstances surrounding the continuous habit of indiscriminate defecation in the Municipality?
- what are the alternative ways for effective excrement collection, treatment and disposal in the Municipality?

1.4 Research Objectives

1.4.1Main Research Objective

The main objective for this study is to determine how human excrement is managed in the Wa Municipality.

1.4.2 Research Sub- Objectives

The specific objectives of the study are:

- to identify existing facilities for the collection, treatment and disposal of human excrement in the Municipality
- to determine the effectiveness of existing human excrement collection, treatment and disposal systems
- to examine the circumstances surrounding the continuous habit of indiscriminate defecation in the Municipality
- to recommend alternative ways for effective human excrement collection, treatment and disposal.

1.5 Significance of the Study

An increase in the cost and logistical difficulties of Municipal solid waste management has put increasing pressures on the infrastructure and authorities responsible for the management process with little being done to address the existing menace. This calls for pragmatic actions to deal with the problem from planning perspective, through policies to attitudes of the people. A research of this nature would give an in-depth knowledge into the extent of the problem in the municipality and how to handle it to bring sanity and ensure good health for the people. In fact, research findings will draw the attention of policy makers to the problem and the recommendations made towards controlling it. The study is thus a contribution to the effort of managing human excreta from the view point of issues in the Wa Municipality of the Upper West Region of Ghana. Again, findings from the research will serve as base data for further research into the area to address related problems and contribute to knowledge base of society on the problem.

1.6 Scope of the Study

The study area is the Wa Municipality of the Upper West Region of Ghana. The research was conducted in five communities in the Municipality. The Municipality is the only Municipality of nine assemblies in the Region. The Wa Municipality covers a geographical area of 234.74 sq km made up about 6.4% of the total land area of the Region (Wa Municipal Assembly, 2006). The Wa Municipality is noted for its commercial, agricultural and administrative activities. The Municipal capital is Wa and also serves as the regional administrative capital of the Upper West Region. The municipality is a relatively peaceful area with people settling there from all walks of life.

The Municipality has since the establishment of the University for Development Studies and the Wa Polytechnic witnessed phenomenal infrastructural development, especially residential infrastructure with its attendant sanitary problems necessitating this study.

1.7 Organization of Thesis

The thesis is organized in Six chapters. The first chapter is the general introduction of the research work and is also made up of: the statement of the problem, the research questions and objectives, the research justification and scope of the study. The second chapter is about literature reviewed on the topic. It examined the work of other researchers and scholars on the problem under study. It put the study in perspective both conceptually and theoretically.

Chapter Three covers the research methodology. That is, the approach to data collection on the study. It explores such areas as: research design, profile of the study location, techniques of sampling, sampling units, sampling size, sample frame, and the sources of secondary data for the study. Methods of data analysis and presentation are also discussed in this chapter. The research findings are presented in chapter Four. Here, a discussion is made of the findings from the data

collected with respect to addressing the problem. The discussions are also done in line with the literature reviewed. Chapter Five is summary of the major findings of the study. It revisits the problem and objectives of the study and then draws a conclusion to it. Chapter Six makes recommendations from the research work for policy making and for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter explores scholarly work on human excreta with particular attention on the generation rate of human excreta and human excreta related disease spread. Another area of concern is the management of human excreta; having to do with the methods of collection, treatment and disposal of human excreta; drawing lessons from rural wilderness and rural-tourism areas and some countries towards an efficient and sustainable management and use.

2.2 The Concept of Sanitation

Sanitation is the hygienic means of promoting health through prevention of human contact with the hazards of wastes. Hazards can be physical, microbiological, biological or chemical agents of disease. Wastes that can cause health problems are human and animal faeces, solid wastes, domestic wastewater (sewage, sullage and grey water), industrial wastes, and agricultural wastes. Hygienic means of prevention can be by using engineering solutions (e.g. sewerage and wastewater treatment), simple technologies (e.g. latrines, septic tanks), or even by personal hygiene practices (e.g. simple hand washing with soap)

Alternatively, sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and faeces. Inadequate sanitation is a major cause of diseases world-wide and improving sanitation is known to have a significant beneficial impact on health both in households and across communities. The word 'sanitation' also refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal (WHO, 2006).

Sanitation can be applied to a specific aspect, concept, location, or strategy, such as:

I. **Basic sanitation:** the management of human faeces at the household level. This terminology is the indicator used to describe the target of the Millennium Development Goal on sanitation.
II. **On-site sanitation:** the collection and treatment of waste is done where it is deposited. Examples are the use of pit latrines and septic tanks.
III. **Food sanitation:** the hygienic measures for ensuring food safety
IV. **Environmental sanitation:** the control of environmental factors that form links in disease transmission. Subsets of this category are solid waste management, water and wastewater treatment, industrial waste treatment and noise and pollution control
V. **Ecological sanitation:** a concept and an approach of recycling to nature the nutrients from human and animal wastes. Ecological sanitation is sometimes presented as a radical alternative to conventional sanitation systems.

Ecological sanitation is based on composting or vermicomposting toilets where an extra separation of urine and faeces at the source for sanitization and recycling has been done. It thus eliminates the creation of black water and eliminates faecal pathogens from any still present wastewater (urine). If ecological sanitation is practiced municipal wastewater consists only of grey water, which can be recycled for gardening. However, in most cases grey water continues to be discharged to sewers

Globally, more than 2.6 billion people lack access to basic sanitation (WHO,2006; Niwagaba 2009) and more than 90% of the sewage in developing countries is discharged untreated (Esrey, et al, 2001; Langergraber and Muellegger, 2005; Niwagaba 2009). Millennium Development Goal (MDG) 7 aims at halving the proportion of the world's population without safe drinking water and basic sanitation between 1990 and 2015 (UN, 2002). Recognizing the risk that the MDG on sanitation may not be achieved and the fact that sanitation affects other MDGs directly

and indirectly, the UN declared 2008 to be the International Year of Sanitation (IYS), in order to raise sanitation awareness amongst UN and other donor agencies, governments and civil society.

Lack of access to improved sanitation to a greater extent contributes to environmental pollution together with its consequences to society. In situations where sanitation is lacking, human excreta may accumulate around homes, in nearby drains and in garbage dumps, leading to environmental pollution (Kulabako *et al.*, 2007; Niwagaba 2009). Where conventional sanitation systems are in use, insufficiently treated excreta from latrines and wastewater systems often end up in deep pits and recipient waters. Wastewater effluents contain large amounts of plant nutrients from excreta. Plant nutrients in wastewater effluents are undesirable because of their potential to cause eutrophication in recipient surface waters, while in deep pits, there is the risk of nutrients, especially nitrogen, leaching to the groundwater. Pathogens from pit latrines directly pollute shallow groundwater, which is often used without any form of treatment in homes, especially drinking by the great majority of slum dwellers (Barrett *et al.*, 1999; Kulabako *et al.*, 2007; Niwagaba, 2009).

2.3 Human Excreta

The human excreta consist of faeces and urine, which are the waste products of body metabolism. The appearance, physical and chemical characteristics of urine and faeces depend largely on the health of the person excreting the material, as well as on the amount and type of food and liquid consumed (Lentner *et al.*, 1981; Feachem *et al.*, 1983; Niwagaba, 2009). Faeces consist of material that passes through the intestines undigested, mixed with material extracted from the blood stream or shed from glands and the intestines (Guyton, 1992), mucus and bile, which imparts the characteristic brown colour (Featherstone, 1999). Faeces can contain large concentrations of pathogenic viruses, bacteria, cysts of protozoa and eggs of helminthes (Faechem *et al.*, 1983; WHO, 2006; Niwagaba 2009).

Urine is the excreta fraction that is filtered from the blood by the kidneys (Guyton, 1992). Urine is used by the body as a balancing medium for liquids and salts and the amount of urine excreted by a person therefore varies (Jönsson *et al.*, 2004). Urine largely consists of water, approximately 93-96% (Vinnerås *et al.*, 2006), and large amounts of plant nutrients that are mainly in water-soluble form (Jönsson *et al.*, 2004; Niwagaba 2009).

The amount of faeces produced by a person depends on the composition of the food consumed. Generally, foods low in fibres, such as meat, result in smaller amounts (mass and volume) of faeces than foods high in fibre (Guyton, 1992). The faecal production in developed countries is approximately 80-140 g/p,d (wet weight) of faeces, corresponding to about 25-40 g/p,d of dry matter (Lentner *et al.*, 1981; Feachem *et al.*, 1983; Jönsson *et al*, 2005; 18 Vinnerås *et al.*, 2006). Faecal excretion rate in the developing countries is on average 350 g/p,d in rural areas and 250 g/p,d in urban areas (Feachem *et al.*, 1983; Niwagaba 2009). In China, Gao *et al.* (2002) measured 315 g/p,d while Pieper (1987) measured 520 g/p,d in Kenya. Schouw *et al.* (2002) measured faecal generation of 15 individuals in three different areas in Southern Thailand and obtained wet faecal generation rates of 120-400 g/p,d. Though this may vary from person to person from one stool per week up to five stools per day, faecal excretion rate is on average one stool per person per day (Lentner *et al.*, 1981; Feachem *et al.*,1983; Niwagaba 2009).

The quantity of urine excreted depends on how much a person drinks and sweats, and also on other factors such as diet, physical activity and climate (Lentner *et al.*, 1981; Feachem *et al.*, 1983). Excessive sweating results in concentrated urine, while consumption of large amounts of liquid dilutes the urine. The urine generation rate for most adults is between 1000 and 1300 g/p,d (Feachem *et al.*, 1983). Vinnerås *et al.* (2006) suggested a design value for urine generation to be 1500 g/p,d based on measurements in Sweden, while Schouw *et al.* (2002) found that in Southern Thailand between 600-1200 g/p,d of urine were produced.

Based on measurements in Switzerland, Rossi *et al.* (2009) reported a urine generation rate of 637 g/p,d on working days and 922 g/p,d on weekends, which is in agreement with 610-1090 g/p,d reported by Jönsson *et al.* (1999) based on measurements in Sweden.

2.4 Human Excreta and Disease Spread

The human excreta is said to be a major medium of transferring many disease both through urine and faeces. This situation is said to be more dangerous at densely populated areas and in rural areas, especially in Africa, North America and Asia (WHO, 2006).

Disease such as cholera, diarrhea and hepatitis are said to spread mainly through the excreta. Hepatitis A virus (HAV) which is very infectious, spreading by faecal contamination from patients suffering from (or incubating) the infection; victims excrete viruses into the faeces for around five weeks during incubation and development of the disease. Overcrowding and poor sanitation help to spread hepatitis A. Hepatitis E virus (HEV) is excreted in the stools, and spreads via the faeco-oral route. It causes large epidemics of water-borne hepatitis and flourishes wherever there is poor sanitation. It resembles acute HAV infection and the patient usually recovers (Black's Medical Dictionary, 2005).

The faeces of a healthy person contain large numbers of bacteria of many non-pathogenic species, referred to as normal intestinal microbiota. Gastrointestinal pathogenic microorganisms do not occur as a natural part of normal intestinal microbiota (Feachem *et al.*, 1983). Their presence in faeces is an indication of infection amongst the population contributing to the faeces analysed. Notwithstanding that, on occasion, some of the commensal bacteria also referred to as normal intestinal microbiota may give rise to disease. This situation is likely to occur when the immune system of the human being has been compromised, for example, during sickness or old age, giving rise to opportunistic infections (Niwagaba, 2009).

Studies have shown that most intestinal pathogenic or potentially pathogenic microorganisms enter a new host by ingestion (water, food, dirt on fingers and lips, aerosols caught in the nose and swallowed), through the lungs (after inhalation of aerosol particles) or through the eye (when eyes are rubbed with contaminated fingers) (Feachem *et al.*, 1983; Niwagaba, 2009), others may also enter through the skin or wounds. After infecting the host, large numbers of pathogens may be excreted.

Depending on the health of the population, several species of pathogenic bacteria, viruses, parasitic protozoa and helminths may be found in the faeces from the population and thus also in its mixed wastewater. From a hygiene point of view, any exposure to fresh/untreated faeces constitutes a risk (Feachem *et al.*, 1983; Schönning and Stenström, 2004; WHO, 2006).

Pathogens that may be excreted in faeces include bacteria of several species (*e.g. Aeromonas* spp., *Campylobacter jejuni/coli,* pathogenic *E. coli,Pleisiomonas shigelloides, Salmonella typhi/paratyphi, Salmonella* spp., *Shigella* spp., *Vibrio cholerae and Yersinia* spp.), viruses (*e.g.* Enteric adenovirus 40 and 41, Hepatitis A virus, Hepatitis E virus, poliovirus and rotavirus), parasitic protozoa (*e.g. Cryptosporidium parvum*, *Entamoeba histolytica*, *Giardia intestinalis)* and helminths (*e.g. Ascaris lumbricoides* (roundworm), *Taenia solium/saginata* (tapeworm), *Trichuris trichiura* (whipworm), *Ancylostoma duodenale/Necator americanus* (hookworm) and *Schistosoma* spp. (blood flukes)) (Schönning and Stenström, 2004; WHO, 2006). The majority of different types of faecal pathogens cause gastrointestinal symptoms such as diarrhoea, vomiting and stomach cramps, while some also cause symptoms involving other organs (Schönning and Stenström, 2004; WHO, 2006).

A few pathogens are excreted via the urine during infection *e.g. Leptospira interrogans*, *Salmonella typhi*, *Salmonella paratyphi*, *Schistosoma haematobium* (Feachem *et al.*, 1983; WHO, 2006), whereas others such as Mycobacterium tuberculosis have occasionally been found

in urine during renal TB infection (Daher *et al.*, 2007). Viruses, *e.g.* BK virus and Simian virus 40, have also been found in children's urine (Vanchiere *et al.*, 2005). *Leptospira interogans* is transmitted by urine from infected animals and its transmission via human urine is low (Feachem *et al.*, 1983). Even though *Salmonella typhi* and *Salmonella paratyphi* can be excreted in urine from persons infected with typhoid and paratyphoid when the bacteria are disseminated through blood, the environmental transmission via urine is low due to the short survival time (just a few hours) of *Salmonella* spp. in urine (WHO, 2006; Niwagaba, 2009).

A study conducted in Sweden revealed that, 22% of the samples of source-diverted urine tested were contaminated with faeces. The contaminated samples were on average contaminated by about 9 mg faeces per litre of urine (Höglund *et al.*, 2002).

2.5 Common Diseases in Excreta

As indicated by many research works, many pathogens that cause diseases can be hosted in the human excreta. One such research conducted in Oron Local Government Area in Nigeria has revealed that most of endemic diseases are spread through the excreta. The research also categorized the incidence of these diseases amongst women, children and men. The result of this research work has been summarized in Tables 2.1, 2.2 and 2.3.

Table 2.1: Incidence of faecal related diseases in Oron Local Government Area, Nigeria

Diseases	Response Frequency	%Samples
Gastroenteritis	61	15.25
Cholera	43	10.75
Schistosomiasis	4	1.00
Diarrhoea	82	20.50
Dysentery	32	8.00
Typhoid	120	30.00
Hepatitis	28	7.00
Polio	10	2.50
Others	20	5.00
Total	**400**	**100.00**

Source: TAF Preventive Medicine Bulletin, 2008

Table 2.2 Patterns and types of human faecal diseases occurrence in Oron Local Government Area, Nigeria (2000-2005) episodes/yearly cases

Disease	2000	2001	2002	2003	2004	2005	Grand total	% total
Gastroenteritis	259	270	178	176	166	132	1181	19.12
Diarrhoea	267	395	363	74	115	39	1253	20.28
Typhoid	346	304	640	475	303	154	2222	35.97
Schistosomiasis	NA	2	NA	NA	NA	NA	2	0.03
Dysentery	173	345	130	68	108	42	866	14.02
Cholera	13	10	15	12	8	18	76	1.23
Hepatitis	88	103	98	77	118	93	577	9.34
Polio	NA	NA	NA	NA	1	NA	1	0.02
Total	**1146**	**1429**	**1424**	**882**	**819**	**478**	**6178**	**100.00**

NA: Not available.
Source: TAF Preventive Medicine Bulletin, 2008

Table 2.3 Distribution pattern of human faecal diseases in Oron Local Government Area (1998-2005)

Age	Dysentery	Cholera	Typhoid	Gastroenteritis	Diarrhoea	Hepatitis	Total	% Total
1-14	427	72	921	725	965	229	3439	37.05
15-45	326	61	1.545	496	457	415	3301	26.52
46-64	158	40	761	272	2118	206	1655	18.31
66+	60	17	260	113	111	83	644	7.12
Total	**971**	**190**	**3487**	**1606**	**3651**	**933**	**9039**	**100.00**

Source: TAF Preventive Medicine Bulletin, 2008

From Table 2.1, Typhoid was found to be the most spread disease through excreta that ranked 30% of the study sample; followed by Diarrhoea (20.50%) with the disease least spread by excreta being Schistosomiasis (1%). In the year by year analysis as in Table 2.2, the story was not different as Typhoid ranked highest at 35.97% followed by Diarrhea at 20.28% and the least being Schistosomiasis at 0.03%. Usual of most excreta related diseases, the most affected age groups as in Table 2.3 are those from 1-14 years rated at 37.05%, followed by those from 15-45 years, making 26.52% with the least affected age group being those in 66+ years.

2.6 Management of Human Excreta

Management of human excreta like management of any other solid waste encompasses the full range of activities of the solid waste streams, from the generation of used materials to their disposal (Lardinois, 1996). Human excreta management primarily involves collection, transportation, and disposal. However, just as the existing solid waste management practices that emphasize collection, transportation, and final disposal by the city's Waste Management Department and private waste collectors have been ineffective (Asomani-Boateng, 2007) so has human excreta management practices. As a result indiscriminate defecation in public and open spaces has become common features in our cities (Issah, 2006).

2.6.1 Methods of Disposal of Human Excreta

Human faecal waste collection, treatment and disposal are the most important aspects of environmental health and safety. The World Health Organization (WHO) in recognizing this has set up an Expert Committee on environmental sanitation, charged with the responsibility of seeing about this aspect of health. This expert committee has listed this area of public health as foremost in order to ensure a safe environment. In most countries of the world, safe human faecal waste disposal is still one of the most pressing health problems, particularly, in developing countries where insanitary disposal of human faeces and improper waste water (sewage) management by municipal authorities have received little attention (TAF Preventive Medicine Bulletin 2008; 7(5)).

A number of studies have at one time or the other examined the effect of insanitary human faecal waste disposal on variables that determine the health status of household members and, on the environment. Most of these studies hypothesized that sanitary disposal of human faeces has a direct effect on people's health via reduced exposure to faecal and water-associated-diseases (TAF Preventive Medicine Bulletin 2008; 7(5)).

2.6.2 Faecal Sludge Management

In their study of faecal sludge (FS) management, Ingallinella et al (2000) revealed some methods of disposing human faeces, which was a suggestion made in the study. This was the semi-centralized sludge management and the neighbourhood (condominial) septic tanks.

Given the immense problems and challenges in FS management, a large array of technical, economic and institutional/organizational measures are required to improve the situation. Ingallinella et al (2000) compared other methods of disposal against the use of semi-centralized FS treatment and of neighbourhood septic tanks and has come to conclude that the latter are particularly expedient. Both measures may contribute significantly to reducing indiscriminate

dumping of FS and, hence, to reducing health and pollution risks. However, every city has to be taken at its own merits, given the great variability of spatial settings, sanitation infrastructure and planning mechanisms, which influence sanitation planning and the allocation of suitable sites for either condominial seepage tanks or FS treatment plants.

2.6.2.1 Semi-centralized faecal sludge treatment

Faecal sludge haulage volumes and mileage are to be minimized, using, in larger cities, semi-centralized FS treatment plants may help to attain this. Compared with wastewater collection in sewers, the advantage of FS collection and transport is its adaptability to any type of topography. Semi-centralised treatment may consist of solids-liquid separation and solids dewatering.

Assuming that the dewatering process yields a reduction of the water content from 98 to 75% or an increase of the solids content from 2 to 25%, the dewatered sludge volume to be transported would be one twelfth the raw FS volume (Ingallinella et al., 2000).

2.6.2.2 Neighbourhood (condominial) septic tanks

This strategic option is particularly suitable for densely populated urban districts with narrow lanes. The problem of inaccessibility of septic tanks or latrines would be alleviated, as the tanks could be located at easily accessible sites (Ingallinella et al., 2000).

2.7 Human Excrement Management Practices

2.7.1 Faecal Sludge Management in Argentina

Of the total population of 37 million inhabitants, (1991 census), 89% live in urban areas; i.e. in communities of 2,000 or more inhabitants. About 54% of the population is connected to sewer systems and the remaining 46% are served by individual, on-site sanitation systems, mainly septic tanks.

In large cities, the vacuum trucks discharge the faecal sludge into the sewer system through manholes designated for this purpose, thereby causing numerous complaints from neighbours due to unpleasant odours and other nuisances (noise, obstruction of the traffic, etc.) (Ingallinella et al., 2000).

Most of the existing wastewater treatment plants generally accept septage delivered by vacuum trucks and this is one of the reasons for the malfunctioning of them. In cities of up to 50,000 inhabitants, the use of stabilization ponds for treatment of septage is slowly spreading in order to pretreat the faecal sludge in co-treatment schemes or in systems designated exclusively for these liquids in the case of absence of sewerage systems (Ingallinella *et al.*, 1996). Centro de Ingeniería Sanitaria (CIS), the centre for sanitary engineering at the University of Rosario, Argentina, and EAWAG/SANDEC are conducting collaborative field research on the co treatment of septage and wastewater in a full-scale waste stabilisation pond scheme (Ingallinella *et al.*, 2000). One of the objectives of this project is to determine treatment performance with respect to the hygienic and agronomic quality of the biosolids generated in the pre-treatment ponds, which cater for solids–liquid separation in septage and for the thickening and stabilisation of the biosolids so generated (Ingallinella et al., 2000).

Use of organic fertilisers in Argentina: The different organic fertilisers currently marketed originate from composting processes and/or vermiculture grown on household waste. These products have to be registered. However, the existing regulations do not stipulate any quality standards. Sewage sludge generated in wastewater treatment plants is being supplied to farmers in various locations. However, this activity is not based on any legal provisions or on sludge quality control measures. Horticulturists also use organic fertilisers such as poultry and pig manure, an activity that is neither registered nor controlled (Ingallinella et al., 2000).

Existing regulations: The only existing legislation at national level, which may apply to faecal sludge disposal, is the Law on Hazardous Waste (República Argentina, 1992). According to this law, sludges, among them FS, may be accepted in sanitary landfills. There, they have to be discharged in specifically designed separate cells.

Sludge designated for sanitary land filling has to meet tolerance limits set for, among others, pH, total solids, volatile solids, combustibility, cyanides and sulphides. Furthermore, tolerance limits in the leachate have been established for 25 parameters, including heavy metals and organic substances. Microbiological sludge quality standards have not been established. Agricultural sludge use is permitted in the said law but not legally regulated. No special reference is made to faecal sludges, i.e. the sludges collected from on-site sanitation systems, such as septic tanks and latrines. Sludge disposal and use regulations were established in Santa Fé Province (Argentina), recently (Ente Regulador de Servicios Sanitarios de la Pcia. de Santa Fé, 2000). Quality criteria are stipulated for various use categories, similarly to the Class A and B standards established by USEPA (USEPA, 1993). The helminth standard for biosolids used in agriculture is set at ≤ 1 viable eggs/4 g TS. This standard may prove rather strict if having to be enforced in areas where helminth infestation is high (Ingallinella et al., 2000).

In urban areas of many developing countries, the excreta disposal situation is dramatic. Every day, all around the world, thousands of tons of sludges from on-site sanitation (OSS) installations, i.e. from unsewered ("dry") family and public toilets and from septic tanks, are disposed of untreated. They are either used in agriculture or aquaculture or discharged indiscriminately into lanes, drainage ditches, onto open urban spaces and into inland waters, estuaries and the sea, causing serious health impacts, water pollution and eye and nose sores. OSS systems are the predominant form of excreta disposal for the majority of urban dwellers in Africa and Asia as well as for a considerable proportion in Latin America (Ingallinella et al., 2000).

Faecal sludge subsumes sludges of various consistencies accumulating in and evacuated from so-called on-site sanitation systems, viz. septic tanks, aqua privies, family latrines and unsewered public toilets. In larger cities, faecal sludge (FS) collection and haulage are faced with great challenges: emptying vehicles often have no access to pits; traffic congestion prevents efficient emptying and haulage; emptying services are poorly managed. Suitable sites for treatment and use or for final disposal may be found at the outskirts of cities only. Vacuum tankers discharge their load at shortest possible distance from the points of collection to save time and cost (Ingallinella et al., 2000).

In many cities, dumping sites for FS are close to squatter or formally inhabited low-income areas where they threaten the health of this ever-growing segment of population. Children, in particular, are at greatest risk of getting into contact with indiscriminately disposed excreta Suitable sites for treatment and use or for final disposal may be found at the outskirts of cities only (Ingallinella et al., 2000).

2.7.2 The 'Poo- tube' Technology at Australia

"Poo-tubes" developed out of a co-operative project between the Australian Alp Liaison Committee (AALC), the Victorian Bushwalking and Mountaincraft Training Advisory Board (which trains outdoor leaders) and the Australian Army Adventurous Training Corps (Byrne, 2000). The AALC provided seed funding and the other two groups developed and promoted the idea with much-needed guinea pigs. In 1996-97, the first prototype was manufactured and trailed on multi-day bushwalking trips and army manoeuvres (Byrne, 2000).

The initial squat and rotund tube, while working effectively as a receptacle for the transport of waste material, was too cumbersome and consumed excessive space in already crowded rucksacks (Byrne, 2000). A number of models were suggested, including the use of heavy duty but flexible rubberised bags to enable the waste to be more easily `moulded' into the already full backpack (Byrne, 2000).

By 1998, the second generation of poo-tube had emerged. This much-improved model was longer but narrower, enabling it to be easily strapped to the outside of a backpack, avoiding concerns of the potential effects of untimely leakage or breakage of the container. This latest model comprises a 45-50cm length of 150mm polytubing or storm-water pipe fitted at the base with a sealed stopper and at the top with a wide-mouth screw lid. The efficacy of the sealed base and screw lid fitted with a large `O-ring' seal meant that all smells and any liquid were contained within the cylinder (Byrne, 2000).

Using the Poo-tube

Various techniques were tried and eventually perfected for getting the human waste into (and out of) the poo-tube without contaminating either the user or the poo-tube (Byrne, 2000). The tried and true method has been referred to as the `fish & chip' method whereby the waste is deposited

on several layers of greaseproof paper and then rolled up like `fish & chips' before being placed carefully in the poo-tube (Byrne, 2000).

The greaseproof paper provides a reliable, compact and flexible wrapper for the human waste; and is far superior to newspaper which (not only got easily wet and tore at the moment of transfer but also) created too much bulk in the poo-tube. Greaseproof paper was also acceptable for subsequent deposit in septic and sewerage treatment plants on return from the outdoor trip (Byrne, 2000). The poo-tube is lined with a disposable plastic bag to keep the inside of the tube clean, if the fish & chips package should leak or burst. It is recommended that the plastic bag be washed for re-use, or before discarding into sanitary land-till (Byrne, 2000).

A key aspect of the use of poo-tubes is the safe and effective disposal of the waste on return to `civilisation'. The contents of the poo-tube can be deposited (by prior arrangement) in a municipal or alpine resort sewerage treatment works, emptied into a septic tank, or progressively flushed down a domestic toilet in small quantities (Byrne, 2000).

Capacity and promotion

The capacity of the poo-tube has proven to be adequate for use by a group of four people on a 3-day trip, or a group of eight on a weekend or overnight trip. In groups, it is always wise to volunteer to carry the poo-tube for the first part of the trip, leaving other party members to share the carrying for the remainder of the trip as the volume in the poo-tube slowly increases with each rest stop or camp (Byrne, 2000).

The concept of carrying-out your personal waste has received only limited promotion to date, with leadership training programs and army exercises being the most common exponents of this

ultimate minimal impact technique. All participants have responded well despite initial reservations, and were proud of their extra efforts to leave no trace' (Byrne, 2000).

The development and use of poo-tubes has been reported in Wild magazine, and there have been several enquiries regarding making personal versions of the poo-tube. At a total cost of less than $30 per unit, they are a cheap and effective waste transport system (Byrne, 2000).

Advantages

- Poo-tubes have the capacity to significantly reduce the volume of human waste left in remote and cold climate environments, where use levels are growing and natural decomposition rates are impaired.

- The technique provides added protection to mountain catchments against small point contamination sources.

- Poo-tubes are cheap to manufacture, and lend themselves to commercial production.

- The poo-tube is easy to carry, easy to use and easy to clean. It could be simply marketed to the conscientious outdoors person or gear freak.

- Most importantly, poo-tubes engender a strong sense of personal responsibility for properly dealing with a major source of waste and easily builds on other well-accepted waste disposal and minimal impact programs (Byrne, 2000)

As use of remote areas increases, there will be a strong need to mitigate the growing accumulation of human waste in such environments, and to encourage visitors to carry out their wastes to appropriate facilities away from these natural areas. Poo-tubes will not be to everyone's liking, but as they progressively become more common, so will their acceptance as an important component of the minimal impact philosophy (Byrne, 2000).

2.7.3 Remote Area Human Waste Management in New Zealand

Management of human waste in remote areas is of particular concern and interest to the New Zealand Department of Conservation (DoC) through its responsibilities for managing the conservation estate throughout the country, including national and forest parks, scenic reserves, and the national walkway system. Facilities include picnic areas adjacent to parking at road accessible reserves, rest and picnic stops on walking tracks, basic camping sites at foreshore, roadside and walk-in locations, and overnight hut accommodation on walking tracks and mountain climbing routes. DoC staffs throughout the country have shown an innovative capacity to adapt traditional techniques and evolve new ones in achieving environmentally effective solutions in areas remote from normal servicing locations (Gunn, 2000).

In the early 1990s DoC was faced with increasing visitor numbers throughout all areas under its management, and was conscious of the inadequacy of many of the pit toilet systems for remote area locations. Composting of solid waste to provide a more environmentally and user-friendly operation, while at the same time producing a mature product with easier and lower volume handling costs, seemed a good idea. A research project was initiated with Lincoln University to examine the operation of a solar assisted compost toilet unit in a remote alpine walking track location. A further research project with The University of Auckland was set up to review all aspects of human waste servicing. The key output of this project was the production of a concept and design manual, followed by a set of system selection guidelines (Gunn, 2000). During the 1993/94 research project at The University of Auckland, a survey of DoC staff throughout NZ

was undertaken to obtain information on existing practice. The results of the "dry" toilet systems (waterless toilets) survey are set out in Table 2.4 (Gunn, 2000).

Respondents were asked to rank the success of the units on a 10 point scoring system based on four items, environmental protection, user convenience, economics, and case of cleaning/ maintenance. The table ranks these in increasing order of success index and the table entries reflect the state of typical servicing success as of 1993. Replacement systems were planned for several of the low scoring systems, with fly-out drum toilets proposed for high altitude systems where rock cavity disposal had been practiced over the years (Gunn, 2000).

Table 2.4: Waterless Toilets Survey (New Zealand) Results (1993)

Location	Site	Capacity	Details	Success Index
Egmont National Park	Kapuni Lodge, new and old Syme Huts	10/day peak use	Dry vaults, details unknown (possibly pit toilets)	28%
Egmont National Park	Holly, Pouakai and Waiaua Huts	30/day peak use	Crude pit toilets, buildings relocated	33%
Franz Joseph Glacier, West Coast	Almer Hut (1700m)	12 beds; 100 bed nights/yr	Pit toilet ins natural fissure	42%
Fox Glacier, West Coast	Neve Hut (2400m)	30/day peak use	Mini-vault toilet using rubbish bag —sealed and placed in crevasse.	53%
Lake Tarawera,	Hot Water Beach	50/day peak	Toatrone and Ecolu composting	73%
Lake Tarawera, Rotorua	Hot Water Beach campground	200/day peak Use	Upgraded Ecolu (fibreglass)and Bioloo (plastic) large capacity compost toilets	98%

Source: Human Waste Management Workshop, Proceedings and Papers Canberra Jindabyne March 2000

2.8 Towards an Efficient Management and Use

2.8.1 Human excreta as a perfect substitute for Fertilizer

According to FAOSTAT (2009), the most recent statistics for 2007 reveal that the amount (in tonnes) of fertilisers consumed in Uganda in 2007 was approximately 4000 of total N, 2200 of P (reported as P2O5) and 1400 of K (reported as K2O). Using results from computations by Jönsson and Vinnerås 2004, and the 2007 mid-year population of Uganda (UBOS,2007; PRB, 2009), the estimated amount of nutrients in Ugandan human excreta is approximately 71000 tonnes of total N, 11400 of P and 39900 of K.

According to FAOSTAT (2009), all of the fertilisers consumed in Uganda were imported. Consequently, if all of the human excreta in Uganda were recycled to agricultural production, there would be no need to import fertilisers and nutrient applications could still be increased by some 10- to 20-fold more than today. In Ethiopia, the results from a material flow model showed that implementing UDDTs in about 33% of the households and recycling their nutrient content would be sufficient to replace the current fertiliser demand in the town of Arba Minch (Niwagaba, 2009; Meizinger *et al.*,2009).

Another purposive survey was conducted in urban and peri-urban locations of central Uganda, where City Councils were implementing an Ecological Sanitation Project (EcoSan). The purpose of the survey was to document baseline information on the level of use, value associated with and benefits derived from the materials. The underlying goal was to contribute to finding a science based outlet for the waste collected. Eighty people in the communities using and not using EcoSan toilets were interviewed. Bulk faecal samples from EcoSan toilets were composted in above ground wooden boards measuring $1m^3$ .The faeces were blended with animal wastes to enhance faecal sanitization and reduce on time of composting. Macronutrient nutrients quality, microbial counts and pH of the mature compost were assesses at the start and end of the composting period (Ogwang, 2005).

A major success of the survey was that over 80% of the respondents were interested in using EcoSan faeces on their gardens, if they are sensitized and the material properly sanitized. Animal waste contributed significantly to faecal waste sanitization and its nutrient enrichment. Major challenges of the survey was that, respondents attributed non-use of human faeces to the following reasons; lack of knowledge (59%), fear of health risks (16%), cultural beliefs (11%) and 14% were expressly unwilling. The results also showed that unblended human faeces is not good for use as a soil fertilizer input as it contains high level of human pathogens (Ogwang, 2005).

The survey revealed that, it is possible, EcoSan human faeces can be adopted as a Soil Fertility Management and fertilizer input in Uganda if blended with animal waste and a means of improving rural sanitation (Ogwang, 2005).

2.8.2 Plant Nutrients in Excreta

It is reported that the nutrient content of faeces originates from the food consumed. It is estimated that the food nutrient content is distributed to the faecal fraction in the proportions: 10-20% nitrogen (N), 20-50% phosphorus (P) and 10-20% potassium (K) (Lentner *et al.*, 1981; Guyton, 1992; Vinnerås *et al.*, 2006). Also, about 20% of faecal nitrogen is ammonia, biochemically degraded from proteins, peptides and amino acids, some 17% is found in living bacteria and the remainder is organic nitrogen combined in molecules such as uric acid and enzymes (Niwagaba, 2009; Lentner *et al.*, 1981). Studies has shown that the nutrients contained in faeces in Sweden are on average 550 g N, 183 g and 365 g K per person and year (Jönsson *et al.* 2005; Vinnerås *et al.*, 2006). Urine contains the largest proportion of plant nutrients found in the household waste and wastewater fractions. The amount of plant nutrients excreted via urine per person and year has been measured at 2.5-4.3 kg N, 0.4-1.0 kg P and 0.9-1.0 kg K (Lentner *et al.*, 1981; Vinnerås *et al.*, 2006).

2.9 Sustainable Management of Human Excrement: The Community-led Total Sanitation (CLTS) Approach

CLTS is an unsubsidised approach to rural sanitation that facilitates communities to recognise the problem of open defecation and take collective action to clean up and become 'open defecation free'. Triggering is the vital core of CLTS. Facilitators convene communities and through participatory mapping of households and defecation areas (and by walking through these areas) the problem of 'shitting in the open' is quickly made visible (IDS, 2009). The crude local equivalent word to 'shit' is always used and facilitators run exercises that are aimed to shock and disgust, for example, calculating the amounts of 'shit' produced and analyzing pathways between 'shit' and mouth. This leads to a moment of 'ignition' when natural leaders speak up and resolve to take action. Whole communities are then galvanized into action (IDS, 2009). CLTS is radically different from all other approaches to rural sanitation. Through unconventional facilitation and without any subsidies for hardware, communities recognize that they are 'eating one another's shit' and decide to take collective action to clean up and become ODF (open defecation free), digging and building simple pit latrines to their own designs. Some may at first share latrines and others improve existing unhygienic ones. Action is often immediate and dramatic (IDS, 2009).

CLTS was pioneered by Kamal Kar in Bangladesh in 1999, working with the Village Education Resource Centre (VERC), a non government organisation (NGO) supported by WaterAid. Since then CLTS has been introduced in more than 20 other countries in Asia, Africa, the Middle East and Latin America. In some countries such as Indonesia, Pakistan, Kenya, Ethiopia and Zambia, it has a solid and expanding base. These are all countries without subsidy programmes, and where Kamal Kar and others have carried out a series of high quality trainings (IDS, 2009).

Upon realizing that about two billion people living in rural areas are adversely affected by open defecation, it can thus be said that in many countries the Millennium development goal for sanitation is off track. Community-led Total Sanitation (CLTS) has become a radically different

approach to rural sanitation and has shown promising successes where traditional rural sanitation programmes have failed (IDS, 2009). Unlike traditional programmes, CLTS does not involve providing subsidies for individual household hardware. In CLTS, communities conduct their own analysis, come to their own conclusions, and take their own action. All gain especially women, adolescent girls and children (IDS, 2009).

2.10 Conclusion

The review of literature so far is suggestive of how serious the problem of sanitation is the world over. Not even Great Britain, Frances or USA thus has a perfect sanitary system. Most deaths across the globe are said to have a link with poor sanitary conditions. As stated earlier, about 3.3 billion people worldwide lack adequate sanitation (equivalent to 70% of the population of developing countries) accounting to about 80% of all morbidity cases due to human excreta and water-related diseases (UNDP, 2002). This situation calls for pragmatic measures form all spheres towards the proper management of human excreta. This could be done by drawing lessons from other places that have been successful in their effort to managing human excreta.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The approach to data collection in the research process is examined in this chapter. Methods refer to instruments used in the collection and analysis of data. According to Sarantakos (2005), methodology is a research strategy that provides guidelines that show how research is to be conducted on a particular situation. Methodology is considered as the greater means by which the research comes to be carried out and thus occupies a central position in the research process. This is so, because, the social scientist faces the problem of precision and validity since social research cannot be subjected to rigorous laboratory analysis as in the physical sciences to ensure exact reliability of findings. Thus, the choice of methodology needs to be given the needed attention in helping to check and detect inconsistencies of findings.

3.2 Research Design

In this study, the mixed research design was adopted both in the collection and analysis of data. Johnson et al (2007:123) define the Mixed Research Design as "the type of research in which a researcher or a team of researchers combine the elements of qualitative and quantitative research approaches (e.g. use of qualitative and quantitative research viewpoints, data collection, analysis, inference techniques) for both broad purposes of breadth and depth of understanding and corroboration". The study employed some quantitative techniques such as questionnaires for data collection and made use of Statistical Package for the Social Scientist to analyze and organize the data. Interviews and observation were some of the qualitative techniques used in the data collection stage. Data collected was then summarized into themes for presentation.

The study however, is more qualitative than quantitative in its design as it relied much more on description than on statistics. According to Sarantakos (2005), most qualitative researches are

explorative and are usually based on the inadequacy of knowledge on the subject. For Sarantakos, qualitative research studies reality from inside and that the object of study is usually complex and requires that the researcher tries to understand it from the viewpoint of the subject. He adds that data collected and presented in qualitative study is usually non-numerical.

3.3 Data Collection Techniques

To ensure research validity, the research adopted the use of multiple data collection tools: interviews, questionnaires and observations.

3.3.1 Interviews

According to Ghosh (1992), an interview is the most common research method used for the study of human behavior and that it helps to read into the life of the respondents who are outside of the knowledge of the researcher. "An interview is a method of field investigation whereby the researcher meets respondents and through the interaction asks specific questions to find answers to his research problem" (Twumasi, 2001:35).

Interviews may take the form of questionnaires, but they are verbally administered (Twumasi, 2001). This study employed the use of semi-structured interviews in the generation of data to address the research question. According to Sarantakos, (2005), semi-structured interview makes it possible for the researcher to use a flexible interview structure which is more of a guide than rules. It thus gives the researcher the opportunity to rephrase questions when the need arises.

The respondents for the interviews were fewer than those for the questionnaires. This was to make it possible to explore for details of issues on the problem under study. Respondents were thus subjected to exhaustive questioning on the problem. Semi-structured interviews were used

to collect data from tenants, landlords/landladies, officials of the Municipal Health Directorate, Zoomlion Ghana Ltd of Wa, Wa Landlords' Association, the Wa Municipal Sanitary Inspectorate, Wa Municipal Town and Country Planning Department and the Wa Municipal Directorate of Food and Agriculture.

3.3.2 Questionnaire Administration

Sarantakos (2005) views questionnaires to be more quantitative oriented and are usually employed for the collection of data that is more general and thus is generated from a wide range of respondents. Baker (1994:172) defined questionnaires as "a method of collecting data in which a specifically defined group of individuals are asked to answer a number of identical questions". Questionnaires are not as flexible as interviews as respondents are usually restricted to the questions that do not lend themselves to rephrasing while in the hands of respondents. Questionnaire is one of the most commonly used data collection tools in social research, more importantly, when data is to be collected from a large sample. It helps to reach many respondents in a short span of time (Sarantakos, 2005).

Like the interviews, the questionnaires were used to gather information from tenants, landlords/landladies, officials of the Wa Municipal Health Directorate, Zoomlion Ghana Ltd of Wa, Wa Landlords' Association, the Wa Municipal Sanitary Inspectorate, Wa Municipal Town and Country Planning Department and the Wa Municipal Directorate of Food and Agriculture about: the existing facilities for the collection, treatment and disposal of human excrement in the township, the effectiveness of existing human excrement collection, treatment and disposal systems, the circumstances surrounding the continuous habit of open defecation in the township,

the health implication of open defecation and their views on alternative ways for effective human excrement collection, treatment and disposal in the township. Questionnaires were also

administered to all those who were interviewed for the purposes of confirming data collected with the interviews.

3.3.3 Observation

Observation makes it possible for the researcher to have firsthand information or picture of the problem under study. According to Twumasi (2001), observation is a method of data collection that enables the researcher to get involved in the activities of the respondents and from that point, takes note of their activities in order to derive answers to address his/her research questions. Observation could be structured or less structured. Structured observation requires the counting of frequencies of occurrences of particular events under study over time, whereas in less structured observation requires that the observer attempts to remember what occurs during his presence.

Less structured observation was undertaken of open defecation in the Municipality. Other things observed were: the existing facilities for the collection, treatment and disposal of human excrement as well as the general attitude of the people towards sanitation issues in the Municipality. The observation was the practical aspect of the study where the problem was actually assessed against the reality of the situation as it prevails on the ground.

3.4 Desk Review of Secondary Data

Both Ghosh (1992) and Twumasi (2001) have identified two sources of data for social research primary and secondary data sources. They refer to primary data as that generated by the researcher from respondents during the research and secondary data as that already in existence for some other purpose(s) but found to be relevant to the study.

For Sarantakos (2005), secondary sources of data are very useful if the researcher really wants to identify and fill existing research data gaps especially during primary data collection. He adds that secondary data provides previously collected data that is relevant to the study. Some sources of secondary data the study resorted to included published and unpublished books, the internet, newspapers and articles on the management of human excrement and issues on sanitation in general.

3.5 Research Location

The study area is in the Wa Municipality of the Upper West Region of Ghana. The research was conducted from five sampled residential areas in the Municipality as designated by the Town and Country Planning Department of the Municipality. The Wa Municipality covers a geographical area of approximately 23,474sq km which constitutes about 6.4% of the total land area of the Region (Wa Municipal Assembly, 2006).

The Municipality, which is also the capital of the Region, is noted for its numerous educational institutions, including those for the physically challenged. The Municipality can also be considered the commercial hub of the Region.

Five communities, namely: Kabanye, Dondoli, Kambali/Kpaguri, Degu residential area and SSNIT Flats were chosen for the study. Five communities were selected, since the entire Wa Municipality was too large to study given the constraints of time and resource availability and the fact that the entire Municipality had similar characteristics and as such could be sampled for a study to represent the entire Wa Municipality. The educational institutions in the Municipality draw a lot of people from all over the country and even abroad to the Municipality. These different people are associated with different hygienic lifestyle of which they tend to practice in

the Municipality creating environmental problems. One of these environmental problems is open defecation.

3.6 Sampling Details

3.6.1 Sampling techniques

Sarantakos, (2005) opines that sampling helps in specifying the type and number of respondents to cover in a study. Baker (1994:154) refers to sampling as a "systematic method of selection". She identifies two types of sampling in social research: probability and non-probability sampling techniques and that the use of any of the two depends largely on the focus of the problem under study. For Baker (ibid), probability sampling is "the procedure in which the choice of respondents is guided by the probability principle in which every unit of the target population has an equal, calculable, and non-zero probability of being included in the sample". Twumasi (2001) notes that non-probability sampling techniques do not lend themselves to randomness. Purposive and quota sampling techniques are common examples of the non-probability sampling techniques often used.

The study employed the simple random type of the probability sampling technique in selecting respondents from houses in the Municipality for data collection. This was made possible by the availability of house numbers in the Municipality. Specifically, target houses were selected through the lottery system of the simple random sampling technique and data collected from the landlord/landlady and any first tenant (18+years) met in each house.

The purposive sampling technique was also employed to select the head and a member each of the Wa Municipal Health Directorate, Zoomlion Ghana Ltd of Wa, Wa Landlords' Association, the Wa Municipal Sanitary Inspectorate, Wa Municipal Town and Country Planning Department and the Wa Municipal Directorate of Food and Agriculture.

3.6.2. Sampling Units

Respondents from whom data is collected for a study are referred to as sampling units. They are usually people who have answers to address research questions. According to Ghosh (1992), when the researcher is able to identify the sampling units clearly, it makes it easier to determine a suitable sample size for the study. The sampling units under this study included: tenants, Landlords/landladies, officials of the Municipal Health Directorate, Zoomlion Ghana Ltd, Landlords' Association, the Wa Municipal Sanitary Inspectorate, Municipal Town and Country Planning Department and the Municipal Directorate of Food and Agriculture who were believed to have a stake in the problem of human excrement management in the Wa Municipality.

3.6.3 Sample Size for the Study

Representativeness in research findings is very important and very dependent on the size of sample used for the study among other factors such as the study tools mentioned earlier. It is therefore very necessary that in determining the sample size for a study, the researcher estimates the population under study and the size that will possibly represent such a population. Baker (1994:148) refers to sample as "a selected set of elements or units drawn from a larger whole of all the elements".

A total of 199 respondents were sampled from the five residential communities of the Municipality for questionnaire administration. That is, 40 respondents from each of the four electoral areas and 39 respondents from the fifth residential community; since after collating the administered questionnaires, it was realized that one respondent could not be traced. From the 40 respondents, two were selected from each house, one being the landlord/landlady and the other being a tenant.

This figure was chosen bearing in mind time and resource factors as well as data manageability and representativeness, which Ghosh (1992) and Sarantakos (2005) think are paramount and need to be taken into consideration in the selection of a sample size for research work. The head and a member each of the Wa Municipal Health Directorate, Zoomlion Ghana Ltd of Wa, Wa Landlords' Association, the Wa Municipal Sanitary Inspectorate, Wa Municipal Town and Country Planning Department and the Wa Municipal Directorate of Food and Agriculture—12 respondents were added to the sample size. In all, a sample size of 211 respondents answered questionnaires meant to solicit data for the study. For the interviews, a landlord/landlady and a tenant from each of the five residential areas and the heads of the target institutions were contacted. Thus, a sample of 16 respondents was interviewed for this study.

3.7 Research Validity and Reliability

Unlike in laboratory studies where it is easy to perform an experiment and get it replicated by the same method to get exact result, it is often not easy to get the same thing done in the field of social research when dealing with people whose behavour change with the change in circumstances. To ensure reliability and validity of research findings, Sarantakos (2005) advises researchers to adopt what he calls the triangulation—the use of multiple research tools to generate data from different viewpoints to authenticate research findings. In line with Sarantakos' assertion, this research work employed interviews, questionnaires and observation to generate data meant to complement each other and supplemented by the review of secondary data.

3.8 Techniques of Data Analysis and Presentation.

The study employed both quantitative and qualitative methods in the analysis of data. Quantitative data was analyzed using the Statistical Package for the Social Scientist (SPSS) and presented in percentage pie and bar charts with narrative descriptions. Qualitative data was also

organized into themes and discussed to establish trends and patterns in accordance with the research questions.

With the choice and use of the right tools for the collection of primary data and the review of appropriate existing literature on the research problem, coupled with the processes used in sampling for the study, it could be said that findings of the research activity are credible and a true reflection of the situation regarding the management of human excrement in the Wa Municipality.

3.9 Fieldwork Challenges

In doing the study, a number of setbacks were encountered. These setbacks had to do with data collection. In fact, it was difficult getting respondents, especially, the heads of the various agencies. It took several days to get them for the solicitation of the views on the research problem. Some other respondents, especially, the females were uncomfortable responding to questions. They had to be reassured of the confidentiality of the data collected before getting them say anything.

Again, the intended number of respondents for the administration of questionnaires fell short of one. This happened because after collating the administered questionnaire, it was realized that one respondent could not be traced.

Moreover, some respondents found the topic of study to be sensitive and tried dodging some questions. Some of the questions therefore had to be rephrased and inferences made out of the responses given.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The analysis and presentation of data gathered is the focus of this chapter. Much of the presentation is in the form of narratives. A few tables and figures have, however, been used to present some quantitative analysis of administered questionnaires. The presentation is the outcome of administered questionnaires and interviews conducted with the observations made. Findings are organized in accordance to the objectives of the study for orderly and logical presentation. Specifically, findings are presented on such sub-titles as: socio-demographic characteristics of respondents, human excrement disposal practices in Wa, the existing facilities for the collection, treatment and disposal of human excrement in the Wa Municipality, effectiveness of the existing human excrement collection, treatment and disposal systems in the Wa Municipality, circumstances surrounding the continuous habit of indiscriminate defecation in the Wa Municipality, effectively managing human excrement and the alternative ways for effective human excrement collection, treatment and disposal in the Wa Municipality.

4.2 Socio-Demographic Characteristics of Respondents

The socio-demographic characteristics of respondents of the study were examined. Their age, sex, level of formal education, residential status and residential designation were specifically looked at with regard to the objective of the study.

4.2.1 The Age and Sex Structure of Respondents

Usual of landladies/landlords and household heads majority (43.6%) fall within the age range of 48+ years with only 13.7% found to be in the ages below 27 years and 42.7% falling in the range

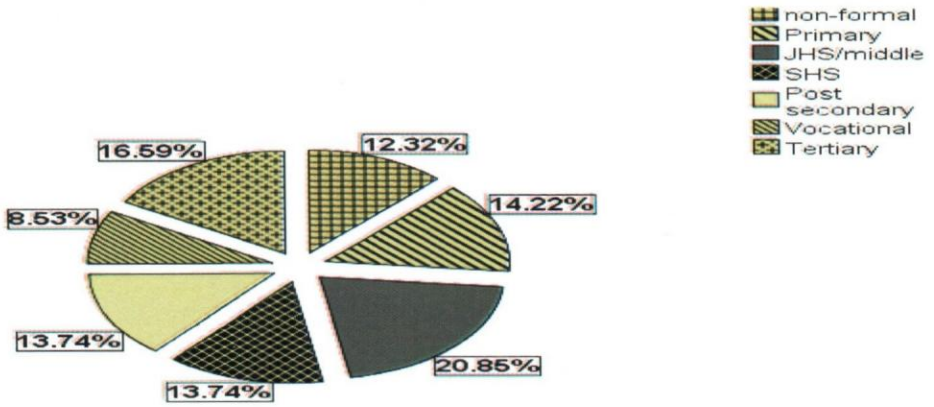
of 28 and 47 years. It was convincing to note that respondents of these ages are a reliable source of data to the study objectives.

As is a common practice in most parts of the Region, females hardly speak to household issues, except in a few instances when males are not readily available. It was not surprising then to realize that as many as 84.4% of the study respondents were males with only a 15.6% being females. For some of the females, they had to be reassured of confidentiality before they would agree to answer any question. The study, despite the disproportion in the sex ratio of the respondents, deems findings concrete since most landlords/landladies and the household heads are males and thus have relevant data for the study.

4.2.2 Respondents' Level of Formal Education

The level of formal education of a respondent, no doubt, affects his/her responses to questions and the data that can be generated from him/her. Again, the level of education of the respondents is believed to impact on their views and understanding of issues of sanitation and personal hygiene with particular reference, in this case, to the management of human excrement; the focus of the research study. Figure 4.1 is a diagrammatic representation of the level of formal education of the study respondents.

Figure 4.1: Level of Formal Education of the Study Respondents



Source: Field Survey August/September, 2011.

From figure 4.1, it was established that the greater majority (20.85%) of the respondents had only up to Junior Secondary School (JHS)/Middle School with only 16.59% having tertiary education. With such a low level of education among the respondents, it was obvious that they placed little premium on issues of sanitation and for that matter, the management of human excrement in the Township. Respondents' level of education was however, of a level reasonable enough to provide responses required to address the research problem.

4.2.3 Residential Status of Respondents

The study sought to find out the residential status of respondents in terms of one being indigenous or a migrant settler. This was meant to establish the relationship between one's residential status and habit regarding the problem under study. The study found out that 96.3% of the respondents were indigenous with the 3.7% being migrant settlers. This shows how indigenous in nature the problem is in the municipality.

4.2.4 Residential Designation of Respondents

By residential designation of respondents, the research sought find out who are landlords/landladies and who are tenants. This was believed to influence responses as regards who are responsible for the provision of toilet facilities in homes and why such facilities are not in place as expected. The research found out that 49.1% of the respondents were landlords/landladies and 50.9% being tenants. It could therefore be said that data collected was balanced in the views between landlords/landladies and tenants.

4.3 Human Excrement Disposal Practices in Wa

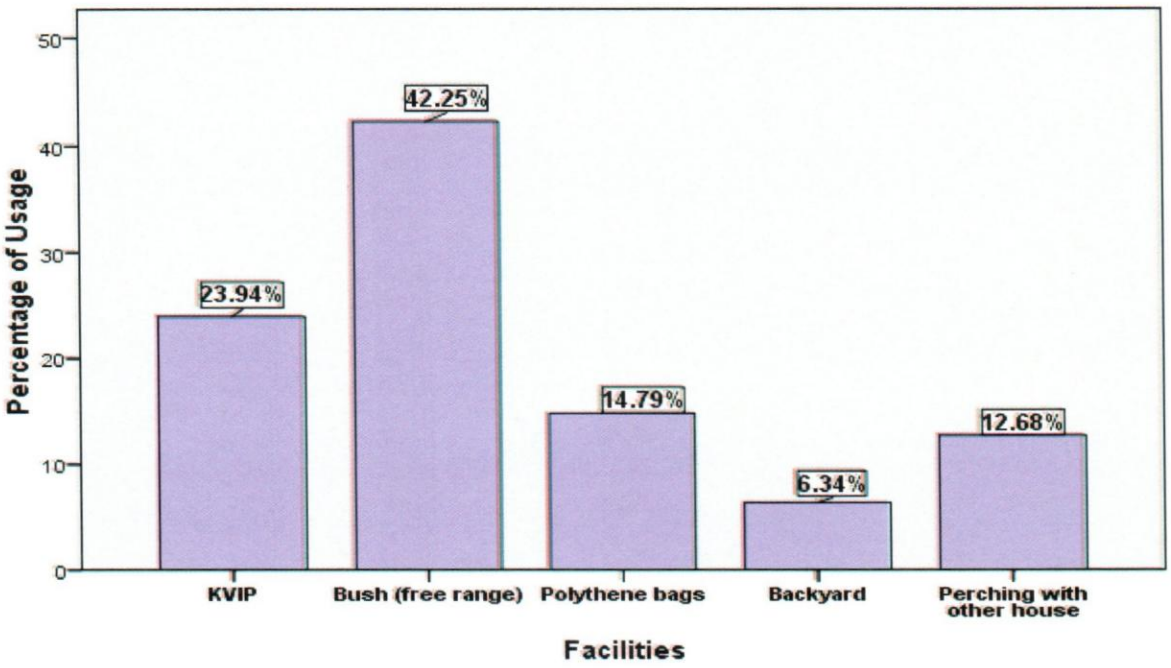
In situations where sanitation is lacking, human excreta may accumulate around homes, in nearby drains and in garbage dumps leading to environmental pollution (Kulabako *et al*., 2007; Niwagaba 2009). Where conventional sanitation systems are in use, insufficiently treated excreta from latrines and wastewater systems often end up in deep pits and recipient waters, particularly ground water. This view of Kulabako *et al* and Niwagaba is the exact reflection of the situation in the communities studied in the Wa Municipality regarding sanitation, particularly, the management of human excrement. An observation through the five communities revealed that there was only one public toilet facility in each community. There was an observation of accumulated human excrement around homes, especially homes that are located near the bushes and refuse dumps. The stinging nature of the environment in the communities resulting from doted excrement leaves much to be desired. No wonder that, Kulabako *et al* and Niwagaba add that the lack of access to improved sanitation to a greater extent contributes to environmental pollution together with its consequences to society.

4.3.1 The Existing Facilities For The Collection, Treatment And Disposal Of Human Excrement in the Wa Municipality

The general picture about the number of facilities available for collection, treatment and disposal of human excrement in the Wa Municipality was not different from many of such towns in developing countries. Apart from the facilities not being near adequacy, Town and Municipal authorities had done little to salvage the situation. This was in line with TAF Preventive Medicine Bulletin's assessment of the condition in other African countries (Oron, Nigeria) in 2008. The research depicted a whopping 67.29% of total respondents from the five (5) communities in the municipality having no toilet facility of which ever kind in the comfort of their homes. These numbers (67.29%) relied on methods such as free range (indiscriminate defecation in open spaces and bushes), excreting into polythene bags and throwing faeces into refuse containers among others as shown in Figure 4.2. The remaining 32.20% of respondents who had toilet facilities in their homes used facilities such as Water Closet (24.63%), Pit latrine (53.62%) referred to as "long drop toilets" by Byrne (2000) and household KVIP (21.74%).

An assessment of how waste from children under six years was collected and disposed was also looked at and it followed a similar pattern as above. About 45% of respondents use the same facility as their children under six years whiles 55% used facilities such as polythene bags (20.5%), backyard (39.7%), chamber pots (11.5%) and refuse dumps (28.2%). The collected wastes were mostly thrown outside the compound, refuse containers or into the bush. This was not much different from the pattern realized from the research conducted in Oron, Nigeria, by TAF Preventive Medicine Bulletin in 2008

Figure 4.2: The Various Methods Used by the 67.29% of the Respondents Who do not have a Toilet Facility at Their Homes



Source: Field Survey, August/September 2011.

From figure 4.2, it is clear that a greater percentage of the respondents without toilet facilities at their homes use the bush (42.25%). This has greater consequences on the health status of the populace in these communities since human faeces carry disease pathogens and bacteria (Feachem *et al.*, 1983; Schönning and Stenström, 2004). The second most patronized means of passing bowels was the use of the public KVIP system (23.94%), followed by the use of polythene bags (14.79%) with perching with other households being 12.68%.

4.4 Effectiveness of the Existing Human Excrement Collection, Treatment and Disposal Systems in the Wa Municipality

In some countries like Argentina, faecal management is mostly the duty of the government in which specific designs for disposal of excrement are available with sites for disposal and facilities for treatment. An assessment by Ingallinella et al. (2000) showed that most cities in Argentina had neighbourhood septic tanks set up by the government, with existing vacuum trucks that empty the facilities on regular bases to processing points. One can say that most cities in Ghana lack this facility with the exception of Tema, where most houses are connected to a community septic tank system, thus, making the Wa Municipality not an odd one. This notwithstanding, the existing facilities for the collection, treatment and disposal of human excrement in the Wa Municipality were nothing to write home about.

One way of checking the effectiveness of any system is to check the adequacy of it. In this research, respondents who had a toilet facility at home complained of it not being adequate for the number of households that use the facility. With an average household size of seven (7) in a house comprising mostly one (1) to five (5) households, the research has shown that houses in the Wa Municipality have on the average one (1) or two (2) toilet facilities implying an average ratio of 1 toilet facility:10 household members. It is not surprising then that 69.56% of the total number of respondents who had toilet facilities in their houses responded 'no' as to whether the number of facilities in their homes was adequate for them. The effects of the inadequacy are that, the people tended not to use the facility in the house, and rather turned to other means such as the KVIP or bush or polythene bags. The sanitary condition of the facilities in the houses was also affected because of the number of people who patronized its use.

With only 32.7% of the study respondents having a toilet facility at home, a look at other better facilities aside those at homes will help in the analysis of effectiveness of existing toilet facilities. The research showed that, out of the 67.3% respondents who did not have a toilet facility at their

homes, 23.94% relied on public KVIP facilities in the communities, which was the only proper, appropriate and environmentally friendly means of collecting human excrement amongst the alternatives for those without a facility at home.

The research further revealed that, the number of these public KVIP facilities was not adequate, with the average number of public KVIP facilities in each community numbering one (1) and located over an average distance of one hundred and fifty to two hundred and fifty metres (150-250 metres) from individual homes. As if this was not a deterring factor enough, people accessing the KVIP in their communities had to spend between ten (10) to fifteen (15) minutes of their time to queue. This tells how pressurized these facilities are leaving people with the choice of not patronizing them, but rather turning to the bush and other unhealthy means to free their bowels.

4.5 Circumstances Surrounding the Continuous Habit of Indiscriminate Defecation in the Wa Municipality

The research revealed a number of factors leading to indiscriminate defecation within the Wa Municipality. These include lack of toilet facility at homes, inadequacy of toilet facilities at home and the inadequacy of KVIP in communities.

Out of the number interviewed, one hundred and forty two (142) representing 67.29% of the sample size have no toilet facilities in their homes. Out of this number 42.25% defecate into the bush, with 23.94% making use of community KVIPs, with this, 67.64% of respondents agree that there are on the average either one or two of such facilities in their communities. The research further revealed that usage of the KVIP, which is by large the only major source of properly collecting human excrement, tends to be hectic. 53.57% of respondents who use KVIPs have said they spend eleven to twenty minutes of their time queuing to access the facility. About 43% of people who use KVIP facility have also complained of it not being neat, making them not use the facility.

The research further revealed that people just defecate in the bush even if they had a toilet facility at their homes. About 31% of respondents having toilet facilities in their homes also complained about it not being neat and not accessible since the ratio of a toilet facility to person is 1:10 for most houses, hence turning them to use other means such as the bush or polythene bags.

Other revelations from the research concerning indiscriminate defecation in the Municipality included, poor educational background, people's personal lifestyle, the inaction of the concerned agencies in ensuring sanity in the issue and the lack of educational campaigns on the possible threats of open defecation.

4.6 Effectively Managing Human Excrement

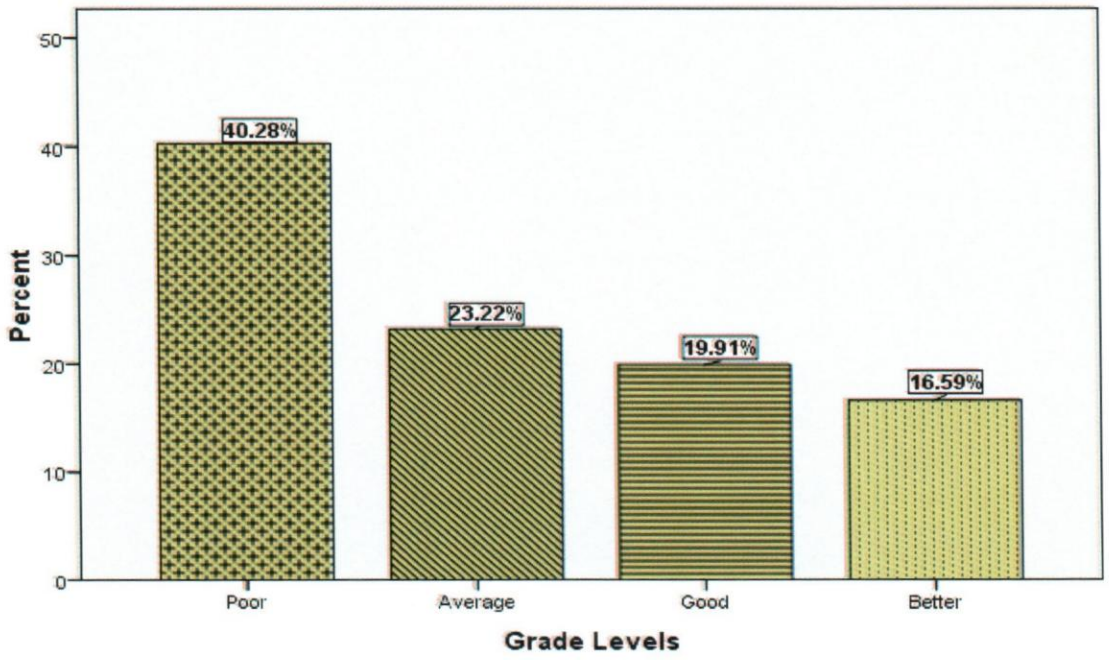
Effective management of human excrement cuts across collection systems, treatment of the excrement and usage of the treated substances. The research looked at these areas in lieu of better management of human excrement in the Wa Municipality. The research looked at facilities that enhance effective management of human excrement. With this, emphasis was placed on collection and dumping/disposal of the human excrement. Ingallinella et al (2000) outlined two major systems used in collecting and disposing human faeces in Argentina— the semi-centralized system and the neighbourhood (condominial) septic tanks system. The semi-centralized system involves liquid separation and solid dewatering of wastes from source and this is deposited at a site constructed for this purpose. The neighbourhood septic tanks system, as explained by, Ingallinella et al. (2000) is suited for densely populated areas with narrow or few access roads (like most non-planned suburb of the municipality) by creating communal septic tanks at accessible areas in the communities. The research revealed that about 70% of respondents who had their facilities at home used individual septic tanks constructed at their own cost. With this, some said it does not encourage them to have their own facilities since the cost of construction and management of the facility is so high for people of their income status.

The research revealed that there is basically only one major institution which clears or empties the septic tanks when full. This is the Wa Municipal Assembly which uses a Vacuum Tank Car. This institution empties about 73% of household septic tanks in the Municipality. Zoomlion Ghana Ltd, a private waste management company also empties about 18% of the septic tanks in the municipality whiles, the remaining 9% is cleared by some private vacuum tank car operators. Asked about where these cleared substances are sent to, about 75% of respondents had no idea about that, the remaining 25% who said they know where the cleared substances are sent to, stated that it was either sent to the bush, thus, dumped indiscriminately.

Whereas officials from the municipal vacuum tank car operation seems to dump the collected substances from the septic tanks at sites branded 'outskirts of town', officials from Zoomlion Ghana Ltd. said they have a dumping site where the cleared excrement from the septic tanks are sent. These sites are later filled up with soils to become agricultural lands, but the period of it drying causes a major health threat to the residents of these areas where the sites are located.

As assessed by Byrne (2000) effective management of human excrement also entails the proximity of collecting facilities to community members. The research sought the views of respondents to know their stance about an effective place of convenience. Seventy-seven percent of respondents indicated that a good place of convenience will mean the facility being at home. Of these respondents, 45% specifically said water closet (W.C) is an example of a good place of convenience. With this, respondents were ask to grade the Municipality in terms of number of toilet facilities (and types), its usage, and its management and in lieu of neatness based on the existing facilities in individual houses. It turned out that 40% graded the municipality as being poor in terms of the availability of toilet facilities and management (figure 4.3).

Figure 4.3: Grading of the Municipality in Terms of Availability of Toilet Facilities and Management (Neatness)



Source: Field Survey, August/September 2011.

4.7 Alternative Ways for Effective Human Excrement Collection, Treatment and Disposal in the Wa Municipality

Deducing from Ingallinella et al.'s (2000) work in Argentina, most countries have benefited from effective collection and treatment of human excrement from environmental neatness to agricultural usage. The research accessed respondents' knowledge about uses of human excrement. Fifty-six percent had no idea about the use of human excrement. Out of the 44% who said yes to the question, believe it is used as biogas (19%), electricity generation (9%) and for fertilizer (57%). Niwagaba (2009) has assessed that the estimated amount of nutrient in human excreta include Nitrogen (N) and Potassium (K) in large quantities which is essential for plant growth, with substantial quantities of these nutrients being present in fertilizers. A recycling of the human

excreta generated from the Wa Municipality into fertilizers will reduce importation of fertilizers and hence channel economic resources into other fields like human development.

Source separation of urine from faeces, according to Höglund *et al*. (2002) is very essential in the treatment of human excreta for recycling purposes. The research thus was set to also assess if such facilities were available in the Municipality. Sixty-five percent of respondents indicated that there are no special places designated for passing of urine and as such places like bathrooms (13%), open spaces (47%), back yards (39%) were relied upon for passing urine. This adds to the already unhealthy environment posed by open defecation since urine also contains disease pathogens.

CHAPTER FIVE

SUMMARY OF MAJOR FINDINGS AND CONCLUSIONS

5.1 Introduction

This chapter summarizes the major findings of the study. This is done in line with the set objectives of the study.

5.2 Socio-Demographic Characteristics of Respondents

The socio-demographic characteristics of respondents to the study were examined. Usual of landladies/landlords and household heads contacted for data, majority (43.6%) fell within the age range of 48+ years with only 13.7% found to be in the ages below 27 years and 42.7% falling in range of 28 years and 47 years. It was convincing to note that respondents of these ages are a reliable source of data to the study objectives. As is a common practice in most parts of the Region, females hardly speak to household issues. Thus, as many as 84.4% of the study respondents were males with only a 15.6% being females. This study, despite the disproportion in the sex ratio of the respondents, deems findings concrete since most landlords/landladies and the household heads were males and thus had relevant data for this study. The level of education of the respondents is believed to impact on their view and understanding of issues of sanitation and personal hygiene. This study established that the greater majority (20.85%) of the respondents had only up to Junior Secondary School (JHS)/Middle School with only 16.59% having tertiary education. With such a low level of education among the respondents, it was obvious that they placed little premium on issues of sanitation in the Municipality. This study found out that 96.3% of the respondents were indigenous with the 3.7% being migrant settlers. This shows how indigenous in nature the problem is in the Municipality. The research found out that 49.1% of the respondents were landlords/landladies and 50.9% being tenants. It could therefore be said that data collected was balanced in the views between landlords/landladies and tenants.

5.3 Human Excrement Disposal Practices in Wa

In situations where sanitation is lacking, human excreta may accumulate around homes, in nearby drains and in garbage dumps, leading to environmental pollution (Kulabako *et al.*, 2007; Niwagaba 2009). Where conventional sanitation systems are in use, insufficiently treated excreta from latrines and wastewater systems often end up in deep pits and recipient waters, particularly ground water. This view of Kulabako *et al* and Niwagaba was the exact reflection of the situation in the communities studied in the Wa Municipality regarding sanitation, particularly, the management of human excrement. An observation through the five study communities revealed that there was only one public toilet facility in each community. There was an observation of accumulated human excrement around homes, especially homes that are located near the bushes and refuse dumps. The stinging nature of the environment in the communities resulting from doted excrement left much to be desired.

The general picture about the number of facilities available for collection, treatment and disposal of human excrement in the Wa Municipality was not different from many of such towns in developing countries. Apart from the facilities not being near adequacy, Town and Municipal authorities had done little to salvage the situation. The research depicted a whopping 67.29% of total respondents from the five (5) communities in the municipality having no toilet facility of which ever kind in the comfort of their homes. These numbers (67.29%) relied on methods such as free range (indiscriminate defecation in open spaces and bushes), excreting into polythene bags and throwing into refuse containers among others. The remaining 32.20% of respondents who had toilet facilities in their homes used facilities such as Water Closet (24.63%), Pit latrine (53.62%) referred to as "long drop toilets" by Byrne, 2000 and household KVIP (21.74%).

An assessment of how waste from children under six years was collected and disposed was also looked at and it followed a similar pattern as above. About 45% of respondents used the same facility as their children under six years whiles 55% used facilities as polythene bags (20.5%), backyard (39.7%), chamber pots (11.5%) and refuse dumps (28.2%). The collected wastes were

mostly thrown outside the compound, refuse containers or into the bush. This was not much different from the pattern realized from the research conducted in Oron, Nigeria, by TAF Preventive Medicine Bulletin in 2008.

This study gathered that a greater percentage (42.25%) of the respondents without toilet facilities at their homes used the bush. The second most patronized means of passing bowels was the use of the KVIP system (23.94%), followed by the use of polythene bags (14.79%) with perching with other households being 12.68%.

5.4 Effectiveness of the Existing Human Excrement Collection, Treatment and Disposal Systems in the Wa Municipality

The existing facilities for the collection, treatment and disposal of human excrement in the Wa Municipality were nothing to write home about. One way of checking effectiveness of any system is to check the adequacy of it. In this research, respondents who had a toilet facility at home complained of it not being adequate for the number of households that use the facility. With an average household size of seven (7) in a house comprising mostly one (1) to five (5) households, the research has shown that houses in the Wa Municipality have on the average one (1) or two (2) toilet facilities implying an average ratio of 1 toilet facility:10 household members. It is not surprising then that 69.56% of the total number of respondents who had toilet facilities in their houses responded 'no' as to whether the number of facilities in their homes was adequate for them. People thus turned to the use of other means such as the public KVIP or bush or polythene bags. The sanitary condition of the facilities in the houses was also affected because of the number of people who patronized its use. This research showed that, out of the 67.3% respondents who did not have a toilet facility at their homes, 23.94% relied on public KVIP facilities in the communities, which was the only proper, appropriate and environmentally friendly means of collecting human excrement amongst the alternatives for those without a facility at home.

The research further revealed that, the number of these public KVIP facilities was not adequate, with the average number of KVIP facilities in each communities numbering one (1) located over an average distance of one hundred and fifty to two hundred and fifty metres (150-200 metres) from individual homes. As if this was not a deterring factor enough, people accessing the KVIP in their communities had to spend between ten (10) to fifteen (15) minutes of their time to queue.

5.5 Circumstances Surrounding the Continuous Habit of Indiscriminate Defecation in the Wa Municipality

The research revealed a number of factors leading to indiscriminate defecation within the Wa Municipality. These include lack of toilet facility at homes, inadequacy of toilet facilities at home and the inadequacy of KVIP in communities. About 67.29% of the research respondents had no toilet facilities in their homes. Out of this number, 42.25% defecate into the bush, with 23.94% making use of community KVIPs, with this, 67.64% of respondents agreed that there were on the average, either one or two of such facilities in their communities. The research further revealed that usage of the public KVIP, which is by and large the only major source of properly collecting human excrement is inconvenient. The research further revealed that people just defecate in the bush even if they had a toilet facility at their homes. About 31% of respondents having toilet facilities in their homes use other means such as the bush or polythene bags.

Other revelations from the research concerning indiscriminate defecation in the Municipality included, poor educational background, people's personal lifestyle, the inaction of the concerned agencies in ensuring sanity in the issue and the lack of educational campaigns on the possible sanctions of open defecation.

5.6 Effectively Managing Human Excrement

The research looked at facilities that enhance effective management of the human excrement in the Wa Municipality. The research revealed that about 70% of respondents who had their facilities at home used individual septic tanks constructed at their own cost. With this, some said did not encourage them to have their own facilities since the cost of construction and management of the facility was so high for people of their income status.

The research revealed that there was basically only one major institution which cleared or emptied the septic tanks when full. This was the Wa Municipal Assembly's Vacuum Tank Car. This institution emptied about 73% of household septic tanks in the Municipality. Zoomlion Ghana Ltd, a private waste management company also emptied about 18% of the septic tanks in the Municipality whiles, the remaining 9% was cleared by some private vacuum tank car operators. Asked about where these cleared substances were sent to, about 75% of respondents had no idea about that, the remaining 25% who said they knew where the cleared substances were sent to, stated that it was sent to the bush and thus, dumped indiscriminately. Whereas officials from the municipal vacuum tank car operation seemed to dump the collected substances from the septic tanks in pits at sites branded 'outskirts of town', officials from Zoomlion Ghana Ltd. said they had a dumping pit sites where the cleared excrement from the septic tanks were sent.

The research sought the views of respondents to know their stance about an effective place of convenience. Seventy-seven percent of respondents indicated that a good place of convenience would mean the facility being at home. Of these respondents, 45% specifically said water closet (W.C) was an example of a good place of convenience. In fact, only 40% of the study respondents graded the municipality as being poor in terms of the availability of toilet facilities and management.

5.7 Alternative Ways for Effective Human Excrement Collection, Treatment and Disposal in the Wa Municipality

Deducing from Ingallinella et al., 2000 work on Argentina, most countries have benefited from effective collection and treatment of human excrement from environmental neatness to agricultural usage. The research assessed respondents' knowledge about uses of human excrement. Fifty-six percent had no idea about the use of human excrement. Out of the 44% who said yes to the question, believed it was used as biogas (19%), electricity generation (9%) and for fertilizer (57%). Sixty-five percent of respondents indicated that there are no special places designated for passing of urine and as such places like bathrooms (13%), open spaces (47%), back yards (39%) were relied upon for passing urine.

5.8 Research Problem and Objectives of Study Revisited

Here, there was an attempt to match research findings with objectives of the study in order to verify how the objectives had been satisfied by the research findings.

Only 17.5% of the total population of the Wa Municipality had access to safe toilet facilities in 2009. The lack of proper development control had led to encroachment of designated sanitary areas that had been developed for residential or commercial purposes. Additionally, flouting building regulations by not providing toilet facilities in every house and poor enforcement of sanitary regulations further compounded the problem of managing human excrement in the Wa Municipality. The situation was made worse with ever increasing population pressure on the existing sanitary facilities and indiscriminate defecation that marred the aesthetics beauty of Wa Municipality. The study therefore sought to investigate how human excrement was managed amidst the prevailing circumstances in the Municipality. Revelations of the study were not impressive.

Regarding the existing facilities for the collection, treatment and disposal of human excrement in the township, an observation through the five communities studied revealed that there was only one public toilet facility in each community. There was an observation of accumulated human excrement around homes, especially homes that are located near the bushes and refuse dumps. The research depicted a whopping 67.29% of total respondents from the five (5) communities in the municipality having no toilet facility of which ever kind in the comfort of their homes. These numbers (67.29%) relied on methods such as free range (indiscriminate defecation in open spaces and bushes), excreting into polythene bags and throwing into refuse containers among others. The remaining 32.20% of respondents who had toilet facilities in their homes used facilities such as Water Closet (24.63%), Pit latrine (53.62%) referred to as "long drop toilets" by Byrne, 2000 and household KVIP (21.74%). The collection and disposal of waste from children less than six years followed a similar pattern as above. About 45% of respondents use the same facility as their children under six years whiles 55% used facilities as polythene bags (20.5%), backyard (39.7%), chamber pots (11.5%) and refuse dumps (28.2%). The collected wastes were mostly thrown outside the compound, refuse containers or into the bush.

On the effectiveness of existing human excrement collection, treatment and disposal systems, the study gathered that the existing facilities for the collection, treatment and disposal of human excrement in the Wa Municipality were nothing to write home about. With an average household size of seven (7) in a house comprising mostly one (1) to five (5) households, the research has shown that houses in the Wa Municipality have on the average one (1) or two (2) toilet facilities implying an average ratio of 1 toilet facility:10 household members. People thus turned to the use of other means such as the KVIP or bush or polythene bags. The sanitary condition of the facilities in the houses was also affected because of the number of people who patronized its use. The research further revealed that, the number of these KVIP facilities was not adequate, with the average number of KVIP facilities in each communities numbering one (1) located over an average distance of one hundred and fifty to two hundred and fifty metres (150-200 metres) from individual homes. People accessing such KVIPs had to spend between ten (10) to fifteen (15) minutes of their time to queue.

Regarding the circumstances surrounding the continuous habit of indiscriminate defecation in the Municipality, the research revealed a number of factors. These include lack of toilet facilities at homes, inadequacy of toilet facilities at home and the inadequacy of KVIP in communities. About 67.29% of the research respondents had no toilet facilities in their homes. Out of this number, 42.25% defecate into the bush, with 23.94% making use of community KVIPs. The research further revealed that usage of the KVIP, which is by and large the only major source of properly collecting human excrement, tends to be hectic and that some people just defecate in the bush even if they had a toilet facility at their homes. About 31% of respondents having toilet facilities in their homes use other means such as the bush or polythene bags. Other revelations from the research concerning indiscriminate defecation in the Municipality included, poor educational background, people's personal lifestyle, the inaction of the concerned agencies in ensuring sanity in the issue and the lack of educational campaigns on the possible threats of open defecation.

The research looked at facilities that enhance effective management of the human excrement in the Wa Municipality and revealed that about 70% of respondents who had their facilities at home used individual septic tanks. The research sought the views of respondents to know their stance about an effective place of convenience. Seventy-seven percent of respondents indicated that a good place of convenience would mean the facility being at home. Of these respondents, 45%pecifically said water closet (W.C) was an example of a good place of convenience. Forty per cent of the study respondents graded the Municipality as being poor in terms of the availability of toilet facilities and management. The research assessed respondents' knowledge about uses of human excrement. Fifty-six percent had no idea about the use of human excrement. Out of the 44% who said yes to the question, believed it was used as biogas (19%), electricity generation (9%) and for fertilizer (57%).

5.9 Conclusion

From the study, it became apparent that in the Wa Municipality, access to safe toilet facilities is poor and that designated sanitary areas had been encroached and developed for residential or commercial purposes. The management of human excrement in the municipality is thus compounded by weak regulatory institutions and the ever increasing population pressure on the few existing sanitary facilities; an obvious reason for indiscriminate defecation that has marred the aesthetics beauty of Wa Municipality. A community in the municipality at best had only one public toilet facility explaining the accumulation of human excrement around homes, especially homes located near the bushes and refuse dumps.

Indeed, resorting to free range (indiscriminate defecation in open spaces and bushes) and excreting into polythene bags and throwing into refuse containers were interlinked to the absence of effective human excrement management systems in the municipality. This conclusion could not be mistake when in the municipality, there was an average ratio of 1 toilet facility: 10 household members whereas people who turned to the use of the KVIPs not only had to content with the insanitary conditions of these facilities but patronized them from over an average distance of 150m-200m from their individual homes and spending between 10 to 15 minutes of their time queuing to access them. There was no known alternative use for human excrement during the study in the municipality.

On the basis of the above, the study concluded that the management of human excreta in the Wa Municipality remains poor and unhealthy.

CHAPTER SIX

RECOMMENDATIONS

Important as the issue of human excrement management is in every society, it forever remains an inexhaustible topic for discussion. The research conducted in the Wa Municipality came up with some recommendations that could help in making policies to improve the sanitation situation in the Wa Municipality, especially the management of human excrement. Indeed, usual of every research work, these recommendations also give room for researchers to research further into the issue of human excrement management.

As is currently happening with the Accra Metropolitan Assembly, there is the challenge to the Wa Municipal Assembly to wake up and enforce the by-laws that require that landlords provide adequate toilet facilities for their tenants.

Also, the study recommends that the Wa Municipal Assembly should see to the construction of many more public toilet facilities (KVIPs) to reduce the distance involved in accessing the facilities in the various communities, improve upon their quality and to as well reduce the time required and the ordeal in waiting in queues to access such facilities in the community. It is hoped that this will reduce the use of the bush for defecation in the various communities if not to totally stop it.

Education and public campaign on personal hygiene, and general community sanitation could also do the magic of ensuring that the township becomes clean to promote good health. The municipal authorities are therefore urged to augment the people's level of education on sanitation through public education and campaigns on sanitation.

A recycling of the human excreta generated from the few toilet facilities in the Wa Municipality into fertilizers is recommended. This will reduce the importation of fertilizers and hence channel economic resources into other fields like human development.

Collaboration between both public and private operators as well as landlords and tenants is required to making sure that the few existing toilet facilities for managing human excrement are in the proper shape for use. Again supervision from sanitary inspectors in the municipality is key to ensuring that the citizenry practice personal hygiene.

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APPENDIX A

UNIVERSITY FOR DEVELOPMENT STUDIES GRADUATE SCHOOL, WA CAMPUS

RESEARCH QUESTIONNAIRES ON THE MANAGEMENT OF HUMAN EXCREMENT IN THE WA MUNICIPALITY—FOR INSTITUTIONS AND STAKEHOLDERS

Introduction

This questionnaire is meant solely to collect data in respect of the research work entitled "Managing Human Excrement in the Wa Municipality" in partial fulfilment of academic work leading to the award of a Masters of Philosophy Degree in Development Management. Respondents are assured of maximum confidentiality in the management of data collected from them.

PLEASE TICK WHERE APPROPRIATE

A. Socio-Demographic Characteristics of Respondents

1. Name of respondent: .....

2. Age .....

3. Sex: Male [ ] Female [ ]

4. Level of Formal Education

A. No Formal Education [ ] B. Primary Education [ ]

C. JSS/Middle School [ ] D. SSS [ ] E. Post Secondary [ ]

F. Vocational/Technical [ ] G. Tertiary [ ]

5. Marital Status: Single [ ] Married [ ] Divorced [ ]

Widow/Widower [ ] Separated [ ] Co-habiting [ ]

6. Residential Status: Native [ ] Migrant/Settler [ ]

7. Residential Designation: Landlord [ ] Tenant [ ]

8. Respondent's institution……

9. Respondent's position in the institution……..

A. Existing Facilities for the Collection, Treatment and Disposal of Human Excrement in Wa Township

1. What roles does your institution play in the collection, management and disposal of human excrement in the Township? ……..……

……...

……...

2. Are your activities backed by law/legislative instrument? Yes [ ] No [ ]

3. If yes, which law and how often is this enforced in carrying out your obligations?

……...

……...

……...

4. Does your outfit have a database of the number of both private toilet and Public toilet facilities (KVIPs) in the Township? Yes [ ] No [ ]

5. If yes, how many public facilities, on the average, are in a particular vicinity/area/community? ……

6. On the average, how many houses have their private toilet facilities in the Wa Township? ……

7. If no, do you intend to have one, and how soon? ……..

……...

……...

……

8. Ranking from 1 – 5 (with 1 being lowest and 5 being highest), how will your organization rank the following facilities as commonly used in the Township?

W.C [ ] KVIPs [ ] Bucket latrine [ ]

Pit latrine [ ] Bush (free range) [ ]

Other (specify) …… [ ]

9. Is your organization by any means directly involved in emptying both public and private facilities when full? Yes [ ] No [ ] ***(if no, skip to question 10)***

If yes, how often do you do this? ……

……

……

10 Does your organization charge a fee when these facilities are emptied? Yes [ ] No [ ]

11. If yes, how much do you charge for public facilities? ……and paid by whom? ……...

12. How much do you charge for private facilities? ……...

13. What are the procedures one has to follow in order for the facility to be emptied?

……

……

……....

14. How long does it take for your organization to respond to request to emptying these facilities? .....

15 What account for such delays, if any? .....

.....

.....

16. Where are the collected waste (faeces) deposited? Landfills [ ] Agricultural use [ ] Dumping site(Explain where) [ ] ..... Other (specify).....

17. What suggestion will you give to be the best use these human wastes (faeces) can be put into? .....

.....

.....

.....

18. Does your organization run education programmes to the general public in the management of human waste (faeces)? Yes [ ] No [ ]

19. If yes, by which means and how often? .....

.....

.....

.....

20. If no, what accounts for this? .....

.....

.....

.....

APPENDIX B

UNIVERSITY FOR DEVELOPMENT STUDIES GRADUATE SCHOOL, WA CAMPUS

RESEARCH QUESTIONNAIRES ON THE MANAGEMENT OF HUMAN EXCREMENT IN THE WA MUNICIPALITY—FOR TENANTS AND LANDLORDS

Introduction

This questionnaire is meant solely to collect data in respect of the research work entitled "Managing Human Excrement in the Wa Municipality" in partial fulfilment of academic work leading to the award of a Masters of Philosophy Degree in Development Management. Respondents are assured of maximum confidentiality in the management of data collected from them.

PLEASE TICK WHERE APPROPRIATE

A. Socio-Demographic Characteristics of Respondents

1. Name of respondent: .....

2. Age .....

3. Sex: Male [ ] Female [ ]

4. Level of Formal Education

A. No Formal Education [ ] B. Primary Education [ ]

C. JSS/Middle School [ ] D. SSS [ ] E. Post Secondary [ ]

F. Vocational/Technical [ ] G. Tertiary [ ]

5. Marital Status: Single [ ] Married [ ] Divorced [ ]
Widow/Widower [ ] Separated [ ] Co-habiting [ ]

6. Residential Status: Native [ ] Migrant/Settler [ ]

7. Residential Designation: Landlord [ ] Tenant [ ]

B. Existing Facilities for the Collection, Treatment and Disposal of Human Excrement in Wa Township

1. How many households are in your house? ……..
2. Do you have a place of convenience (toilet facility) at home? Yes [ ] No [ ]
3. If yes, which of one of the under listed facilities do you have at home?
   W.C [ ] Bucket latrine [ ] Pit latrine [ ] Household KVIP Toilet [ ]
   Others (Specify)…….
5. How many of the chosen facility do you have in your house?
6. Are the numbers of this facility adequate for your house? Yes [ ] No [ ]
7. If no, how many of such facilities do you think will be adequate for your house?
   ……
8. Do you often use the facility in your house? Yes [ ] No [ ]
9. If no, why? ……
   And which other facility (means) do you use? …….
10. If you do not have a place of convenience in your house, which of the following facilities do you use? KVIP [ ] Bush (Free range) [ ] Polythene bags [ ]
    Backyard [ ] Perching (use other house's facility) [ ]
    Other (specify)……

C. Effectiveness of Existing Human Excrement Collection, Treatment And Disposal Systems

1. If you use the KVIP, how many do you have in your vicinity/area/community? …...
2. How far is it from your house (distance)? ……...

3. Do you have to pay for its usage? Yes [ ] No [ ]

4. If yes, how much do you pay? ……..

5. Do you normally queue to access the facility? Yes [ ] No [ ]

6. If yes, how many minutes do you spend in queuing to access the facility? 2 – 5 [ ] 6 -10 [ ] 11 – 15 [ ] 16 – 20 [ ] other (specify) ……..

7. How does this affect your frequency of usage? .....

……

……

……

8. In your own opinion, what do you think should be done to improve the KVIP facility in your community? ……..

……

……

……

……

D. Circumstances Surrounding the Continuous Habit of Indiscriminate Defecation in Wa Township

1. Do your children above 6+ years use the same facility as you have chosen in ***B3 or B10*** above?

Yes [ ] No [ ]

2. If no, which facility do they use? Polythene [ ] Backyard [ ] Chamber pot [ ]

On refuse dumps [ ] Other (specify) ……...

3. How do you dispose these waste from your babies? ……...

……...

……...

4. If you chose yes in ***B2*** above, how is the facility emptied or cleared when it is full?

……

……

.....

5. Do you have any idea how the cleared substance (waste) is disposed?

Yes [ ] No [ ]

6. If yes, how? .....

.....

.....

E. Alternative Ways for Effective Human Excrement Collection, Treatment and Disposal in Wa.

1. Do you have a special place designated for passing urine? Yes [ ] No [ ]

2. If no, where do you pass urine? Open space [ ] Bathroom [ ] Backyard [ ]

Other (specify) .....

3. In your own opinion, what would you consider a good place of convenience (toilet facility)? .....

.....

.....

3. Do you have any idea about other uses of human waste (faeces)? Yes [ ] No [ ]

4. If yes, mention any of such uses. .....

.....

.....

.....

.....

.....

5. How would you grade the Municipality in terms the number of toilet facilities, its usage, its management and in lieu of the neatness? Poor [ ] Average [ ] Good [ ] Better [ ] Best [ ] Other (specify).....

APPENDIX C

UNIVERSITY FOR DEVELOPMENT STUDIES GRADUATE SCHOOL, WA CAMPUS

RESEARCH INERVIEW GUIDE ON THE MANAGEMENT OF HUMAN EXCREMENT IN THE WA MUNICIPALITY—FOR INSTITUTIONS AND STAKEHOLDERS

Introduction

This interview guide is meant solely to collect data in respect of the research work entitled "Managing Human Excrement in the Wa Municipality" in partial fulfilment of academic work leading to the award of a Masters of Philosophy Degree in Development Management. Respondents are assured of maximum confidentiality in the management of data collected from them.

A. Socio-Demographic Characteristics of Respondents

1. Name of respondent: .....

2. Age .....

3. Sex: Male [ ] Female [ ]

4. Level of Formal Education

A. No Formal Education [ ] B. Primary Education [ ]
C. JSS/Middle School [ ] D. SSS [ ] E. Post Secondary [ ]
F. Vocational/Technical [ ] G. Tertiary [ ]

5. Marital Status: Single [ ] Married [ ] Divorced [ ]

Widow/Widower [ ] Separated [ ] Co-habiting [ ]

6. Residential Status: Native [ ] Migrant/Settler [ ]

7. Residential Designation: Landlord [ ] Tenant [ ]

8. Respondent's institution.....

9. Respondent's position in the institution.....

10. What problems does your organization encounter in discharging your duties in line with managing human excrement? .....

.....

.....

.....

11. How can these problems be solved? .....

.....

.....

12. Would say there is proper management of human excrement in the Wa Township?

13. What are your general suggestions and comments?

.....

.....

APPENDIX D

UNIVERSITY FOR DEVELOPMENT STUDIES
GRADUATE SCHOOL, WA CAMPUS

RESEARCH INERVIEW GUIDE ON THE MANAGEMENT OF HUMAN EXCREMENT IN THE WA MUNICIPALITY—FOR TENANTS AND LANDLORDS

Introduction

This interview guide is meant solely to collect data in respect of the research work entitled "Managing Human Excrement in the Wa Municipality" in partial fulfilment of academic work leading to the award of a Masters of Philosophy Degree in Development Management. Respondents are assured of maximum confidentiality in the management of data collected from them.

B. Socio-Demographic Characteristics of Respondents

1. Name of respondent: .....

2. Age .....

3. Sex: Male [ ] Female [ ]

4. Level of Formal Education

A. No Formal Education [ ] B. Primary Education [ ]

C. JSS/Middle School [ ] D. SSS [ ] E. Post Secondary [ ]

F. Vocational/Technical [ ] G. Tertiary [ ]

5. Marital Status: Single [ ] Married [ ] Divorced [ ]

Widow/Widower [ ] Separated [ ] Co-habiting [ ]

6. Residential Status: Native [ ] Migrant/Settler [ ]

7. Residential Designation: Landlord [ ] Tenant [ ]

C. Existing Facilities for the Collection, Treatment and Disposal of Human Excrement in Wa Township

1. How many households are in your house? .....
2. List the places of convenience (toilet facility) you have at home
3. Are these facilities adequate for use in your house?
4. Do you often use the facility in your house? Yes [ ] No [ ]
5. If no, why? .....

   And which other facility (means) do you use? .....

D. Effectiveness of Existing Human Excrement Collection, Treatment And Disposal Systems

1. How comfortable do find the use of the toilet facilities you have?
2. Do you think they are of standard?

   .....

   .....

   .....
3. In your own opinion, do you think the facilities need to be improved?

   .....

   .....

   .....

E. Circumstances Surrounding the Continuous Habit of Indiscriminate Defecation in Wa Township

1. Do some members of your house defecate in the open environment?

2. What do you think is/are the reason(s) for their behavour regarding the use of the open environment for deification?
3. What do you think can be done to stop open defecation?
4. Do you have any idea how the cleared substance (waste) is disposed?

F. Alternative Ways for Effective Human Excrement Collection, Treatment and Disposal in Wa.

1. In your own opinion, what would you consider a good place of convenience (toilet facility)? .....
.....
.....

2. Do you have any idea about other uses of human waste (faeces)?

3. How would you grade the Wa Township in terms of the number of toilet facilities, its usage, its management and in lieu of the neatness

APPENDIX E

UNIVERSITY FOR DEVELOPMENT STUDIES GRADUATE SCHOOL, WA CAMPUS

OBSERVATION GUIDE ON THE MANAGEMENT OF HUMAN EXCREMENT IN THE WA MUNICIPALITY

- Inspecting some existing facilities for the collection, treatment and disposal of human excrement in the township
- Observing to confirm or reject the practice of open defecation in the Township and whether there could be alternative means to the practice