IMPACT OF LIQUID WASTE ON ENVIRONMENTAL MANAGEMENT IN UBUNGO MUNICIPALITY: A CASE OF SINZAWARD

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT FOR THE REQUIREMENTS OF THE DEGREE OF MASTER OF ARTS IN GOVERNANCE AND LEADERSHIP OF THE OPEN UNIVERSITY OF TANZANIA

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CERTIFICATION

The undersigned certify that he has read and hereby recommend for acceptance by the Open University of Tanzania a dissertation entitled: Impact of liquid waste on environmental management in Ubungo Municipality: A case of Sinza Ward, in partial fulfilment of the requirement for the degree of Master of arts in governance and leadership of the Open University of Tanzania.

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Dr. Emmanuel Mallya

(Supervisor)

……

Date

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DECLARATION

I, Mathias M. Kijanga, do hereby declare that this dissertation is my own original work and that it has never been presented and will not be presented to any other University for similar or any other degree award.

……..

Signature

……

Date

DEDICATION

This work is dedicated to my wife Flavia Kijanga, my daughter Agnes and my sons (Agrey and Alfred). Also I dedicate this work to my parents (Martin Kijanga and Agnes Kijanga) and my brothers Silvester Kijanga, Emmanuel Kijanga and Joseph Kijanga, my sisters; Tekla Kijanga, Emiliana Kijanga, Lucy Kijanga and Rozina Kijanga.

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ABSTRACT

This study investigated the impact of liquid waste on environmental Management in Ubungo Municipality: A case of Sinza Ward. The sample size comprised a total number of 50 respondents in Sinza Ward chosen to represent the rest of wards in Ubungo Municipality. Data on liquid waste management were collected using observation, interview and questionnaire. Data were analyzed by using Statistical Package for Social Sciences (SPSS) Version 16.0. Findings revealed that high volume of liquid waste generated from premises in Sinza Ward is not properly processed and transported to the disposal site, about 60% of the respondents in Sinza Ward do not process and transport their liquid waste generated from their premises through safe methods, 28% of the respondents have either processed liquid waste or transported it to the disposal site and 12% of the remaining respondents have access to process and transport liquid waste from their residential areas. Likewise about 62% of the respondents in Sinza Ward are not aware with effects of liquid waste on their premises, 22% of the respondents are either aware about effects of liquid waste or not aware and 16% of the respondents are aware about effects liquid waste. Also, about 78% of the respondents do not have ability to manage their liquid waste, 16% of the respondents are either able to manage their liquid waste or not able and 6% of the respondents are able to manage their liquid waste generated from their homes. It can be concluded that, the overall liquid waste management is poor. It's then recommended from this study as follows, that for efficiency and effective liquid waste management there should be established sewer system, the involvement all stake holders, the liquid waste generated must be recycled, education to the residents and the formulation of long term program on liquid waste management in study area.

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LIST OF ABBREVIATIONS

CBO	Community Based Organization
CURT	Constitution of United Republic of Tanzania
DAWASA	Dar es Salaam Water and Sewerage Authority
DDT	Dichloro Diphenlyl Trichloroethane
DSSD	Dar es salaam Sewerage and Sanitation Department
EMS	Environmental Management System
ISWM	Integrated Solid Waste Management
NBS	National Bureau of Statistics
NEP	National Environmental Policy
NUWA	National Urban Water Authority
SIDECO	Sinza Development Community
SPSS	Statistical Package for Social Sciences
TMA	Tanzania Meteorological Agency
UNCED	United Nation Conference on Environment Development
UNDP	United Nation Development Program
UNEP	United Nations Environmental Program
URT	United Republic of Tanzania
WEHO	Ward Environmental Health Officer
WEO	Ward Executive Officer

CHAPTER ONE

STUDY OVERVIEW

1.1 Introduction

This study dealt with the impact of liquid waste on environmental management in Ubungo Municipality, a case of Sinza Ward – Dar es Salaam, Tanzania. The study has been conducted in Ubungo Municipal where Sinza ward has been chosen as representative sample. This chapter introduces the study by addressing background to the study, statement of problem, objectives of the study, research questions and significance of the study, scope of study, limitation of study and organization of study.

1.2 Background of the Study

Dar es Salaam is the country's largest industrial and commercial center with an estimated population of more than 5 million according to National Bureau of Statistics (2017) and a population growth rate of 7 percent. The total land area is about 1,500 km^2 with a population density of around 2,700 persons per km^2. More than seventy percent of the population lives in unplanned and under-serviced areas of the city (Breeze, 2012). The rapid population growth in Dar es Salaam multiplies challenges on environmental management resulted from domestic or commercial houses like hotels, hospitals, small industries, lodges, and guests as well.

The Sinza Development Community has played a big role in ensuring proper handling of wastes but never reached a vital goal for making Sinza Ward free from wastes especially liquid waste which affect the environment of Sinza Ward (SIDECO). Nevertheless inadequate waste management is considered as one of the

problems posing potential risk to public health and the environment in Tanzania particularly in urban areas with proportionately significant population residing in squatter areas (URT-State of the Environment Report, 2006). The waste management problem is more pronounced in squatter settlements, where 70 percent to 80 percent of the urban population resides (Ibid). Consequently, over 70 percent of the diseases attended in health facilities are water and sanitation related diseases (Ibid). The current disposal practices are unhygienic and posing serious threat to risk occupational safety, environment and public health (Membe, 2015).

The government of United Republic of Tanzania through the prime minister's office, regional administration and local government, intends to improve roads networks in the Dar es Salaam city covering all the five Municipalities of Kinondoni, Ilala and Temeke, Ubungo, and Kigamboni (ESIA, 2014). At Kinondoni Municipal there are 13 roads covering a total distance of 24.65 km which were upgraded from gravel or by improving the existing tarmac roads in which currently there are additional districts such as Kigamboni and Ubungo (ESIA, 2014). The improvement aims to provide safe and efficient access to social and economic activities by removing transport flow constraints, supporting the present and projected economic and social development in Dar es Salaam (Ibid).

The Ubungo Municipal Council is among the five municipalities of the Dar es Salaam city, consisting of 14 wards in which Sinza is among, and 91 sub-wards (Ubungo Municipal profile, 2016). The municipality has a total population of 845,368 and 257,837 households with an average of 4 persons per household (NBS, 2012). The municipality has a seasonal river called Ng'ommbe found at Sinza D

Street, only Sinza Ward is concerned in the study due to contamination from incessant discharge of liquid waste. Air and noise pollution are among the modern issues in the city of Dar es Salaam, especially Sinza area in which the study was conducted.

The public sewerage system in Dar es Salaam was constructed between 1948 and 1950; the Mikocheni sewer system is the only one that was constructed after the independence. This was constructed in 1976 (ESIA, 2014). The Mikocheni public sewer is also dilapidated due to poor construction. Generally the public sewer in Dar es Salaam is more than 48 years old (Ibid). These sewers provide services to only seven percent of the Dar es Salaam residents. The rest of the residents 93 percent use onsite disposal services such as septic tank system and pit latrines (UNE, 1996). This situation imposes necessities for increasing the capacity of cesspit emptying services, which is being provided by both Municipal Council and private sector (ESIA, 2014).

About 67.7 percent of the respondents reported to discharge liquid waste by local sewer system which is not safe at all, it should be noted that liquid waste is poorly disposed of as result causes environmental pollution (SIDECO). Sinza Ward is one of the administrative areas of Dar es Salaam region which has the deterioration of urban environment, it becomes one of the major problems that facing Sinza community today because most of the households are directly discharging liquid waste into the environment through drainage line, from overflowing, seeping pit, latrines, septic tanks, public toilets, open ground excreta defection and gray water from kitchens and bathrooms that connect to rivers and open spaces without any treatment (ESIA,2014).

Lack of adequate drainage in Dar es Salaam means that after short periods of rain water pools and storm water floods limits sewerage network around the city (Mwalimu, 2012 in Thomas et al, 2013).The environmental liquid waste discharge also comes from other industries in Dar es Salaam including; food processing, tanneries, fertilizer and petroleum refining (Thomas at el, 2013). The industrial liquid waste discharge requires a permit from the Wami-Ruvu Basin Water Office, however at present in Dar es Salaam no permits have been issued (Barozi, 2011 in Thomas at el, 2013). The contamination of environmental water with industrial liquid waste causes environmental health problem that needs attention as other problems that threats well-being of human life.

The discharge of untreated households' liquid waste with odor on environment such as air, rivers, streams and open spaces are adversely to the environment management on the human healthy that cause diseases such as cholera, typhoid and diarrhea (Barozi, 2011 in Thomas at el, 2013). The liquid waste management is a fundamental issue for maintaining public health and protecting the quality of environment (Ibid). Usually people generated liquid waste materials which are either by-product of his activities or products which have reached the end of useful lives (Abebaw, 2014).

The lives of Tanzanians are intimately connected to the environment, our survival and that of our future generations depends on the harmonious relationship with the natural elements, the Tanzanians have no choice but to strive to manage the environment and its natural resource in ways that enhance the potential for growth and opportunity for sustainable development of present and future generations (NEP,

1997). The situation has been of great concern to the citizens in Sinza Ward through budgetary allocations and politics which have failed to tackle the situation (Kironde, 1995). The governance of waste management in Dar es Salaam has not always taken seriously.

The conventional approach on transportation and disposal of municipal liquid waste in Ubungo Municipality failed to plan and manage the increased demands for municipal liquid waste services posed by rapid urbanization (Kalwani, 2009). The rapid urbanization and population increase that have been taking place during the 20th century transformed the world into communities of cities and towns facing similar challenges on environmental management issues in which most of them have to be addressed so as to minimize its risk to human life and ensure quality environment (Smith, 2010).

The Dar es Salaam region has no formal capacity for the disposal of hazardous liquid waste produced by hospitals, industries, and households (ISWM, 2016). There is no specific sewerage system that keeping track of these materials and most of these materials are therefore expected to be disposed of in improper ways and this threats human life (Mnyanyi, 2014). Some studies on environmental management have been conducted out in Dar es Salaam but have not investigated on the impact of liquid waste on environmental management in Ubungo Municipality (Majani, 2002), and Kironde (1998). The focus on environmental planning and management in Dar es Salaam as learning experience has not played vital role in dealing with liquid waste in which currently has great impact on environment management in Sinza Ward (Majani, 2002).

The poor liquid waste management practice has led to the health degradation, particularly among low income residents living in unplanned settlements across Dar es Salaam (Palfreman, 2014). The ministry of health reported that 60 percent to 80 percent of hospital admissions in Palestina hospital in Sinza Ward were due to sanitation related diseases resulted from poor disposal facility (Palfreman, 2014). The Specific diseases that have been related to improper liquid waste management practice include; Cholera, Malaria, Typhoid, Diarrhea and other related diseases (Palfreman, 2014) and the spread of liquid waste on the surface turns into chemical and cause environmental pollution (Millinga, 2016).

Much more efforts have been observed in the approaches adopted on liquid waste management in Sinza Ward but the efforts have proved futile (Mbuguma, 2005). However, liquid waste poses a threat in Sinza Ward which is due to inadequate infrastructures of liquid waste disposal (Mbuguma, 2005). Most housing plots at Sinza Ward are highly density category, and the area has no adequate and defined safe disposing of liquid waste other than frequent emptying which leads to contamination on the roads and around homesteads (Mbuguma, 2005). Thus impact of liquid waste on environment is posing high health risk at Sinza Ward.

The impact of liquid waste on environmental management in Ubungo Municipality needs periodic investigation in order to accommodate the volume of liquid waste produced due to rapid urbanization and population increase (Mnyanyi, 2014). (Mnyanyi, 2014). The relevant authorities should wake up and implement this responsibility that falls in their domains (Mnyanyi, 2014). They should ensure that there is improved hygiene in their residents; likewise as the government pushes for

increased investment of industries, it is equally important to educate the masses on the importance of hygiene and sanitation (Mbuguma, 2005). However, prevention is better than cure and more needs to be done to educate the people on environmental care in Sinza Ward.

1.3 Statement of the Problem

Urban environments in many developing countries are increasingly degraded due to rapid population growth and urbanization coupled with unprecedented economic and industrial development activities (ISWM, 2016). Dar es Salaam city in Tanzania is one of the cities with population currently estimated at over 5 million with growth rate of more than 7 percent (NBS, 2017). Ubungo Municipal as a part of Dar es Salaam city has commitment to the environmental conditions as far as Sinza Ward capacity on sanitation facility is concerned, currently Sinza Ward environment needs more attention despite of remarkable efforts expected in the past (Millinga, 2016).

However the Ward has no capacity in dealing with impact of liquid waste on environment and the situation is worse to date (Millinga, 2016). The Ward has no adequate and defined safe disposing of liquid waste (Mnyanyi, 2014)). Inspite of the fact that the Ward being in town there is no any study which has investigated about capacity `of Sinza Ward in removing liquid waste on environment. Due to lack of the study of liquid wastes at Sinza Ward results to lack of awareness about hazardous liquid waste on environment in which this study has an opportunity to fill this gap. The research focused on exploring the impact of liquid waste on environmental management in Ubungo Municipality, Sinza Ward being a representative sample of the study.

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of this study is to explore the impact of liquid waste on environmental management in Ubungo municipality.

1.4.2 Specific Objectives

i. To determine the capacity of Sinza Ward on liquid waste management.
ii. To investigate the process used by Sinza Ward on liquid waste management.
iii. To explore the level of awareness of the society on liquid waste management.

1.5 Research Questions

This study has three specific research questions as follows;

i. Explain the capacity of Sinza Ward in managing liquid waste?
ii. What are the processes used by Sinza Ward on liquid waste management?
iii. How far does the society understand about liquid waste management?

1.6 Significance of the Study

There is an increased generation of liquid waste in Ubungo municipality due to an increased population. This liquid waste quickly releases pungent odors. The discharge of liquid waste attracts flies and other pests for example vectors which spread diseases such as typhoid, cholera, diarrhea, eye problem and skin diseases etc. Improper disposal of liquid waste increases contaminated water bodies and results in an increase in mosquito population which causes malaria. These mosquitoes affect

health of the people by shorten life span and its more worse to the children hence it raises infant mortality rate. The environment has been affected due to bad management of household's liquid waste in Sinza Ward. The contaminants with the household's wastewater pollute water bodies. This study seeks to find better ways to control liquid waste on environmental management in Ubungo municipality through improved sewages and household's liquid waste treatment, proper transportation of household's liquid waste to the proper destination. The result of this study will add valuable information to be availed to the general public about liquid waste treatment and transportation. Since better household's liquid waste management improves the health of all citizens and ensure sustainability of the environment in place which results to the beauty of an environment and attract investors in various aspects of life for example economic aspect.

1.7 Scope of the Study

The study covers impact of liquid waste on environmental management in Ubungo municipality in Dar es Salaam city. The researcher dealt with the impacts brought by liquid waste in an area of study.

1.8 Limitation of the Study

The research was conducted at Sinza Ward- Ubungo municipality in Dar- es- Salaam due to the time limitation, scarcity of monetary fund and the researcher is a resident of Dar es Salaam. The researcher in this study was restricted with these limitations during conducting research. Therefore, due to the time limitation and scarcity of monetary fund a researcher used his efforts to work hard using his resources to ensure correctness and accuracy of the findings from the field.

1.9 Organization of the Study

The study has five chapters, chapter one has carried an introduction part concerning the impact of liquid waste on environmental management, background of the study, statement of the problem, objectives of the study, research questions, the significance of the study, scope of the study, limitation of the study and lastly organization of the study. Also chapter two is all about the review of the work of literature which has been done by other researchers. It generally contains information about liquid waste, policy which is related to liquid waste on environmental management and principle of land. This chapter included the definition of key terms and knowledge gap.

Likewise chapter three discusses methodologies that the researcher employed in collecting data during the study, research design used and sample techniques and chapter four of this study discussed and presented data from investigation of the impact of liquid waste on environmental management in Ubungo municipality, a case of Sinza Ward. Lastly, Chapter five is the final chapter where by a researcher concluded and make some recommendations about the study concerning impact of liquid waste on environmental management in Ubungo municipality: A case of Sinza Ward.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter critically analyzes the published work by summarizing, classifying and doing comparison prior to research studies; it involves review of principle, policy and related studies. According to Saunders et al (2009) literature review is the evaluation of the report from the studies found in literature that are related to your study topic. The literature review enabled the researcher to draw some conclusion and a guide for the study on the impact of liquid waste on environmental management in Ubungo Municipality, a case of Sinza Ward.

2.2 Definitions of the Key Terms

In conceptual definition, the meaning of key words that appear frequently in the study has been provided. The most repeated terms in this research are; environment, liquid waste, environmental management, construction of drains and sewer, liquid waste transportation and some associated authority and policy like liquid waste Authority in Dar es Salaam and National Environmental Policy respectively. These definitions are useful in this work because explains in details the concept of the terminologies used in this work hence helps the reader in understanding this report.

2.2.1 Liquid Waste

This is the end water form material produced from household level or industrial level or heath center and disposed of, sometimes are called unwanted water for use for the domestic purposes, likewise waste is termed as an useless material product or substances produced while making something else (Oxford Dictionary, 2000). This

definition is useful in my work hence it is dependent part of my research topic, it can be easier for the reader to capture the idea contextually.

2.2.2 Environment

The word environment has a very wide meaning. It refers to atmosphere, lithosphere and hydrosphere, plants and animal life including human life, the social, economic, recreational, cultural and aesthetic conditions and factors that influence the lives of human beings and their communities, buildings, structures, machine or other devices made by man, any solids, liquids, gases, odor, heat, sound, vibrations or radiation resulting directly or indirectly from the activities of man and any part or combination of the foregoing and the inter-relationships between two or more of them (NEP, 1997). This terminology is useful because it provides a general picture to the reader of this research report before he or she grasp the targeted objectives.

2.2.3 Environmental Management

Environmental management is a subject that combines science, policy and socio-economic activities. It primarily stresses on finding solution to practical problems that people face in cohabitation with nature, resource exploitation and waste production (UNDP, 2011). In a purely anthropocentric sense, environment management is all about dealing with the fundamental issues of how to innovate technology to evolve continuously while limiting the degree to which this process alters natural environment. Thus, environmental management is closely related to or linked with issues regarding sustainable economic growth, ensuring fair and equitable distribution of resources and conserving natural resources for future generations.

Although environment management is also a response to human actions considering the increasing seriousness and significance of today's disastrous to human impact on natural ecosystems (Ibid). It is comforting to know that with a smaller global population base and a less pervasive use of technology, the environment might be able to recuperate on its own from human misuse and abuse, but it is now widely recognized fact that in many cases positive intervention is necessary if the environment is to recover in view of the fact that people have bestowed more importance on economic growth than preservation of the natural ecosystem (UNDP, 2011).

Likewise environmental management is used to describe the organizational structure, responsibilities, practices, process and resources for implementing and maintaining natural resources and man-made heritage (EMS, 1997). In order to sustain the development and the existence of mankind the government shall ensure that Agenda 21 of UNCED is fully implemented (UNCED, 1992). The government with collaboration with other actors shall take a strong role and shall institute appropriate mechanism for the conservation and protection of environment.

Water development shall be geared towards improving the environment and shall be expected to adversely affect the quality of water resources in particular and environment in general and mechanism for monitoring and collating of domestic liquid waste discharges shall be observed (DAWASA Report, 2000). Regulatory framework shall be established and pollution control laws shall be enacted and enforced. Mechanism shall also be explored to introduce financial and tax incentives

to industries for establishment of pollution control facilities. The government shall also explore mechanism of imposing penalty to environmental polluters (DAWASA Report, 2000).

The major environmental impact derived from provision of adequate potable water within reasonable distance and provision of sanitation services are decrease of water and sewerage related diseases, poverty eradication. More time for economic, recreational activities and improvement of health and general welfare of the society. Communities shall be made aware of the importance of personal and household hygiene. This includes use of pit latrines and washing of hands after defections and proper handling and storage of water for domestic use. Pit latrines in urban areas shall be constructed at minimum safe distance from water sources. Likewise minimum depth of water wells in urban areas shall be 30 meters (DAWASA Report, 2000).

The government shall ensure that environment sanitation is given emphasis. In the poor and peri-urban areas individuals shall be required to construct pit latrines and septic tanks within their premises in accordance with urban laws or by-laws. Facilities for wastewater removal, disposal and treatment shall be established by respective local government, sewerage systems are expensive to establish, they shall be implemented in phases, septic tanks with soak-away pits shall be used in developing medium and low density and ventilated improved pit latrines shall be used in developing areas and unplanned settlements (DAWASA Report, 2000). This definition is important in this work because it’s used as independent in this work.

2.2.4 Construction of Drains and Sewer

It's a pathway of liquid waste from the sources to the disposal area (Mbuguma, 2005). This is all about cleanliness which is a chief aim of sanitation, not in the personal wider of keeping the body, food and clothing clean, but also in the wider sense of cleanliness of surroundings. Man, in the course of his life is constantly polluting his environment by discarding waste materials which if not rapidly removed, will certainly set up conditions inimical to his life (www.Sewerhistory.org/ 1948).

The sewage is taken from the house in pipe called drains, which joins other pipes called sewers, which latter carry the sewage from two or more houses. Drains and sewers must be so constructed as to effect an immediate and perfect sewage removal. They should be water-tight; smooth in the interior and small enough to be self-cleansing (Mbuguma, 2005). The existing drainage system fails to serve the needs of the poor and is a major contributor to flooding episodes in the city's unplanned settlements, diseases, environmental degradation, degradation of roads and pavements (TMA Final Report, 2011). Therefore, the meaning provided helps the reader of this research report to understand the content and form of this work.

2.2.5 Liquid Waste Transportation

This is the process of removing liquid waste materials from the environment or home carried out by a drainage system (Sammalisto, 2007).Sewage is a name given to liquid waste, the great bulk of which is water polluted by grease, soap, fouls matters, from the surface of the body and from clothes and general house washing, waste materials from the body itself, urine and excreta, some rainwater which has fallen on

houses, gardens and roads and in many cases trade effluents from manufacturing processes (Sammalisto, 2007). This definition is useful in this work because it is easier for the reader to understand the meaning of terminologies used in this work and hence capture the general idea of this research report

2.3 Global Context for Liquid Waste

Liquid waste is defined as end materials that are produced by human being or that are produced from human and industrial activities. The improvement of environmental sanitation and hygiene behavior involves changes, despite all progress reported worldwide in recent decades, more than 1. 3 billion people still live without access to sanitation facilities and are unable to practice such basic hygiene as washing their hands with soap and water (Mbuguma, 2005). There are many diseases related to poor sanitation which usually cause many people to fall ill or even die. Children are the most vulnerable to health hazards and consequently are most the affected. Likewise, poor sanitation has led to infestation of nearly a billion people worldwide and thousands in Tanzania, largely children, with a variety of worm infections (UNDP, 2011).

While the impact of poor sanitation and hygiene is known to be disastrous for community, it also has an important impact on health especially on children both at school and out of school. It is thus obvious that lack of sanitation and hygiene is a public disaster that deserves urgent interventions (Mbuguma, 2005). Adequate sanitation coupled with good quality, easily available, and safe water, makes a tremendous difference to our quality of life. As we step into 21st century it is realized that the trend towards urbanization is posing ever-increasing problems with respect

to sanitation (Mbuguma, 2005). The rate of growth of population, especially in the urban areas, is far exceeding that of the rural areas in most countries.

A vast majority of this urban population lives in slums areas of towns and cities, and sprawling peri-urban fringe areas (UNDP, 2011). The level of services of sanitation is extremely poor in these areas. Statistics indicate that worldwide nearly two billion people lack safe sanitation, it is also reported that more than three million people die every year from water and sanitation related diseases. While the direct effects of inadequate sanitation are diseases, the indirect effect amounts to lost earnings and lost educational opportunity for young people. Greater attention, better planning, better operation, maintenance, and management, for sanitation are desperately needed to improve the livability of these Settlements (Mbuguma, 2005).

2.4 Classification of Liquid Waste

Liquid waste generated from home or community is of various categories depending on the nature of human activities but in most cases the liquid waste generated from homes is also called domestic waste water which usually comes from toilets, baths, laundry, lavatory, and kitchen-sink waste (Alemayehu, 2004). Generally these may be classified into four categories as explained here below.

2.4.1 Sanitary Sewage

Sanitary sewage is the liquid waste which is produced from homes that containing human wastes and wash water. This is mostly generated from homes, public buildings or commercial and industrial site. Sometimes is referred as domestic waste water meant waste from kitchen, barn, bathroom, laundry, and others that do not

contain human sewage (Alemayehu, 2004).

2.4.2 Industrial Sewage

Industrial liquid waste, this is category of liquid waste generated from the industrial activities during manufacturing of different products depending on the nature of production and nature of industry. This liquid waste from industry is always contained various chemical compound which are mostly harmful to human being (Alemayehu, 2004).

2.4.3 Storm Sewage

Storm sewage is a surface run off caused by rainfall, it carries organics, suspended and dissolved solids, and other substances picked up as it travels over the ground (Alemayehu, 2004). This is usually depends on rainfall season and the liquid waste generated during rainfall can be harmful if the surroundings are not clean but when the surroundings are clean it's usually contains normal waste that cannot be a problem to the peoples' environment.

2.4.4 Mixed Sewage

This is the result of all classifications of liquid waste when get combined or mixed up over the surface and it becomes most dangerous compared to other classifications of liquid waste. This is according to Alemayehu (2004).

2.5 Sources of Liquid Waste

There are three sources of liquid waste generated in environment which usually affect the environment in reverse when not well removed from the surroundings

(Randell et al, 2012). These sources are the result of the human socio- economic activities that without them the life could not be better hence the state with more industries should always become a better state with stable economic. The following are the sources of liquid waste in an environment.

2.5.1 Industrial Activities

The industrial liquid waste is generated by processing or manufacturing different products, such as car repair shops, food processing industries (Randell et al, 2012). The type of industry always determines the composition of the liquid waste it produces. The liquid waste from facilities that make food products will not be most harmful to human, but those from other industries may contain a variety of chemical compounds, some of which may be hazardous and therefore potentially harmful. The industrial liquid waste which contains hazardous substances must be treated before is discharged to the environment, thereafter the substance removed.

2.5.2 Commercial Activities

The liquid waste from commercial areas comprising business establishments, shops, open markets, restaurants and cafes mostly resemble those from households (Randell et al, 2012). This is because only human related activities are undertaken in such areas, as opposed to other activities such as industrial production. This liquid waste is generate from other commercial areas rather than industrial areas and it can be different in volume and content of various material combined due to various businesses conducted in commercial areas in a place.

2.5.3 Home Activities

The liquid waste from the residential area was often referred to as domestic liquid waste. This liquid waste comes from our day to day living and involves those from food preparation, washing, bathing, and toilet usage (Randell et al, 2012). As you read in this study different terms are used to describe liquid waste from various domestic sources. In residential areas there are also black water and grey water which are generated or produced from domestic dwellings and also from business premises and the various institutions, such as schools and health center found in residential areas.

2.5.4 Liquid Waste Classification Tree

The figure below shows the liquid waste classification tree from the general class to the specific class in most areas in Tanzania. The classification tree show a reasonably consistent set of policy frameworks and definitions for liquid waste (Randell et al, 2012).

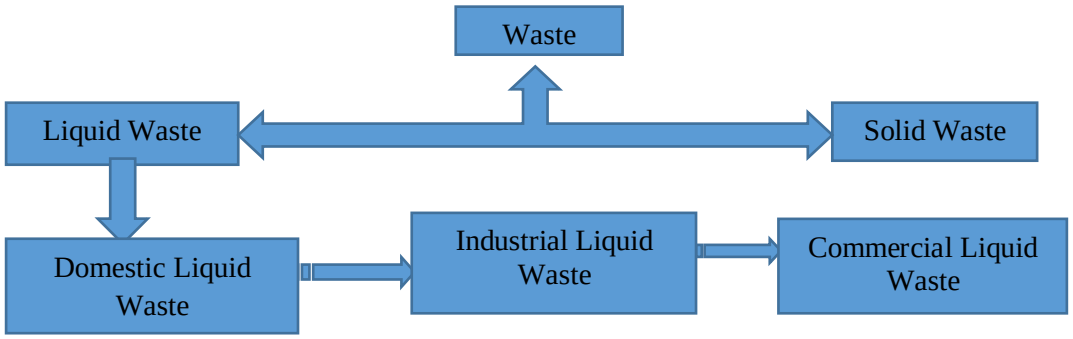

Figure 2.1 Liquid Waste Classification Tree

Source: Randell, et al, 2012

2.6 Principle of Quic Quid Plantatur Solo Solo Cedit

This principle was developed in land law and it deals with land matters. The principle states that whatever is attached to the land becomes part of it and he who owns the land owns everything extending to the heavens and to the depth of the earth (Black Law Dictionary). The common law concept of land is that land is made up of; surface of the soil, everything naturally growing or attached to the surface of the soil, everything inside the subsoil, the air space above the soil and things artificially attached to the soil and includes land of any tenure, building or parts of buildings whether the division is horizontal, vertical or made in any other corporeal (Ibid). This principle supports my study as it deals with land matters which are used by people to build their houses for living and my study is dealing with the impact of liquid waste on environmental management at Ubungo Municipality, a case of Sinza Ward. Hence the liquid waste is generated from the households and if it's not well handled it affects the environment.

2.7 National Environmental Policy (Tanzania)

This policy goes hand in hand with the following Tanzania policies; The National Health Policy (1990). The Sustainable Industrial Development Policy (1996), in which both of them deals with environmental issues (Maziku, 2014). The National Environmental Policy is main policy concerned securing environment from being deteriorating by the act of human being in order to ensure the life of future generation, its objectives are; to ensure sustainability and equitable use of resources for meeting the basic needs of the present and future generations without degrading the environment or risking health or safety (Maziku, 2014).

Moreover, it prevents and controls degradation of land, water, vegetation and air which constitute our life support systems, to conserve and enhance our natural and man- made heritage, including the biological diversity of unique ecosystems of Tanzania, to improve the condition and productivity of degraded areas including rural and urban settlements in order that Tanzanians may live in safe, healthful, productive and aesthetically pleasing surroundings, to raise public awareness and understanding of essential linkages between environment and development (NEP,1997).

The policy also used to promote individual and community participation in environmental action and to promote international cooperation on the environment agenda and expand our participation and contribution to relevant bilateral, sub-regional, regional and global organizations and programs including implementation of Treaties (NEP, 1997). Likewise the policy addressed that the pollution of environment in towns and the countryside is affecting the health of many people and has lowered the productivity of the environment (NEP, 1997). This is where the researcher decided to make analysis of impact of liquid waste on environmental management in Ubungo municipality.

Generally, this policy is very exhaustive on issues concerning environment in Tanzania but the only problem is implementation of the said policy and the government is not much committed to the environmental conservation compared to other areas in which the government invests much like security issues, elections matters and education (ISWM, 2016). The liquid waste problems in an environment at municipality is left to the municipal responsible to deal with it using its resources,

so if the resources are scarce therefore nothing can be done to fight the problem.

2.8 Regional Efforts on Liquid Waste Management

The region has played a big role on fighting against impact of liquid waste on environment (DAWASA Report, 2000). The fight involved the establishment of the Authority which specifically deals with liquid waste which is generated from different sources in different human activities. The region has created an authority as explained here below;

2.8.1 The Liquid Waste Management Authority

The liquid waste Authority as a governmental water utility has shown its efforts for several times in ensuring proper handling of the liquid waste but due to rapid population increase in Dar es Salaam city and lack of enough budget the problem left unresolved (DAWASA Report, 2000). The Authority lacks enough resources to tackle the problem while the Authority is kept on changing its name hence DAWASA was created by merging the parastatal National Urban Water Authority (NUWA) and the former Dar es Salaam Sewerage and Sanitation Department (DSSD). The newly established Authority has taken over DSSD responsibilities autonomous and has board which makes easier decision making on matters pertaining to daily operations of the Authority while the liquid waste problem is still cumbersome (DAWASA Report, 2000).

Dar es Salaam Water and Sewerage Authority, established under section 4 (1) of the DAWASA Act, cap 273 of 2001 is empowered to deal with various matters concerning water sanitation matters among of its function is to construct and

maintain sewerage disposal works on any public land lawfully appropriated for that purpose and to construct and maintain a public sewer under any street (DAWASA Report, 2000).

It is not a surprise that environmental degradation caused by liquid waste in Sinza Ward is mostly worse while the volume continues to rise with the number of people (Emig, 2010). In colonial times dangerous liquids like DDT were used to sterilize closed dumps, but the negative impact on the environment was still lower than today as dumps were smaller (Emig, 2010). The inauguration of plastics caused a substantial change in terms of the amount of wastes especially liquid waste (Emig, 2010). Nowadays water and food is always sold packed in plastics which mostly ends up on public ground.

2.8.2 Roles of Liquid Waste Management Authority

The liquid waste Authority has got different roles as provided to the Act initiating the institution under section 6 as here under listed; Securing the continued supply of water for all lawful purposes, to develop and maintain waterworks connected with the supply of water, to promote the conservation and proper use of water resources, to advise the government in the formulation of policies relating to the development and conservation of water and potable water standards, to plan and execute new projects for the supply of water, to educate and provide information to people on public health aspects of water supply, water conservation and similar issues, to cooperate with other authorities on matters relating to water disposal, preparation and execution of plans relating to the expansion of water supply, to collect fees and levies (including any regulatory levy) for water and sewerage services supplied to

consumers (DAWASA-Act,2001).

Likewise the Authority has a duty to provide amenities or facilities which it considers necessary or desirable for persons making use of the services or the facilities provided by Authority, to do anything or enter into any transaction which in the opinion of the board is calculated to facilitate the proper exercise of its functions, to construct and maintain sewerage disposal works on any public land or land acquired or lawfully appropriated for that purpose and to construct and maintain a public sewer under or over any street (DAWASA Act, 2001).

2.9 The Situation of Liquid Waste in Ubungo Municipality

The big population in Ubungo municipality lives in unplanned settlements and the residents who live in an informal settlement are estimated to live under US$ 1 per day (ISWM, 2016). This is an important starting point for discussing the municipal's vulnerability to liquid waste and the strategies for adapting proper methods in dealing with the issue (ISWM, 2016). There are large numbers of people living in poor quality housing that is exposed to a variety of wastes; these people are socially, economically and environmentally vulnerable.

The Ubungo municipal also has severe shortfalls in its sanitation systems, it's approximately suggested that about 93 percent of municipal residents rely on pit latrines of various types, only 5 percent have access to sewerage system (Mbuguma, 2005) and the remaining 2 percent have no formal sewerage disposal facilities. Adaptive responses need to take these issues into account if they are to respond to

the threats posed by liquid waste to the municipality. The spread of diseases like cholera as we have seen in the past, instances of excessive improper discharge of liquid waste to the municipal surroundings, even though the volume of liquid waste varies from rainfall season to winter season (Mbuguma, 2005).

Apart from other problems in Ubungo municipality, the liquid waste processes is still a big issue hence the municipality has withdrawn from dealing with liquid waste and has allowed the private sector to take off. The private sector is usually profit oriented in every program it takes, this becomes a big deal to them but the poorest people in Ubungo municipality tend to remain puzzled when they see every corner of the municipality is wet throughout the year due to poor liquid waste discharge to the environment (millinga, 2006).

2.10 Position of Liquid Waste in Sinza Ward

The Ward is a residential settlement in Ubungo municipality- Dar es Salam city that has developed out of a master plan prepared by the ministry of lands, housing and human settlements development. Sinza ward is among the wards in Ubungo municipality with about five streets. The settlement is surveyed area under the World Bank project of 1975. The ward covers an area of about 52.5 ha (Mbuguma, 2005).

It’s basically characterized by semi-planned residential area, mainly inhabited by middle income people. The area is predominately poor roads, poor sewerage system and high ground water table prevail in Sinza ward (Mbuguma, 2005).

Much more efforts have been made in the approaches to the liquid waste management in Sinza Ward while did not tackle the situation (Mbuguma, 2005). The

impacts of liquid waste pose a threat in Sinza Ward area due to inadequate infrastructures of liquid waste disposal. Hence most housing plots at Sinza Ward are high density category with 5 streets and a population density of 60,000 (NBS, 2017). The Sinza Ward has no adequate and defined safe disposing of liquid waste (Mnyanyi, 2014)).

Most housing plots at Sinza ward are of high- density category and the area has no adequate and defined safe disposing of liquid waste generated from the premises. These situation cause contamination due to poor liquid waste discharge to the surroundings (Mbuguma, 2005). Thus poor sanitation, due to lack of sewerage system is posing high health risk at Sinza ward residents. Disposal of human waste is a major environmental concern everywhere in Sinza ward and of course the Sinza ward residents do discharge their liquid waste to the streams, rivers and the open space (Mbuguma, 2005).

2.11 Knowledge Gap/Research Gap

According to the literature that have been reviewed, it has been shown that many things concerning environmental management generally has already discussed by previous researchers for instance Mnyanyi (2014), Millinga (2016), Maziku (2014) and Membe (2015) but they did not specify about investigation of the impact of liquid waste on environmental management in Ubungo Municipality, a case of Sinza Ward. This study brought an opportunity to cover the gap left by the previous researchers.

2.12 Conceptual Framework

In this study there are three types of variables which are independent, dependent and intervening or control variables. These variables tend to depend on each other in construing a good flow of the statement intended to communicate hence there are variables which always affect the other.

2.12.1 Independent Variables

These are variables which a researcher can control over, they can be referred as what a research can choose and manipulate. It is normally what researcher thinks will affect the dependent variables. In some cases a researcher may not be able to manipulate the independent variables. It may be something that is already there and is fixed, something a researcher would like to evaluate with respect to its impacts to the dependent variable (Patton, 1990). In this research some independent variables were developed by researcher and others were from other scholarly work in order to address the topic. In this study independent variables are; environment management, sustainability, cleanliness and development because these were affected by liquid waste.

2.12.2 Dependent Variable

This is what a researcher measures in the study, it also what is affected during the study. The dependent variable tends to respond to independent variable (Patton, 1990). In this study the researcher tends to relate impact of liquid waste on environmental management in Ubungo municipality. The researcher dealt with impact of liquid waste on environmental management, therefore dependent variables

are; liquid waste, sewerage and education which tend to affect environment.

2.12.3 Intervening Variable

An intervening variable is a hypothetical internal state that is used to give explanation on the relationship between observed variables such as independent and dependent variables in empirical research (Patton, 1990). Therefore, it facilitates a better understanding of a relationship between independent variables and dependent variables when the variables appear not to have a definite connection. In this study laws and regulations, economic stability and political stability were considered as intervening variables because it has been shown in other studies to have influence in different aspects of human life where in this work the aspect referred is management of liquid waste on environment. However the researcher also took the policy on environment as an intervening variable and the policy referred is national environment policy.

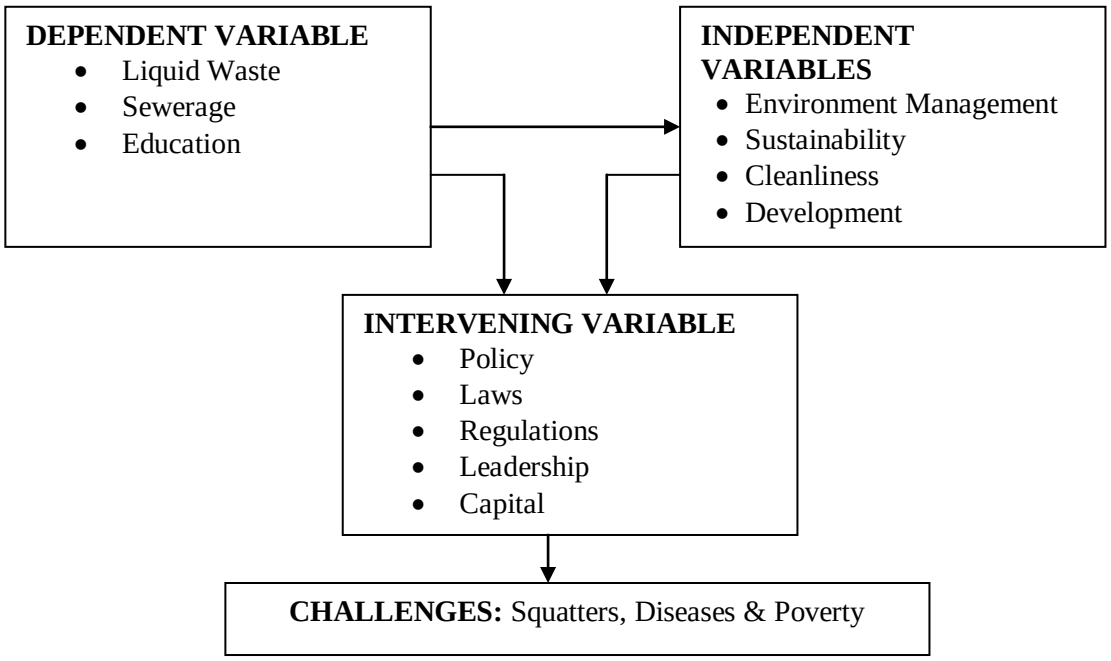

Figure 2.2 Conceptual Framework
Source: Researcher, 2018

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents ways of data collection and processes that have been employed by the researcher in collecting data from the field. The section includes research design, study population and study area, methods of data collection and methods of data analysis.

3.2 Research Design

According to Naoum (2006) research design is the way research objectives can be investigated and there are two types of research strategies which are categorized into qualitative research and quantitative research. Qualitative research tends to seek to gain information and to understand people's perception of the world, whether as individuals or groups (Fellows at el, 2003). Likewise quantitative research is the type of research strategy that seeks to gather factual data and to study relationships between facts and how such facts are relating to the theories and the findings of any researches which have been executed previously (Strauss et al, 1998).

The nature of this study is to deal with the impact of liquid waste on environmental management; the suitable research strategy in conducting this research has been the combination of both qualitative and quantitative strategies. Research design according to Kothari (2008) is used to restructure the research by showing how the major parts of the research projects such as sample or group work together in addressing research questions. This study used a case study research design which is the investigation of the one or more specific instances of something that comprise

the cases in the study. A case can be something relatively concrete such as an organization, a group or an individual, or something more abstract such as an event, a management decision or a change programe (Gomm et al, 2000). A case study research design can also facilitate a holistic perspective on causality because it treats the case as a specific whole. It thereby offers the possibility of investigating causal complexity where there are many relevant factors but few observations. Case studies can also be used to research questions about process because the use of multiple data sources supports the retrospective investigation of events (Gomm et al, 2000).

A case study research design has been employed in this study because case studies have been used in many different areas of management research including strategy, information systems, innovation and organizational change, reflecting the versatility of the design (Gomm et al, 2000). The ability to investigate cases in depth and to employ multiple sources of evidence makes them a useful tool for descriptive research studies where the focus is on a specific situation or context where generalizability is less important and in applied research, for example in describing the implementation of a programme or policy.

It answers to ‘how’ and ‘why’ questions, however, that case study research comes into its own (Yin, 1998), for both theory building and theory testing. In explanatory research, for instance, case studies offer the possibility of investigating causal mechanisms and the specific contexts in which they are activated (George and Bennet, 2005). It measures variables by asking people questions and then examine the relationship between variables. Therefore the use of a case study research design in this study was very useful in finding relationship between liquid waste and

environmental management in Ubungo municipality.

3.3 Study Population and Study Area

Sinza Ward under the geographical location of Ubungo Municipal was chosen for this study, where a total number of 50 respondents were surveyed. This ward was important to represent the rest of wards in Ubungo Municipality to investigate the impact of liquid waste on environmental management in Ubungo Municipality. Meanwhile the chosen area of study is highly populated and the generation of liquid waste is at high volume due to different domestic human activities, a lot of shops, bars, guests, hotels, restaurants, hospitals, churches, mosque and ordinary residential homes are found within the area (Researcher, 2018).

The Ward is located about 12km from city Centre, in the city of Dar es Salaam, it is also a residential area with a population of about 60,000 people (NBS, 2017). The area is more ethnically mixed. There are families with high income per month and others have low income per month. The main socio-economic business conducted in this area includes commercial business, brick making, and small scale commercial, gardening along the river, hospital services, and hotel services. These activities are related to generation of liquid waste and cause burden to the environment (ISWM, 2016).

3.4 Sampling Techniques

The mode of sampling used to select units of inquiry for the study was random sampling for ordinary citizens except for key informants, reason being easy accessibility of reliable information. Sample size is the number of respondents who

were selected to participate in the study from targeted population. It depended on the accuracy that was needed, population heterogeneity whether the sample was subdivided or not (Kothari, 2008).The sample size of this study involved one ward environmental health officer (WEHO), one ward executive officer (WEO), five Street Leaders (chairperson), and forty three (43) ordinary citizens were visited in their area in order to collect primary data. The total number of respondents visited were fifty (50).

Table 3.1 Population and Sample Size of the Study

S/N	Category	Sample
1.	Ward Environmental Health Officer	1
2.	Ward Executive Officer	1
3.	Street Leaders (Chairperson)	5
4.	Ordinary Citizens	43
	Total	50

Source: Researcher, 2018

3.5 Methods of Data Collection

The data collection method is also described as the specific approach used to gather information (Kothari, 2008). The choice of methodology depends on research objectives and questions to be addressed. Those data which were collected for this study comprised both primary and secondary data.

3.5.1 Primary Data Collection

This is a method of gathering data that do not actually exist until it is generated through the research process (Lancaster, 2005). The primary data for this study was collected by using structured questionnaire, interview and observation approaches. This method is more reliable as a researcher obtained firsthand information.

3.5.1.1Questionnaire

According to Kothari (2008), a questionnaire is a set of questions which are usually sent to the respondents to answer at their own convenient time and return back the field questionnaire to the researcher. Questionnaire was used in the study to obtain data from respondents concern the impact of liquid waste on environmental management in Ubungo Municipality; a case of Sinza ward. Structured questionnaire was employed in this study because they are easier and convenient to fill by respondent. This method was used because it's easier to obtain data.

3.5.1.2 Interview

According to Kothari (2008) an interview can be viewed as a set of questions administered through oral or verbal communication or it can be a face to face discussion between the researcher and the respondent (Pandey et al, 2015). As the case of this study interview was used to collect data to supplement the existing data from other methodology after collection of filled questionnaires. Also this method was used to help the researcher to obtain qualitative data from some few selected respondents concerning impact of liquid waste on environmental management in Ubungo Municipality. The interview was face to face and in preparation for interview, the targeted respondents were requested for appointment and issued a copy of interview guide to make them aware of issues they expected to be responded on. This method was used because it saves time in collecting data.

3.5.1.3 Observation

This is mostly common used technique of evaluation research (Pandey et al, 2015). It's used for evaluating cognitive and non-cognitive aspects of a person (Ibid). It's

used in evaluating performance, interest, attitudes, values towards, their life problems and situations. It is most useful technique for evaluating the behaviors and nature of human being in their respective area of residence. This method was used because it's easier for researcher to see the situation with his or her own eyes.

3.5.2 Secondary Data Collection

According to Saunders et al (2009) secondary data can be described as the data which are developed and analyzed in the processing of accomplishing other research objectives. The suitable source of secondary data for this study which dealt with impact of liquid waste on environmental management are from documentary review, internet, library, laws and reports of different liquid waste Authorities. After collection of secondary data, the information obtained was subjected to data processing which involves editing, checking for completeness and accuracy to ensure that data become accurate and consistent (Pandey et al, 2015). This method is very crucial in authenticating the arguments of the researcher. This method was used to get second hand information.

3.6 Methods of Data Analysis

According to Burns (2008) data analysis is the application of reasoning to understand and interpret the data that have been collected from the field. In this study the process of data analysis was depending on the nature of the data whether it was qualitative or quantitative. In analyzing qualitative data the thematic analysis of the collected data was undertaken in order to understand the common pattern in the data. This is because it is used to analyze classifications and present themes (patterns) that relate to the data and it illustrates the data in great detail and deals

with diverse subjects via interpretations (Alhojailan, 2012).

Thematic analysis is considered the most appropriate for any study that seeks to discover using interpretations. It provides a systematic element to data analysis. It allows the researcher to associate an analysis of the frequency of a theme with one of the whole content. It enables accuracy, intricacy and enhances the research's whole meaning. Qualitative research requires understanding and collecting diverse aspects of data. Thematic analysis gives an opportunity to understand the potential of any issue more widely (Alhojailan, 2012).

The study employed quantitative analysis of data in which data were analyzed by following all statistical procedures in Statistical Package for Social Science (SPSS) version 16.0. The SPSS used because it has the incredible capabilities and flexibilities of analyzing huge data within seconds and generating an unlimited scale of simple and sophisticated statistical results including simple frequency distribution tables, polygons, graphs, pie charts, percentages, cumulative frequencies, binomial and other distributions as much as needed in computing data from the field.

In analyzing quantitative data, data was coded, investigated for integrity, analyzed and presented in useful outputs such as figures for easier drawing of conclusions and to make recommendations regarding impact of liquid waste on environmental management in Ubungo Municipality. Descriptive analysis was used in calculations.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS OF FINDINGS

4.1 Introduction

This chapter deals with analysis and presentation of data after being generated from the field which included qualitative and quantitative information collected from groups of respondents. The groups of respondents were members of the community (ordinary citizens), Ward environmental health officers, Ward executive officer and street leaders (street chairperson) in Sinza Ward, as well as literature from research works and different publications from library.

4.2 Research Tools Used to Generate Data

The instruments used to generate the data were questionnaire, interview and observation. The questionnaire was structured in a way as to elicit as much responses as possible on the management of liquid waste on environmental management. This is because it was prepared technically for the respondents to answer them without fearing their confidentiality issues and the questionnaires were addressed in simple, easier and polite language, finally distributed and retrieved from respondents for analysis.

General questions which tried to explore the nature and activities of Sinza Ward in responding to the preceded support measures to the management of liquid waste in the study area was about capacity, awareness and processes used in removing liquid waste from residential areas. In all the categories of subject matter studied, efforts were made to investigate impact of liquid waste on environmental management after generated from the study area in order to ensure conducive environment for well-

being of the residents.

4.3 The Capacity of Sinza Ward on Liquid Waste Management

The responses from questionnaire in the study area were as shown in figure 4.1 below and reveals that 78% of the surveyed residents in the study area in Sinza Ward have no capacity to manage their liquid waste generated from their premises. This percent is too high compared with other percent and it reflects that the area has no capacity to deal with liquid waste properly. Another group of respondents about 6% said that Sinza Ward has capacity to deal with liquid waste and most of them are residents of Sinza A Street where there is a partial sewerage system which does not cover all residents in that street. The remaining 16% of the respondents were of the view that Sinza Ward has attempted to deal with liquid waste and most of them are well off families and public servants that they are using chamber system and they can afford to call for car truck in order to sludge their liquid waste upon their chambers are full.

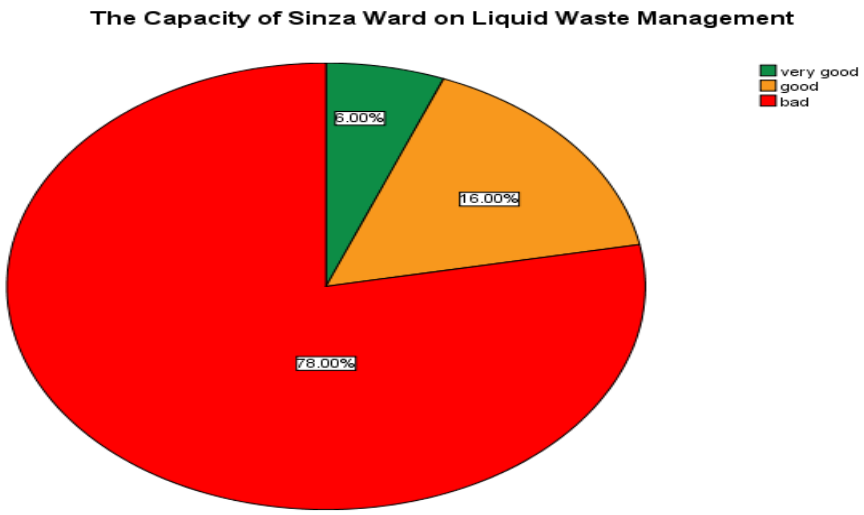

Figure 4.1: The Capacity of Sinza Ward on Liquid Waste Management
Source: Research Findings, 2018

4.4 The Processes Used by Sinza Ward on Liquid Waste Management

The responses from interview was summarized in Figure 4.2 hence it reveals that 60% of the respondents in Sinza Ward do not have clear mechanisms to process and transport their generated liquid waste from their premises to the disposal site. This is the highest percent compared with other percent and it reflects the whole ward that most residents in Sinza Ward are not using proper process in dealing with liquid waste generated from their premises. The next 28% of the respondents have stated that the mechanism in place for dealing with liquid waste is at least sound good.

The remaining 12% of the respondents have said that the mechanism in place for dealing with liquid waste is neat and properly constructed. These respondents most of them were from Sinza A Street in which there is a partial sewerage system which does not cover all residents in Sinza A Street and currently the said system does not accommodate the volume of liquid waste generated due to rapid increase of population and urbanization in place.

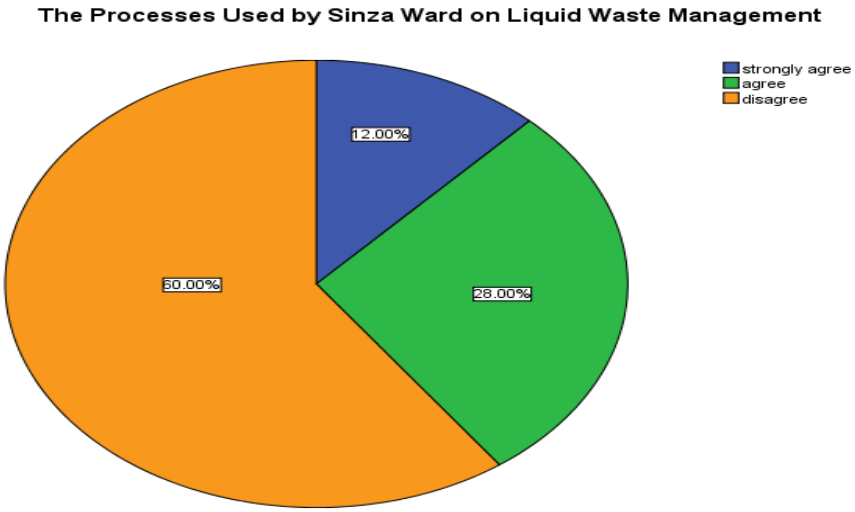

Figure 4.2: The Process Used by Sinza Ward on Liquid Waste Management
Source: Research Findings, 2018

4.5 Residents Awareness on Liquid Waste Management

The responses from questionnaire demonstrated that, the findings from study area revealed as shown in figure 4.3, that 62% of the respondents in Sinza Ward are not aware about the impact of liquid waste on environmental management and this is the highest percent compared with other percent and it reflects the whole ward. This means that the ward has no any clear program for educating its people on the impact of liquid waste on environmental management.

The next 22% of residents in Sinza Ward claimed to be educated by their street chairperson for sometimes in case it's found that a resident had discharged liquid waste to the unauthorized area, then he or she will be fined and most people in this group equate this fine as education to them. The remaining 16% of the residents stated that the education is provided and they are aware about the impact of liquid waste on environmental management in their premises.

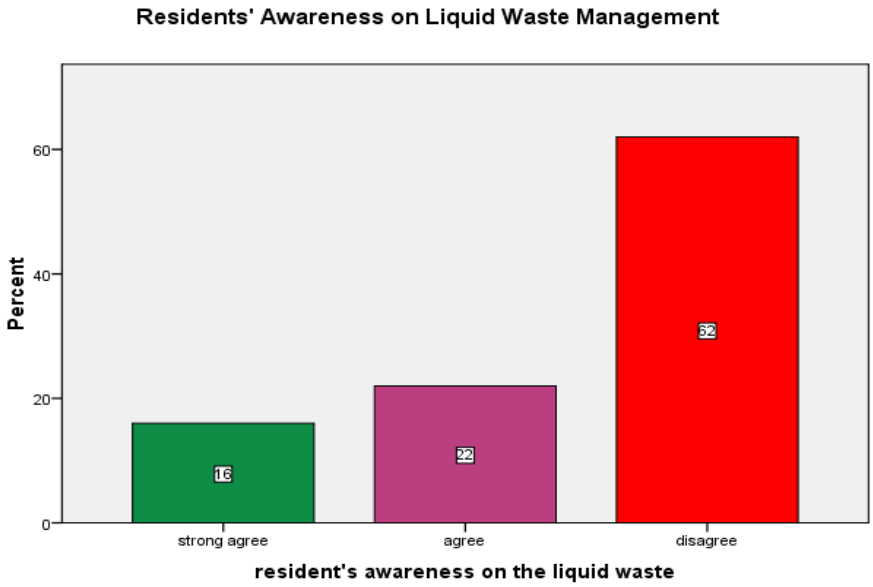

Figure 4.3: The Resident's Awareness on Liquid Waste Management

This group of residents claimed that hygiene matters are more personal than public,

sometimes there is no need for education because it's presumed that every person of sound mind knows wrongs and rights. Also this group of residents are most living in Sinza A where there is a partial sewerage system in which this system was constructed through residents' contribution in 1990s and currently residents are responsible for payment of service charge to DAWASA.

4.6 Researcher Observation

4.6.1 A Photo Taken by Researcher during Research Field Work at Sinza D

This picture shows the situation of liquid waste in the street where the researcher surveyed. The researcher observed the situation which it was too worse. The area was found with liquid waste from household's latrines, bathrooms and kitchens combined together and allocated to the corridors toward a river Ng'ombe which is found in Wami Street at Sinza D. It's a tradition for the residents of Sinza to allocate the liquid waste from their homes to the open spaces without any fear hence they have no sewerage system in Sinza D. The Figure 4.4 is shown the situation in Wami street where the photograph was taken.

Figure 4.4 Shows on Corridor Discharge
Source: researcher, 2018

4.6.2 A Picture of River Ng'ombe in Sinza Ward

The river Ng'ombe is a natural river found in Sinza Ward. The river currently is used for transportation of liquid waste from houses at Sinza ward, the respondents described this river as a place in which all kinds of wastes are dumped in especially during night and it's very rare for the residents to discharge their toilets during a day. Likewise the respondents confessed that the situation usually changes during rain session where many residents believe that during rain session no one who will doubt on the process of discharging their wastes hence it will form a mixture with rain water and join with other volume of rain water from other directions. This river threats lives of many residents because it crosses many area, the Figure 4.5 has shown the real situation about the said river. However, the government is there but the efforts to ensure good environment has proved futile to recent.

Figure 4.5: Shows how River Ng'ombe is used to discharge liquid waste

Source: Researcher, 2018

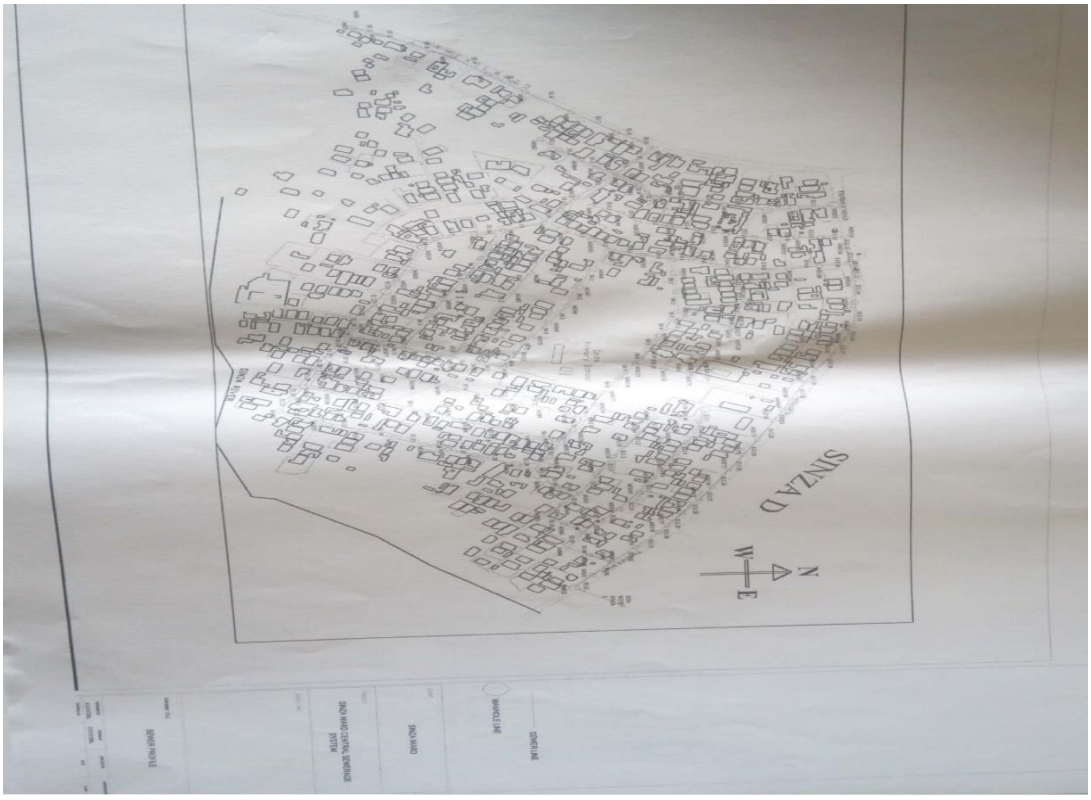

Figure 4.6: The Sketch Map on Designed Sewerage System at Sinza D

Source: Sinza Ward office

The Figure 4.6 is a result of non-existence of sewer system in Sinza Ward and currently there is a proposed sewer system as shown in this map above, each street in Sinza Ward has designed its own sewer system except Sinza A Street which has partial sewer system. The situation made citizens and leaders of the Ward agree to make a proposal on construction of a good sewerage system in order to avoid contamination but this program is still implemented in respective streets in Sinza Ward and each street has its own proposed sewerage system. Since time immemorial Sinza Ward never had sewerage system. The Figure 4.6 is also a status of sewer system in Sinza Ward. This shows each street and its status on sewerage system and it's remarkably that four streets out of five never had a sewer system since independence.

Table 4.1: Sinza Ward Sewer Status from Independence to Recent

Item	Sinza Ward Streets	Sewer Status for each Street
i.	Sinza **A** Street	There is partial sewer system but poor
ii.	Sinza **B** Street	There is no sewer system
iii.	Sinza **C** Street	There is no sewer system
iv.	Sinza **D** Street	There is no sewer system
v.	Sinza **E** Street	There is no sewer system
Assessment of Overall Status of Sewer System		No quality sewer System at Sinza Ward

Source: Sinza Ward Offie

4.7 Prevalent Diseases Related to Sanitation in Sinza Ward

The respondents have revealed that in Sinza Ward the diseases which are most enemies of the residents in the area are related to sanitation in the surroundings. The following are the diseases which respondents explained them are due to the lack of capacity for Sinza Ward to manage liquid waste generated from the area in which people live, work or make productive activities for economic gain. Malaria, this is the most killer disease in Sinza Ward according to the responses from the interviewee in an area of the study and they explained that the volume of liquid waste generated from the premises is not well removed which renders the surrounding to be wet all the time and become reproduction area for mosquitoes.

Typhoid, this was amongst the diseases which were listed by the respondents to be common in their area due to contamination of liquid waste with clean water pipes that transport clean water for domestic uses hence cause the user to contaminate with bacteria which spread typhoid as a result people are victims of this situation. Cholera, this is most dangerous diseases which is spread quickly and it's rated to be the fast killer amongst the epidemic diseases, the respondents in Sinza Ward stated

that cholera is a result of poor handling of wastes including liquid waste in Sinza Ward area. In 2016 the residents of Sinza Ward were suffering from cholera hence were admitted to the Mburahati cholera emergence center. Diarrhea, this is also the disease which make the residents of Sinza Ward to be most vulnerable because it's caused by bacteria that occur in an area with poor sanitation. This disease is a result of wastes especially liquid waste from latrines which is discharged everywhere in Sinza Ward due to lack of proper sewer system.

Figure 4.7 reveals that about 61.2 percent of the interviewees listed malaria, typhoid, cholera and diarrhea as the most prevalent diseases related to sanitation in Sinza Ward, likewise 24.4 percent of the interviewees did not include malaria, typhoid, cholera and diarrhea as most prevalent diseases in the study area but they listed TB as prevalent disease in the study area. Finally, 14.4 percent of the interviewees listed yellow fever as a common prevalent disease in an area. Therefore basing on analysis it's undisputed that the prevalent diseases in the study area are; malaria, typhoid, cholera and diarrhea which are the diseases related to liquid waste or sanitation.

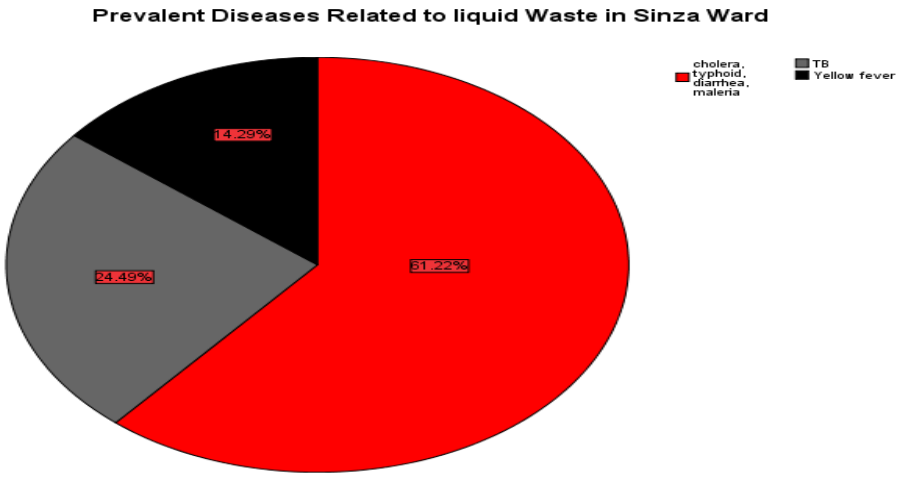

Figure 4.7: Prevalent Diseases Related to Liquid Waste in Sinza Ward

4.8 Conclusion

The findings revealed that Sinza Ward has no sewerage system in four streets among five streets; Sinza D, Sinza B, Sinza C and Sinza E. The only Sinza A street has a partial sewerage system which covered few houses in the street, and it does not accommodate the current volume of liquid waste due to rapid increased number of residents in an area. Hence people residing in an area are suffering from the situation.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSSION ANDRECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of findings, conclusion and recommendations of the study, as per research questions. These questions were as follows; Does Sinza Ward have enough capacity to manage liquid waste? What are the processes used by Sinza Ward on liquid waste management? And How far the society understand about liquid waste management?

5.2 Summary of Findings

The general objective of this study is to explore the impact of liquid waste on environmental management in Ubungo municipality, specifically in Sinza Ward. In carrying out this research study, the research process was guided by research objectives which were accompanied with questions; and the study was mainly quantitative with some elements of qualitative for description purposes. The sample comprised of fifty (50) respondents from Sinza Ward as follows; Ward executive officer (1), Ward Environmental Health Officer (1), street Leaders (chairperson/ Mjumbe) (5) and 43 ordinary citizens were also involved in contributing their ideas on impact of liquid waste on environmental management in Ubungo Municipality-specifically at Sinza Ward in Dar es Salaam city.

Data were collected through questionnaires, interviews and observation which enabled to obtain important information about liquid waste management in the study

area. Each item in the questionnaire was developed to address specific objectives or research questions. Structured or closed ended questionnaires were formulated for the purpose of this study. Liquid waste management was the major theme focused. Also, secondary data were collected from documentary review and compiled by various researchers and stakeholders. Both descriptive and inferential statistics were used for data analysis and likewise SPSS was used in data analysis.

The liquid waste is not separated by using separate containers for re-use or recycling or making compost. Field observation revealed that there are individuals that collect plastic bottles for selling to recycling industrials but when they meet a plastic with liquid waste they usually pour it and take such plastic. Proper collection and transportation of liquid waste is not practiced effectively and efficiently. Proper liquid waste disposal was seldom practiced in few planned areas but most of households discharge their liquid waste in river canals, open space, corridors, and near roads. There is a need to establish liquid waste management systems in Sinza Ward at Ubungo Municipal for ensuring health of the residents and protection to the environment sustainability.

5.3.1 The capacity of Sinza Ward on Liquid Waste Management

The findings revealed that high volume of liquid waste was generated from households, hotels and other commercial areas in Sinza Ward. The rate of liquid waste generated increases with the population, since the liquid waste is not properly discharged and transported to disposal site. The response from respondents indicated that 78% of the surveyed respondents said that Sinza Ward has no capacity to manage liquid waste as it’s seen to every corner of Sinza Ward to be surrounded

with liquid waste and 16% of the surveyed respondents accepted completely that Sinza Ward has capacity to deal with liquid waste, these respondents who had agreed are most living to the Sinza A in which there is a partial sewerage system and the remaining waste 6% also had partially agreed that SinzaWard has capacity to deal with liquid waste and these group of respondents are mostly well off family whom they can afford car truck emptying which currently is 140,000/= Tzs .

Generally liquid waste is not collected and transported to disposal site in Sinza Ward. This means that liquid waste management in Sinza Ward at Ubungo Municipality is not effectively implemented because the liquid waste has affected the environment in Sinza Ward, it is the responsibility of the Municipal and every citizen to ensure that, the liquid waste generated is handled and managed properly. The Sinza Ward did not manage to deal with liquid waste produced as 78% percent of findings revealed or shown poor removal of liquid waste from residential areas in Sinza Ward.

5.3.2 The Process Used by Sinza Ward on Liquid Waste Management

The findings revealed that there are various methods of liquid waste processes that are employed by the residents in Sinza Ward at Ubungo Municipality, these included; sewerage method which is found in Sinza A street, about 12% had access on this method. Car truck system about 28% of the respondents had access to it, and 60% of residents use the following methods; discharge to the near rivers, roads canals, discharge on corridors and open spaces discharge, big number of Sinza Ward residents use either of these methods which in turn cause various diseases like

cholera, typhoid, malaria and skin diseases.

The residents who are using chamber system they always call for car truck to sludge the liquid waste when their chambers are full of liquid waste, this is only in case they have money to afford to pay sludge fee which is currently 140,000/= Tzs. If it happens the chambers are full and no money to call for car truck to sludge it, then they discharge by using other methods which in turn cause environmental pollution. The research revealed that there is no efficiency and effective manner in the whole process of liquid waste management system at Sinza Ward.

5.3.3 The Community Awareness on Liquid Waste Management

The findings have shown that few residents in Sinza Ward are aware about impact of liquid waste on environmental management. About 16% of the surveyed respondents are aware about impact of liquid waste on environment, 22% of the respondents are partially aware about impact of liquid waste on environment, and 62% of the surveyed respondents are not aware about the impact of liquid waste on environment, hence the big number of the residents are not aware about impact of liquid waste on environmental management.

This reflects that the Sinza Ward has no any clear program to educate its people on the impact of the liquid waste on environmental management in which they reside. This means that most of the areas within the Sinza Ward in Ubungo municipalilty does not receive education services in dealing with liquid waste generated from their premises and left uncollected. As a result it’s poorly transported hence discharged to the roadside, rivers, corridors and to the open spaces.

5.4 Conclusion

The overall impact of liquid waste on environmental management at Sinza Ward in Ubungo municipality reveals that liquid waste management in Ubungo municipality, specifically Sinza Ward is very poor. Since liquid waste generated is of high volume as compared to the amount collected and transported to disposal site. Insufficient methods of liquid waste collection system, methods of liquid waste transportation in Ubungo municipal are not efficient, inadequate education on liquid waste management to the residents and there is little access to car truck sludge for liquid waste transfer and transportation to the final disposal due to costs involved in the process as currently sludge fee is about 140,000/= Tzs. Likewise Sinza Ward area has very near water table which cannot allow to have chambers with high meter deep as a result chambers are partially deep and they always become full frequently which becomes difficult for ordinary citizens to afford sludge fee.

The purpose of the Proper liquid Waste Management is to ensure liquid waste is managed in such a way that protects both public health and the environment. For efficiency and effective liquid waste management, a cooperative effort involving all stakeholders, including citizens, community based organizations, non-governmental organizations, government agencies, and other research organizations is inevitable. These inputs from stakeholders form the basis of reviewing all environmental policies that influence liquid waste management.

5.5 Recommendations

For purposes of proper management of the impact of liquid waste on environmental management in Ubungo Municipality specifically at Sinza Ward is concerned the

following should be done;

i. Liquid waste generated must be segregated/ sorted for recycling and reuse purposes.

   The Municipal must think of using liquid waste to produce fresh water for reuse in order to avoid environmental pollution in an area.

ii. Methods of liquid waste collection and transportation should be improved.

iii. Both private sector and the municipal authorities must improve their methods of liquid waste transportation by encouraging private sector to deal with liquid waste. This will ensure more collection and transportation of the liquid waste generated.

iv. The Municipal Council should formulate a long-term and comprehensive liquid waste management program that would encourage and motivate the public to give their support.

v. Massive information dissemination campaign on liquid waste management should be conducted to promote public awareness and change the culture of throwing and pouring the liquid waste to every place like open places, roads, rivers and other places which are designated for such purposes.

vi. Establishment of sewerage system to areas which has no sewer system.

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APPENDICES

Appendix 1: Questionnaire

Title: Impact of Liquid Waste on Environmental Management in Ubungo Municipality: A Case of Sinza Ward

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Dear Sir/Madam, I am **Mathias M.Kijanga**, a student of the Open University of Tanzania pursuing Master's Degree of Arts in Governance and Leadership. Currently I am doing my research on Impact of Liquid Waste on Environmental Management in Ubungo municipality- A Case of Sinza Ward, Dar es Salaam city.

Therefore, your response is very important for the success of the study because all information that you provide determines the analysis and conclusion of the research. Hence, you are kindly requested to give your response by selecting your answer from the given alternative choice. This structured questionnaire consist of four parts you required to answer all questions.

Please be informed that your response is kept in confidential and you are not required to write your name.

I would like to thank you in advance

Item no:	Your required to put tick as example indicated in the top right column			Please insert tick where necessary [√]
i.	Sex	a	male	
		b	female	
ii.	Marital status	a	married	
		b	single	
iii.	Age	a	5-20 Years	
		b	21-40 Years	
		c	41-60 Years	
		d	61- 80 years	
iv.	Level of education	a	Primary Education	
		b	Secondary Education	
		c	Tertiary Education	
		d	University Education	

Part One: Particulars of Respondent

Part Two

Questions to Ward Environmental Health Officer

Choose Appropriate Answer

1. The municipal has managed to deal with liquid waste by providing quality services to the residents.

   (a) Disagree (b) Agree (c) Agree Strongly ( )

2. The liquid waste management system shall be allocated enough budget in order to curb the challenges that faces Sinza Ward.

   a) Very Important b) Important (c) Not Important ( )

3. The responsibilities for the liquid waste management is only for leaders and not citizens.

   (a) Disagree (b) Agree (c) Agree Strongly ( )

4. The services provided by the liquid waste regulators are of satisfactory to the extent that no citizen is complaining of the current situation of the Sinza Ward surroundings.

   a) Very Good b) Good c) bad ( )

5. Are their enough car trucks for liquid waste sludge in your residents?

   (a) Disagree (b) Agree (c) Agree Strongly ( )

6. The liquid waste is properly transported from informal settlements to the main sewerage system without environmental pollution.

   (a) Very Good (b) Good (c) Bad ( )

THANK YOU

Part Three

Questions to Ward Executive Officer

Choose Appropriate Answer

1. The Liquid waste treatment process involves physical and chemical treatment techniques to remove contaminants such as oils, dissolved metals and solids.

   (a) Definitely (b) Very Probably (c) Probably ( )

2. The liquid waste is processed through clear constructed sewerage system up to the point of disposal point.

   a) Strongly Agree b) Agree c) Disagree ( )

3. The types of liquid waste materials that recycled are; gray wastewater from kitchen, latrine wastewater, bathroom wastewater, industrial wastewater materials and hospital liquid chemicals.

   (a)Very Frequently (b) Frequently (c) Never ( )

4. The mechanism in place to help reduce the amount of liquid waste generated in premise are clearly constructed and liquid wastes are well managed to ensure healthy standards.

   (a) Strongly Agree (b) Agree (c) Disagree ( )

5. The methods for which the liquid wastes are processed and transported starts from household level, commercial area through sewerage or septic tank or emptying through car trucks and is done regularly in order to ensure sanitation to the surroundings and avoid contamination.

(a) Strongly Agree (b) Agree (c) Disagree ( )

6. The mode of discharge liquid waste used in an area is through sewerage system and not through, roadside emptying, out of the door emptying and all

surroundings emptying.

(a) Completely Agree (b) Agree (c) Disagree ( )

7. The mode and services delivery for discharge liquid waste used in an area is through sewerage disposal, tank system and car truck emptying.

(a) Strongly Agree (b) Agree (c) Disagree ( )

THANK YOU

Questions to Ordinary Citizens

Choose an Appropriate Answer

1. Is the liquid waste transported from informal settlements to the main sewerage system without environmental pollution?

   a) Very Good

   b) Good

   c) Bad ( )

2. The mode of service delivery for discharge of liquid waste used in an area are; sewerage disposal, tank system (chamber) and car truck system?

   a) Strongly agree

   b) Agree

   c) Disagree ( )

3. Do you know that liquid waste is more dangerous than solid waste in household level around your residence?

   a) Strongly Agree

   b) Agree

   c) Disagree ( )

THANK YOU

APPENDIX II: INTERVIEW GUIDE

Title: Impact Of Liquid Waste on Environmental Management in Ubungo Municipality: A Case of Sinza Ward

PART ONE

Questions to Street Leaders (M/Kiti wa Mtaa/ Mjumbe)

i. What is liquid waste?

_____

ii. What are the effects of liquid waste to the environment in your street?

_____

iii. What are prevalent diseases caused by liquid waste in Sinza Ward?

_____

iv. Does Sinza Ward has enough capacity to deal with liquid waste?

_____

v. Are services provided by the Sewerage Authority in your premises satisfactory?_____

vi. Briefly explain how municipal deal with liquid waste?

_____

vii. Is there enough budget provided to combat environmental pollution in your street?

THANK YOU

Part Two: Questions to Ordinary Citizens

i. Which processes are used by Sinza Ward in managing liquid waste?

_____

ii. What is the status of the sewerage as a transportation means of liquid waste?

_____

iii. What kind of treatment is used in Sinza Ward to manage liquid waste?

_____

_____

iv. How do you process liquid waste from your premises?

_____

_____

v. Where do you discharge your liquid waste produced in your house?

_____

vi. Explain which processes are used to deal with liquid waste in Sinza Ward?

_____

vii. Why some hotels and other recreational areas in Sinza Ward discharge liquid waste to public area?

_____

viii. To what extent do you aware about liquid waste in your family level?

_____

ix. Do you get any seminar on how to manage liquid waste in your premises?

THANK YOU

UBUNGO MUNICIPAL COUNCIL

ALL CORRESPONDENCES TO BE ADDRESSED TO THE MUNICIPAL DIRECTOR

Tel: 0222-926341
Fax: 0222-926342

MUNICIPAL DIRECTOR UBUNGO
MUNICIPAL COUNCIL,
P. O. BOX 55068
DAR ES SALAAM.

In reply please quote:

DATE: 19/07/2018

Ref. AB.27/333/01

Kijanga Mathias,
The Open University of Tanzania,
P.O. Box 23409,
DAR ES SALAAM.

RE: **RESEARCH ATTACHMENT**

Refer to the above heading.

I am pleased to inform you that your above request has been considered by the Municipal Director, and has offered you a place to research attachment from **16 July, 2018 to 30 August, 2018.**

Upon receipt of this letter, please report to the, **Ward Executive Officers – Sinza** for commencement of your research.

During the period of research you are required to obey the rules and regulations of the institution.

Yours Sincerely.

E. F. Kisenha
For: **THE MUNICIPAL DIRECTOR**
UBUNGO

Kny: MKURUGENZI WA MANISPAA
HALMASHAURI YA MANISPAA YA UBUNGO
DAR-ES-SALAAM

Copy: Vice Chancellor,
The Open University of Tanzania,
P.O. Box 23409,
DAR ES SALAAM.

THE OPEN UNIVERSITY OF TANZANIA

DIRECTORATE OF POSTGRADUATE STUDIES

P.O. Box 23409
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Tel: 255-22-2668992/2668445
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E-mail: dpgs@out.ac.tz

Our Ref: PG201702201

Date: 16th July, 2018

Director,
Ubungo Municipalality,
Sinza Ward,
P.o Box 55068,
Dar es Salaam.

RE: RESEARCH CLEARANCE

The Open University of Tanzania was established by an act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No. 55 in the official Gazette. The act was however replaced by the Open University of Tanzania charter of 2005, which became operational on 1st January 2007. In line with the later, the Open University mission is to generate and apply knowledge through research.

To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you **Mr.KIJANGA Mathias.M. RegNo:PG201702201** pursuing **Master of Arts in Governance and Leadership (MAGL).**We here by grant this clearance to conduct a research titled***"Impact of Liquid Waste on Environmental Management in Ubungo Minicipality.A case of Sinza Ward." He*** will collect his data at Ubungo Municipality in Dar es Salaam region from 16th July 2018 to 30th August 2018.

In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O. Box 23409, Dar es Salaam. Tel: 022-2-2668820.We lastly thanks you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours sincerely,

Prof. Hossea Rwegoshora
For: VICE CHANCELLOR
THE OPEN UNIVERSITY OF TANZANIA

UBUNGO MUNICIPAL COUNCIL

ALL CORRESPONDENCES TO BE ADDRESSED TO THE MUNICIPAL DIRECTOR

Tel: 0222-926341
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UBUNGO

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The Open University of Tanzania,
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DAR ES SALAAM.