ASSESSING THEEFFECTIVENESS OF DECENTRALISED SOLID WASTE MANAGEMENT SCHEME IN TANZANIA. A CASE OF DODOMA MUNICIPALITY

BY

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DECLARATION

I, Mkumwa Raphael declare that this dissertation is my own work. It has not been and will not be presented for any other course of study. I confirm that appropriate credit has been given where reference has been made to the work of others.

_____ _____

Mkumwa Raphael Date
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The above declaration is confirmed

_____ _____

Date

(Supervisor)

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"*Who am I, O Lord God, and what is my house that you have brought me this far? 2 Samuel 7:18*. I thank the Almighty God for the gift of life and good health for the time I was preparing this dissertation. The accomplishment of this work is the result of His grace and guidance.

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DEDICATION

This research is dedicated to a family of Mr and Mrs Mkumwa Raphael for the support, especially during the whole period of my studies and whole life. May God Bless this family.

ABSTRACT

Solid waste management is the part of the growing problem that attract attention of anthropologists, economists, historians, sociologists in the world. This believed to have been caused by rising of urbanization and change of life style of food habits which have led to the increase of municipal solid waste. In Tanzania, Dodoma municipality among the municipal/town that experience a problem of solid waste. This has contributed to eruption of diseases and dust beans in the town. This study was designed to investigate the effectiveness of decentralized solid waste management scheme in Tanzania specifically in Dodoma municipality

Data were collected using structured and non- structured interviews. Purposive sampling procedures were used to obtain representatives of from Majengo and Uhuru wards, this led to a total sample of 126 respondents. The collected data were analyzed using SPSS software where outputs from descriptive statistics cross tabulation and frequencies were used in verifying the effectiveness of decentralized solid waste management scheme in Tanzania specifically in Dodoma municipal. From the study,70% respondents reported that the municipal is guided by solid waste management policy guided by four objectives under the policy. However, the ways used to collect solid waste were four but one that dominated in the study area was people moving rounding with wheel brrlow 36.6% of respondents. The ways used on managing the solid waste were recycling of solid waste, incineration of solid waste and open burning. There were different diseases thought to have erupted as the impact of solid waste. Furthermore, conclusion was made and different recommendations that were thought to improve the system.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATION AND ACRONYMS

CBOs Community Based Organizations

CDO Community Development Officer

CFR Council on Foreign Relations

FGD Focus Group Discussion

NIMBY Not In My Backyard

PPPs Public Private Partnershiper

SJUT St John's University of Tanzania

SPSS Statistical Package for Social Science

UN United Nation

UNDP United Nations Development Program

URT United Republic of Tanzania

WEO Ward Executive Officer

WHO Ward Health Officer

WHO World Health Organization

CHAPTER ONE

1.1Background of information

Solid waste management is part of a growing discourse attracting the attention of anthropologists, economists, historians, sociologists manager and amongst others, most of whom point that waste is an indication of negative side of different dichotomies (UN- Habital, 2010, Van Dijk, 2008, Van Dijk and Oduro – Kwarteng, 2007). The increasing volume and complexity of waste associated with the modern economy is posing a serious risk to ecosystems and human health. Of all the waste streams, waste from electrical and electronic equipment containing new and complex hazardous substances presents the fastest-growing challenge in both developed and developing countries (Kibwage, 2002).

Achankeng,(2003) observes that with rising urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been increasing rapidly and its composition changing. In 1947 cities and towns in India generated an estimated 6 million tons of solid waste; in 1997 it was about 48 million tons. More than 25% of the municipal solid waste was not collected at all; 70% of the Indian cities lack adequate capacity to transport it and there are no sanitary landfills to dispose of the waste (Hina and Devadas, 2007).

Scheinberg,(2011) pointed out that solid waste cannot be avoided; but in developed countries like China and United States of America solid waste management is highly practiced whereby recovery of materials and energy from waste as well as remanufacturing and recycling waste into usable products is the important second option. Recycling leads to substantial resource savings. For example, for every tone of

paper recycled, 17 trees and 50 per cent of water is saved. Moreover, recycling also creates jobs and the sector employs 12 million people in these countries(Tukahirwa, 2011).

According to Liyala(2011) pointed out that solid waste management in urban centers of East Africa has for a long time been centralized with the use of imported refuse truck that collect wastes from sources or transfer point and deliver to designated waste dumps(Oberlin, 2011).Municipal solid waste management (MSWM) system in East Africa has changed from the colonial days in the 1940s, 1950s and early 1960s when it was efficient because of the lower urban population and adequate resources (Okoth-Okumu&Nyenje 2011) compared to the current status which displays inefficiencies. The centralized waste management system has evolved into the current management mixtures that include decentralized as well as the involvement of the private sector (Rotich*et al*., 2006; Okoth-Okumu&Nyenje 2011).

In Tanzania decentralization of solid waste management is not a new phenomenon since have profound impacts on other aspects, such as governance in public sector, including public services delivery like solid waste management (Kaseva and Mbuligwe, 2005).The dilapidated state of municipalities and the near total collapse of municipal infrastructure and services in several towns have lent greater emphasis to this trend. It has generally been taken as a given that decentralization and privatization of municipal services provision would ensure greater efficiency and effectiveness (Palczynski, 2002). However, sustainable solid waste management is a major challenge for local governments today. Unplanned rapid population growth in urban areas has resulted in

serious infrastructural problems making conventional solid waste management practices difficult to implement (Okoth-Okumu&Nyenje 2011).

Furthermore, many cities, suffer from the following challenges that are not easily solved through conventional systems, inadequate government funding and capacity (esp. trucks) to provide services, initial costs and operation of conventional systems are very expensive, lack of fee collection system and law enforcement on fees and fines, lack of training, equipment, and capacities by local service providers, limited community awareness, llimited to no waste separation before the final dumpsite,land limitations inhibiting the creation of new transfer stations and dumpsites and unreliable solid waste management services results in illegal waste dumping and pollution(UN- Habital, 2010).

It is because of the above challenges that face developing countries on solid waste management that a researcher wants to investigate on the extents of effectiveness on solid waste management. Therefore the study will assess the extents of effectiveness on decentralized solid waste management in Dodoma municipality have been less studied.

1.2 Problem Statement

The problem of solid waste management is more in developing countries than in developed countries (Wang et, al., 2008). In Tanzania, the decentralized solid waste management is facing by different challenges like ,inadequate government funding and capacity (esp. trucks) to provide services, initial costs and operation of conventional systems are very expensive, lack of fee collection system and law enforcement on fees and fines, lack of training, equipment, and capacities by local service providers, limited community awareness, limited to no waste separation before the final dumpsite,land

limitations inhibiting the creation of new transfer stations and dumpsites and unreliable solid waste management services results in illegal waste dumping and pollution (UN-Habital, 2010). The problem is believed to have been caused by inadequate and poor governance in local governments (Warioba, 1999). Situation in Uganda, Kenya and Sudan have shown that low investment and inadequate capacity of local personnel to manage solid waste have resulted into different challenges in different cities and towns (Wilson *et al*., 2010.).

Despite, the decentralization of solid waste management by commencing different reforms like participation of local people in solid waste collecting, commencement of clubs and provision of wards and streets education on how to manage solid waste in local government, still solid waste management is still host different challenges such as poor funding for urban sanitation, budget deficiencies, insufficient public awareness, few vehicles and often poorly serviced, rapid urbanization and burning plastic that produces very toxic fumes, such as furans and dioxins, which are very harmful to human beings and the environment in urban areas (Dzikus, 2013). It is because of these diverse experience and events that the study aims to assess the effectiveness of decentralized solid waste management scheme in Dodoma Municipality.

1.3. General objective

In view of the above, the broad goal of the study is assessment of the effectiveness of decentralized solid waste management scheme in Dodoma Municipality.

1.3.1. Specific objectives

- To identify strategies at which local government use to implement the policy of solid waste management in Dodoma municipality.
- To determine the effects of solid waste management land strategies on reducing solid waste disasters.
- To estimate the extent of waterborne diseases as a result of rampant solid wastes disposal in Dodoma municipality.

1.4. Research question

- What are the strategies at which local government use to implement the policy of solid waste management in Dodoma municipality?
- What are the effects of solid waste management land strategies on reducing solid waste disasters?
- What is the trend and consequences of diseases and illness developed as a result of improper solid waste disposal?

1.5 Significance of the study

The information obtained will provide a clear picture of solid waste governance in LGAs.

It is also expected that the results from the study will assist the local government in developing correct interventions in solid waste management and ensure their sustainability in preserving the municipal clean, which is the Millennium Development Goal that targets on ensuring environmental sustainability.

1.6 Study limitation(s)

Any study of this kind is likely to encounter a number of limitations. Limitations that were encountered in the field during data collection were poor cooperation from respondents. Some respondents were not ready to cooperate with the researcher in providing reliable information for the study. This was caused by lack of understanding on why such studies were made in their communities. The challenge faced was to create a motivating environment for respondents especially by assuring respondents to maintain confidentiality on any information that was provided. These challenges were overcome by getting as much prior knowledge as possible and understanding of the environment over which the study took place. Efforts were also undertaken to ensure positive cooperation by working closely with local/ward leaders.

Another limitation was bureaucratic procedures from leaders at ward level and municipality level when scheduling time to meet required officers for data collection. Meeting with leaders in the municipality was very much bureaucratic with much delays resulting in using much time unnecessarily. Again, the level of understanding about research problem was not very much satisfactory among respondents and this affected information given. Poor understanding in filling questionnaires sometimes resulted into unclear information. Personal information from respondents such as age and marital status were sometimes hidden under confidential circumstances. In overcoming these problems, the researcher asked questions that did not embarrass respondents and promise to keep confidentiality on data collected.

Some secondary sources of data such as books, papers, journals and dissertations of 1990s and below, gave information that was not current especially when literature was reviewed. To overcome this problem, data gathered for secondary source which were not current were assessed basing on the contemporary phenomena and reality that was reflected on the environment. Some secondary data were not released for example status of water borne diseases from Dodoma regional hospital, instead public health demography reports in Tanzania were reviewed.

CHAPTER TWO

LITERATURE REVIEW

2.1. Overview

This chapter provided an overview of different literature that focused on the effectiveness of decentralized solid waste management scheme. It will provide more knowledge and widened understanding on different phenomena under study such as causes, effects and magnitude of the problem and strategies that local government authorities enforce in solid waste. The review gives more insights in the understanding of solid waste management.

2.2 Definition of Key Concepts

2.2.1 Decentralization

According to Shauri (2001) decentralization is commonly viewed as the transfer of legal and political authority from the central government and its agencies to the field organizations and institutions. Decentralization involves the shifting of fiscal, political and administrative responsibilities from higher to lower levels of government. Throughout the world, countries have been enthusiastically embracing different aspects of decentralization, particularly during the past decade. Because the motivation and design of decentralization differ in each country, it is extremely difficult to compare a single notion of "decentralization" across countries.

Brinkhuis (2013) defines decentralization, or decentralizing governance, refers to the restructuring organization of authority so that there is a system of co-responsibility between institutions of governance at the central, regional and local levels according to the principle of subsidiary, thus increasing the overall quality and effectiveness of the

system of governance, while increasing the authority and capacities of sub-national levels. Decentralization could also be expected to contribute to key elements of good governance, such as increasing people's opportunities for participation in economic, social and political decisions; assisting in developing people's capacities; and enhancing government responsiveness, transparency and accountability.

Ribot (2002) defines decentralization is usually referred to as the transfer of powers from central government to lower levels in a political-administrative and territorial hierarchy. This official power transfer can take two main forms. Administrative decentralization, also known as deconcentration, refers to a transfer to lower-level central government authorities, or to other local authorities who are upwardly accountable to the central government.

2.2.3 Solid waste

According to Achankeng, (2003) solid waste means any garbage, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded materials including solid, liquid, semi-solid, or contained gaseous material, resulting from industrial, commercial, mining and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges that are point sources.

Palczynski, (2002) defines the term solid waste as material such as household garbage (includes recycling), food wastes, yard wastes, and demolition or construction debris. It

also includes discarded items like household appliances, furniture, scrap metal, machinery, car parts and abandoned or junk vehicles.

Oberlin, (2011) refers solid waste to non-soluble material such as agricultural refuse, industrial waste, mining residues, demolition waste, municipal garbage or even sewage sludge. Most of these kind of wastes cannot be recycled or rehabilitated for further use.

Wilson *et al*., (2010) defines solid waste can be defined as: the useless and unwanted products in the solid state derived from the activities of and discarded by society. It is produced either by - product of production processes or arise form the domestic or commercial sector when objects or materials are discarded after use**.** In an average person; solid waste is usually being said as the following terms; Garbage: the term given principally to food waste, but may include other degradable organic wastes. Rubbish: consists of combustible and non-combustible solid waste, excluding food wastes. Refuse: the collective term for solid wastes, includes both garbage and rubbish. Litter: odds and ends, bits of paper, discarded wrappings, bottles etc. Left lying around in public places.

2.2.4 Solid waste management

Semboja (2009) defines solid waste management is a polite term for garbage management. As long as humans have been living in settled communities, solid waste, or garbage, has been an issue, and modern societies generate far more solid waste than early humans ever did. Daily life in industrialized nations can generate several pounds (kilograms) of solid waste per consumer, not only directly in the home, but

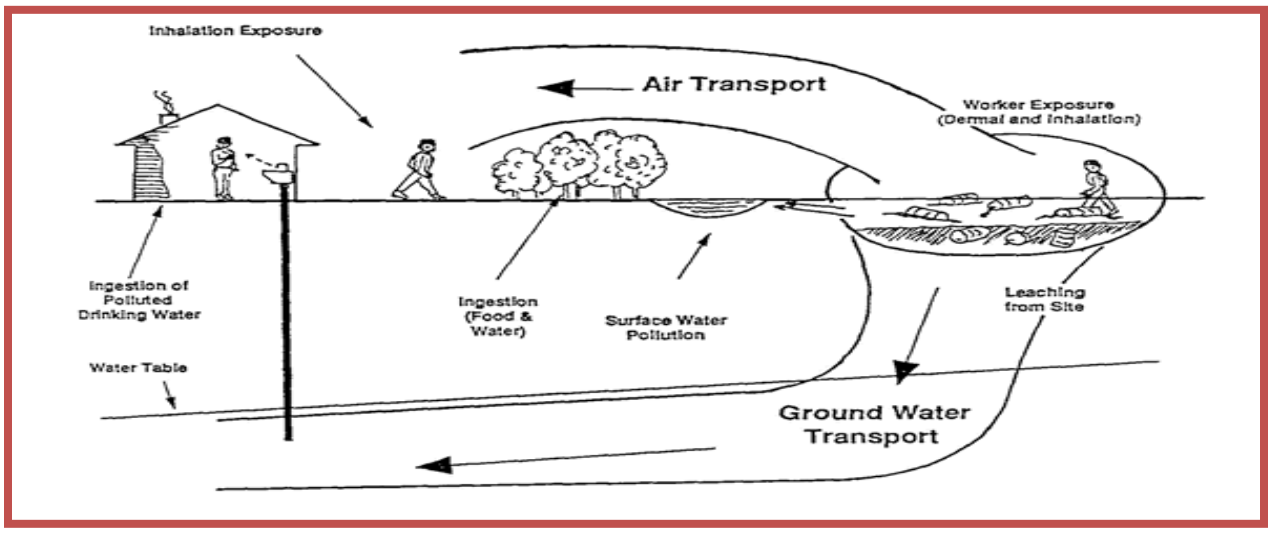
indirectly in factories that manufacture goods purchased by consumers. Solid waste management is a system for handling all of this garbage, and includes municipal waste collection, recycling programs, dumps, and incinerators.

According to Kibwage,(2002) waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste management is a distinct practice from resource recovery which focuses on delaying the rate of consumption of natural resources. All waste materials, whether they are solid, liquid, gaseous or radioactive fall within the remit of waste management. Waste management practices can differ for developed and developing nations, for urban and rural areas, and for residential and industrial producers. Management of non-hazardous waste residential and institutional waste in metropolitan areas is usually the responsibility of local government authorities, while management for non-hazardous commercial and industrial waste is usually the responsibility of the generator subject to local, national or international authorities.

2.2.5 Industrial waste : These are waste produced by industrial activity, such as that of factories, mills and mines. Industrial waste may be not hazardous or toxic, such as waste fiber produced by agriculture and logging and may be hazardous. Precisely, Industrial waste is the unwanted materials produced in or eliminated from an industrial operation and categorized under a variety of headings, such as liquid wastes, sludge, solid wastes and hazardous wastes (UN-Habital, 2010).

2.2.6 Domestic waste: According to Tukahirwa, (2011) domestic waste is also known as municipal waste that means any non putrescible waste, consisting of combustible materials, such as paper, cardboard, yard clippings, wood, or similar materials, generated in a dwelling, including the real property upon which it is situated, containing four living units or less. Municipal waste includes: bulky waste (e.g. white goods, old furniture, mattresses); yard waste, leaves, grass clippings, street sweepings, the content of litter containers. Market cleaning waste if managed as waste. It includes waste originating from: households, commerce and trade, small businesses, office buildings and institutions (schools, hospitals, government buildings)

Figure1: The pollution from solid waste



2.3: Trends in solid waste management in East African cities

Waste management in urban centres of East Africa has for a long time been centralised (Liyala 2011), with the use of imported refuse truck (Rotich *et al*., 2006; Okot-Okumu &Nyenje 2011) that collect wastes from sources or transfer point and deliver to designated waste dumps. Municipal solid waste management (MSWM) system in East

Africa has changed from the colonial days in the 40s, 50s and early 60s when it was efficient because of the lower urban population and adequate resources (Okot-Okumu &Nyenje 2011) to the current status that displays inefficiencies. The centralized waste management system has evolved into the current management mixtures that include decentralized as well as the involvement of the private sector. The storage, collection, transportation and final treatment/disposal of wastes are reported to have become a major problem in urban centres (ADB 2002; Kaseva & Mbuligwe 2005; Okot-Okumu & Nyenje 2011; Rotich *et al.,* 2006). The composition of wastes generated by the East African urban centers is mainly decomposable organic materials (Table 1) based on the urban community consumption that generates much kitchen wastes, compound wastes and floor sweepings (Oberlin, 2011; Okot-Okumu & Nyenje 2011; Scheinberg, 2011; Simon, 2008; Rotich *et al*., 2006). This calls for efficient collection system to avoid health, aesthetics and environmental impacts. The global trend of increased use of electrical and electronic goods is also evident in EAC where E-waste is becoming a significant threat to the environment and human health in EAC urban centres (Blaser & Schluep, 2012; NEMA 2010 & UNEP, 2010; Wasswa & Schluep, 2008).

2.4 Solid waste management challenges

All the EAC countries have policy, legal and institutional framework for waste management where urban councils are charged with the tasks to manage urban wastes (Liyala 2011;Oberlin 2011; Okot-Okumu & Nyenje, 2011; Tukahirwa, 2011). The duties and responsibilities are spelt out in a number of pieces of national legislations mainly in the area of public health, environmental management, urban planning and local governance (Kaseva & Mbuligwe 2005; Liyala 2011; Oberlin 2011; Okot-Okumu & Nyenje 2011). The urban councils are responsible for the implementation of these

instruments including ordinances and bye-laws. In the (EAC), environmental policymaking remains largely a function of the central government, but implementation of policies and legislation is devolved to the Local Governments (Liyala 2011; Oberlin2011; Okot-Okumu & Nyenje 2011; Tukahirwa 2011). The existing laws on waste management are not being effectively enforced (Liyala 2011; Oberlin 2011; Okot-Okumu & Nyenje 2011; Simon 2007), which may be attributed to inherent weaknesses of the laws themselves. The informal sector and the community therefore operate with little or no regulation at all.

Waste management is poorly financed because it is not a prioritised activity in all urban councils. Funds for the operation of the urban councils are mainly from external sources (over 50 %) like the central government and donors in the form of grants (Liyala, 2011). This means fiscal autonomy has not been realised by the EAC urban councils as observed by Okot-Okumu & Nyenje (2011). The central governments do not adequately cost-evaluate the decentralised environmental management functions implemented by the urban council (Okot-Okumu & Nyenje 2011). National priorities usually differ from environmental management activities causing low remissions in these sectors by the central governments.

The study by Liyala (2011), of Kisumu (Kenya), Mwanza (Tanzania) and Jinja (Uganda) clearly illustrates the solid waste management financing dilemma. It is difficult to solve the dilemma because urban council local revenue sources are limited and locally raised revenues are in some cases as low as 3% of the total annual local authority budgets. In

Kenya and Tanzania the community pay for waste management, while in Uganda there is unwillingness to pay although in all these countries, Local Governments are by law (Local Government Acts) are given the powers to charge fees for waste services (Liyala 2011). The problem is compounded by the inability by a large percentage or urban community to pay for waste collection services due to low income levels in the EAC region. Therefore households not served by waste collection have developed their own waste management systems. The most common household waste management methods identified are waste burning and backyard burying or indiscriminate open dumping (Liyala 2011; Oberlin, 2011; Okot-Okumu & Nyenje 2011; Simon, 2007). Waste composting is still small-scale and CBOs to train for awareness and capacity building for MSWM are not coordinated and are also discontinuous causing duplication of efforts, therefore have insignificant impacts on target communities. Even though urban councils contract private operators to collect wastes, the urban councils themselves are still the main waste collectors and the combined efforts of the urban councils with the private sector have not yielded the levels of success expected. This is evident by the common scenes of uncollected wastes on roadsides and in drainage channels, streams and wetlands in urban and peri-urban areas.

The problem of MSWM in East Africa is compounded by the rapid urban population growth caused by rural to urban migration overstretching resources. The rising urban population and increasing industrial activities means larger volumes of wastes that pose threat to public health and the environment since they are predominantly decomposable organic and E-wastes are also increasing in the waste stream. Zurbrugg (1999) noted that the problems of MSWM are of immediate importance in many urban areas of the

developing world and waste management is known as one of the key issues in urban management aside from water and sanitation. Municipal wastes therefore constitute one of the most crucial health and environmental problem of African urban councils (Achankeng 2003; Adebilu & Okekunle 1989; Asomani-Boateng & Haight 1999; Kaseva & Mbuligwe 2005). It is evident from Kaseva & Mbuligwe (2005) for Tanzania, Rotich *et al*., (2006) for Kenya and Okot-Okumu & Nyenje (2011) for Uganda that urban areas in East Africa have been experiencing serious solid waste management failures.

The prevailing attitude of the public towards waste collection and disposal or treatment is poor (Liyala 2011; Oberlin 2011). The urban communities generally do not participate in waste management responsibly and this is not helped by the inability of the urban councils to enforce existing waste management laws (Liyala 2011). Political interference caused by personal interests has in some cases obstructed opportunities to implement ordinances or bye-laws. Political interference weakens environmental management institutions and creates a community that is difficult to work with for environmental management (Okot-Okumu & Nyenje 2011). There are also the negative factors of attitude and culture that have prevented in some cases the very important element of public participation as noted by some authors (Kaseva & Mbuligwe 2005; Palczynski 2002; Rotich *et al.,* 2006; Yhedgo 1995). The low standard of living (poor pay), education (high illiteracy levels) and the economy (low GDP per capita) are influencing factors that cause low levels of willingness to participate in public management matters. The combination of all these factors together with the urban council weaknesses that cause management failures have led to the accumulation of wastes in neighborhoods leading to environmental degradation and threat of disease epidemics such as cholera,

diarrhea and parasites. Socio-cultural and attitude problems in waste management may be addressed gradually through public education to sensitize the communities, while economic issues can be addressed by providing livelihood opportunities (employment) within the waste management activities.

There is need to explore the opportunities for the 3Rs and composting in urban waste management among urban communities to minimize waste while at the same time or recyclable materials) benefits. To successfully adopt sustainable methods of waste management by the communities, Mbeng *et al.,* (2009) suggested making awareness programmes simple and accessible to change the mindset of urban residents to perceive waste as resources (goods) rather than something without value. To address community level waste problems pre-collection/ primary collection needs better organisation and strengthening by communities working together with urban councils and CBOs to chart the most suitable waste minimisation and collection methods. Integrated waste management approach that employs decentralised community based systems involving NGOs/CBOs targeting the peri-urban poor and the more centralised urban council and private operator systems that target the central business areas and the rich and middle class estates should be explored by the urban councils. Such systems can be promoted through community participation and education involving CBOs and the informal sector. There is need for political support for such initiatives of waste management strategies to succeed.

2.5 Factors influencing the elements of the waste management systems

According to Sujauddin et al. (2008) the generation of waste is influenced by family size, their education level and the monthly income. Households attitudes related to separation of waste are affected by the active support and investment of a real estate company, community residential committees' involvement for public participation (Zhuang et al., 2008) and fee for collection service based on the waste volume or weight (Scheinberg, 2011). Gender, peer influence, land size, location of household and membership of environmental organization explain household waste utilization and separation behavior (Ekere et al., 2009).

It has been reported that collection, transfer and transport practices are affected by improper bin collection systems, poor route planning, lack of information about collection schedule (Hazra and Goel, 2009), insufficient infrastructure (Moghadam et al., 2009), poor roads and number of vehicles for waste collection (Henry et al., 2006). Organizing the informal sector and promoting micro-enterprises were mentioned by Sharholy et al. (2008) as effective ways of extending affordable waste collection services.

Lack of knowledge of treatment systems by authorities is reported as one factor affecting the treatment of waste (Chung and Lo, 2008). Tadesse et al. (2008) analyzed the factors that influence household waste disposal decision making. Results showed that the supply of waste facilities significantly affects waste disposal choice. Inadequate supply of waste containers and longer distance to these containers increase the probability of waste dumping in open areas and roadsides relative to the use of

communal containers. Insufficient financial resources limiting the safe disposal of waste in well equipped and engineered landfills and absence of legislation are mentioned by Pokhrel and Viraraghavan (2005).

In relation to the pricing for disposal Scheinberg (2011), analyzing the data from “Solid Waste Management in the World’s Cities” (Scheinberg et al., 2010), notes that there are indications that high rates of recovery are associated with tipping fees at the disposal site. High disposal pricing has the effect of more recovery of waste generated, that goes to the value chains or beneficial reuse of waste.

In relation to recycling Gonzalez-Torre and Adenso-Diaz (2005) reported that social influences, altruistic and regulatory factors are some of the reasons why certain communities develop strong recycling habits. The authors also showed that people who frequently go to the bins to dispose of general refuse are more likely to recycle some product at home, and in most cases, as the distance to the recycling bins decreases, the number of fractions that citizens separate and collect at home increases. Minghua et al. (2009) stated that in order to increase recycling rates, the government should encourage markets for recycled materials and increasing professionalism in recycling companies. Other factors mentioned by other scholars are financial support for recycling projects and infrastructures (Nissim et al., 2005), recycling companies in the country (Henry et al., 2006), drop-off and buy back centers (Matete and Trois, 2008) and organization of the informal sector (Sharholy et al., 2008).

Waste management is also affected by the aspects or enabling factors that facilitate the performance of the system. They are: technical, environmental, financial, socio-cultural, institutional and legal.

Literature suggests that technical factors influencing the system are related to lack of technical skills among personnel within municipalities and government authorities (Hazra and Goel, 2009), deficient infrastructure (Moghadam et al., 2009), poor roads and vehicles (Henry et al., 2006), insufficient technologies and reliable data (Mrayyan and Hamdi, 2006).

Matete and Trois, 2008 and Asase et al., 2009 respectively suggested that the factors affecting the environmental aspect of solid waste management in developing countries are the lack of environmental control systems and evaluation of the real impacts. Ekere et al. (2009) proposed that the involvement of the population in active environmental organizations is necessary to have better systems.

Municipalities have failed to manage solid waste due to financial factors. The huge expenditure needed to provide the service (Sharholy et al., 2007), the absence of financial support, limited resources, the unwillingness of the users to pay for the service (Sujauddin et al., 2008) and lack of proper use of economic instruments have hampered the delivery of proper waste management services. Sharholy et al. (2008) indicated that the involvement of the private sector is a factor that could improve the efficiency of the system.

It is generally regarded that waste management is the sole duty and responsibility of local authorities, and that the public is not expected to contribute (Vidanaarachchi et al., 2006). The operational efficiency of solid waste management depends upon the active participation of both the municipal agency and the citizens, therefore, socio cultural aspects mentioned by some scholars include people participating in decision making (Sharholy et al., 2008), community awareness and societal apathy for contributing in solutions (Moghadam et al., 2009).

Management deficiencies are often observed in the municipalities. Some researchers that have investigated the institutional factors that affect the system have come to the conclusion that local waste management authorities have a lack of organizational capacities (leadership) and professional knowledge. Besides they concluded that the information available is very scanty from the public domain (Chung and Lo, 2008). The extremely limited information is not complete or is scattered around various agencies concerned, therefore, it is extremely difficult to gain an insight into the complex problem of municipal solid waste management (Seng et al., 2010).

Waste workers are associated to low social status (Vidanaarachchi et al., 2006) situation that gives as a result low motivation among the solid waste employees. Politicians give low priority to solid waste compared to other municipal activities (Moghadam et al., 2009) with the end result of limited trained and skilled personnel in the municipalities (Sharholy et al., 2008). Positive factors mentioned that improve the system are support from municipal authorities (Zurbrügg et al., 2005) and strategic plans for waste management

2.6 Impacts of solid waste in Developing Countries

There are the different impacts of solid waste in developing countries

2.6.1 Impact on the Surroundings

The closure of existing open dumpsites and the introduction of sanitary landfill is an urgent priority everywhere in the developing world. Even where complementary disposal technologies, such as composting or incineration (waste to energy plants), are practiced, a landfill is still required and is the backbone of any sustainable disposal system. Matching grants designed to encourage landfill investments and sustainable operations may be an appropriate instrument to consider, primarily because the environmental damages and benefits tend to spill over into neighboring municipalities and regions, or into underlying ground water resources (Daniel, 1999). This statement is true. The reason simply being because waste in the landfills is not properly managed, this results to the impacts to the environment.

Medina (2002) also supported the US Environmental Protection Agency. He states that pollution is not directly transferred from land to people, except in the case of dusts and direct contact with toxic materials. Pollutants deposited on land usually enter the human body through the medium of contaminated crops, animals, food products, or water. Land pollution can also damage terrestrial ecosystems, resulting in the deterioration of the conservation on and amenity value of the environment.

2.6.2 Impacts on Residents

According to Marshal (1995), open dumpsites are a major problem to the environment, especially on the air that the people inhale. Dumpsites emit obnoxious odors and smoke that cause illness to people living in, around, or closer to them. According to Wrensh (1990) dumpsites maybe a source of airborne chemical contamination via off site migration of gases and the particles and chemicals adhering to dust, especially during the period of active operation of the site. Contamination of soil and groundwater may lead to direct contact or pollution of indoor air for example in the case of volatile organic chemicals into basements of nearby residents and in the case of consumption of home grown vegetables as well. Wrensh (1990) further stated that in some sites, volatile organic chemicals have been detected in adored air of homes nearby dumpsites.

In a number of community health surveys, a wide range of health problems, including respiratory symptoms, irritation of the skin, nose, and eyes, gastrointestinal problems, psychological disorders, and allergies, have been discovered. A number of researches have been carried out in response to concerns from the public, often triggered by nuisances caused by emissions of volatile organic compounds. For example, according to Dolk (1997), dump sites closer to residential areas are always feeding places for dogs and cats. These pets, together with rodents, carry diseases with them to nearby homesteads.

The UNEPA (2006) state that wastes that are not properly managed, especially excreta and other liquids and solid wastes from households and the community, are a serious health hazard and could lead to the spreading of diseases. The report further states that unattended wastes lying around attract flies, rats, and other creatures that, in turn,

spread diseases. Normally, it is the wet waste that decomposes and releases a bad odor. The bad odor affects the people settled next to the dumpsite, which clearly shows that the dumpsites have serious effects to people settled around or next to them.

Wastes from agriculture and industries can also cause serious health risks. Other than this, co disposal of industrial hazardous wastes with municipal wastes can expose people to chemical and radioactive hazards. Uncollected solid waste can also obstruct storm water runoff, resulting in the forming of stagnant water bodies that become the breeding ground of disease. Wastes dumped near a water source also cause a contamination of the water body or the ground water source. Direct dumping of untreated wastes in rivers, seas, and lakes, result the accumulation of toxic substances in the food chain through the plants and animals that feed on it (Medina, 2002). This clearly shows how waste disposal seriously affects the health of residents located closer to dumpsites.

The effect of solid waste disposal in African countries faces a great problem. It is imperative to note that Swaziland is planning to address the issue of solid waste disposal. The major problem of Swaziland is that, they are engaging in a long term plan, while damage is increasing every day. The National Solid Waste Management Strategy for Swaziland represents a long-term plan up to year 2010 for addressing key issues, needs, and problems experienced with waste management in Swaziland. The strategy attempts to give effects to the National Environmental Policy, the National Environmental Management Act of 2002, and the Waste Regulations Act of 2000. The focus of the strategy is to move towards a holistic approach in waste management, in line with the internationally accepted principles, but taking into account the specific

context of Swaziland, with regard to the institutional and legal framework, as well as land tenure and resource constraints. Integrated waste management, thus, represents a move away from waste management through impact management and remediation to a proactive management system that focuses on waste prevention and minimization (The National Solid Waste Strategy for Swaziland, 2003).

Dumpsites are known for their smelly and unsightly conditions. These conditions are worse in the summer because of extreme temperatures, which speed up the rate of bacterial action on biodegradable organic material. Most developing countries, like Swaziland, use such dumpsites rather than properly managed and environmentally safe landfills. Lack of capital and poor government policies regarding to wastes contributes to such conditions. There is therefore considerable public concern over the possible effects of dumpsites on the health of people living nearby, particularly those where hazardous waste is dumped.

Most solid wastes are disposed on the land in open dumps. Disposal of solid waste on the land without careful planning and management can present a danger to the environment and the human health. The environment should be clean and less polluted by all means. This means that waste should be managed at all costs to limit its effects to the environment (US Environmental Protection Agency, 2006)

2.7Theoretical and Conceptual Framework

2.7.1 Theoretical Perspective

The study will employ and was guided by Evolving the Theory of Waste Management

2.7.2 Evolving the Theory of Waste Management

The Theory of Waste Management is a unified body of knowledge about waste and waste management, and it is founded on the expectation that waste management is to prevent waste to cause harm to human health and the environment and promote resource use optimization. Waste Management Theory is to be constructed under the paradigm of Industrial Ecology as Industrial Ecology is equally adaptable to incorporate waste minimization and/or resource use optimization goals and values.

Prevention of waste creation is the main priority of waste management, which corresponds to the principal goal of waste management: conservation of resources. Moving toward waste minimization requires that the firm commits itself to increasing the proportion of non-waste leaving the process. It has been agued that, it follows from the laws of thermodynamics, that producing by-products is concomitant of a main product (Baumgärtner& de SwaanArons 2003). For this reason, industrial firms have to look beyond their factory walls, and seek for external utilization of their waste, in accordance with the principles of Industrial Ecology (IE). If we accept that waste minimization and resources us optimization is the most important objective of waste management (Pongrácz 2002), it is essential that WMT is to be considered together with IE, as resource use optimization considerations reach beyond the tradition scope of waste management.

2.7.3 Conceptual framework

The figure below shows three variables that are here under explained and on the way they are likely to simplify the understanding on the factors that lead to the problem of poor solid waste management.

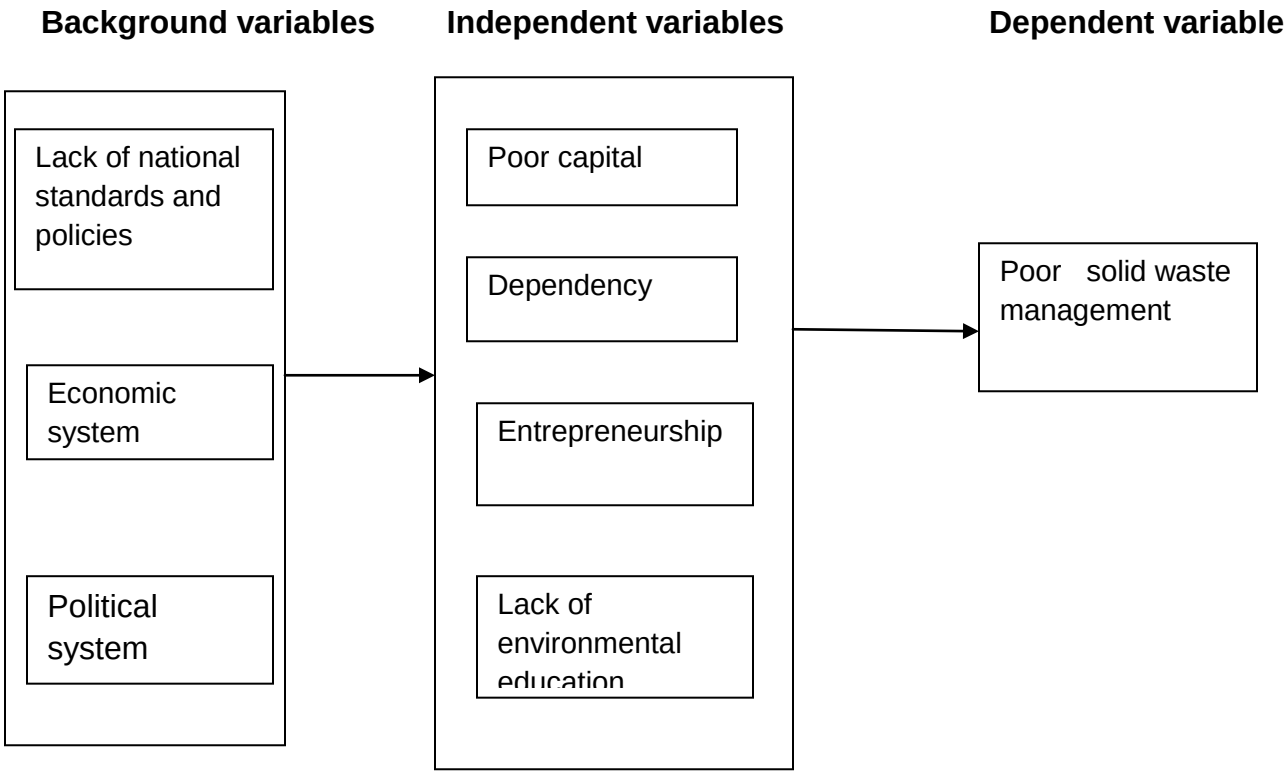


Figure 2: Conceptual framework on the causes for poor solid waste management

Source: Researcher Concept, 2014

Background Variables: These include lack of standard of solid waste management policy, economic system and political system that act as basis for giving direction towards solid waste management. No policy that is addressing solid waste management problems/challenges. The political and economic systems have not basically focused on solid waste management. Entrepreneurship works cause solid waste release.

Independent Variables: They include poor capital among local government, high rate of dependency on the budget, entrepreneurship works lead to poor solid waste management.. These are the results of background variables (lack of policy, Political and Economic System). No policy provides means on how poor solid waste management can be solved as the problem. The economic and political systems are not friendly to waste solid management.

Dependent Variable: This is outcome of independent variables and for this case it is poor solid waste management.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

The study covers the methods used in undertaking of the study. It includes study area profile, research design , study area, sample and sampling procedures, sampling methods, study population, sample size, validity, reliability, scope of study ,data collection techniques, data analysis and ethical considerations.

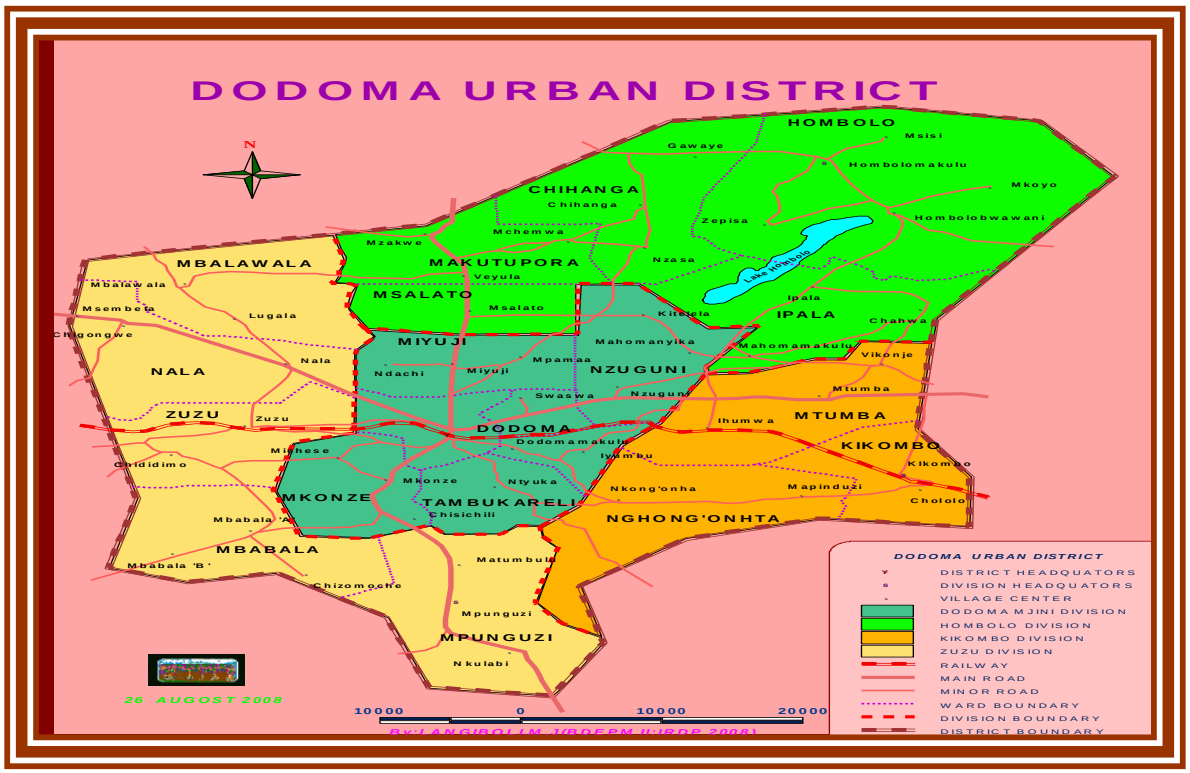
3.2 Study area profile

3.2.1 Geographical location

Dodoma region is in the central zone of Tanzania. It is between 4 to 7 latitudes south and between 37 longitudes east. The region is situated at a height of 3670 meters above the sea level.

The region is the 12th largest in the country and covers an area of 41310 square kilometers equivalent to 5% of the total area of Tanzania mainland. Dodoma municipality is bordered with Dodoma rural District in all sides. The main road passes through the District from Mwanza to Dar es Salaam and also the road from Arusha to Iringa Region. Dodoma Municipality has an area of 2576 square kilometers which has 6.3% of the region share and has four division, 30 wards and 42 villages which are all from the Dodoma Municipality.

Figure 2: Dodoma Urban District Map



Source: Dodoma District Council

3.2.2 Population

The municipality has a total population of 410,956 including 199,487 male and 211,469 female, and the average household size of 4.4 this is according to the 2012 census of Tanzania (URT 2013). Dodoma is the national capital city of Tanzania while Dodoma municipal is the capital of Dodoma region. Tanzania National Assembly was shifted to Dodoma in February 1999. Some of the government offices started to shift to Dodoma as well as some remain in Dar es Salaam. Which remain as commercial capital.

3.2.3 Climatic conditions

Dodoma is characterized by a semi-arid climate, plains, and lands mixed with sporadic hills. Rainfall is between 400 mm and 640 mm annually. The rainy season is between

November and March, and the dry season is from August to November, characterized by hot weather. May to July is the cool season. The windy season is between September and December. The average rainfall for Dodoma town is 570 mm, and about 85 percent of this falls in the months between December and April. Frequent sustained gaps between rainfall events have imposed a pattern of risk aversion in traditional agriculture and are a serious constraint to present efforts to improve crop yields. Temperature in the region varies according to altitude, but generally the average maximum and minimum is 31ºC and 18ºC respectively. From June to August, temperatures are at times very high with hot afternoons up to 35ºC and chilly nights on hilly areas down to 10ºC.

3.2.4 Vegetation cover

The characteristic vegetation of the region is of “bush” or thicket type, which is widespread throughout the area wherever the natural plant cover has been altered by biotic factors. Depressions and seasonally wet areas with impeded drainage support grasses and sometimes a mixture of grasses mixed with woody plants. Wherever the natural vegetation has been altered by agricultural activities, regenerating bushes mixed with annual herbs and grasses form a type of induced vegetation. Most of the hill ranges, steep slopes and protected forest reserves are covered by large woody plants, which form good watershed protective covers.

3.2.5 Economic activities

The main economic activities of the people in Dodoma Municipality are subsistence agriculture and livestock keeping comprising of 80% of the total population. The

remaining 15% depends on business including informal sector which employ mostly youth and women. About 5% of the population is employed in the public services sector.

3.3 Research Design

The research design constitutes the blueprint for the collection, measurement and analysis of data. It aids the researcher in allocation of limited resources by posing crucial choices in methodology (Cooper and Shindler, 2006:138). Cross-sectional design allows data to be collected once at a single point in time that can be used in descriptive analysis and for determination of relationships between variable (Kothari,2004). Hence, Cross sectional design was used. It was considered appropriate to collect within one single point of time in order to fulfill the objectives of the study.

3.4 Scope of Study

The study was conducted in Dodoma municipality focusing on all people found in their places. . Wards of Majengo and Uhuru were selected and people in these wards were visited for data collection.

3.5 Sample and Sampling procedures

3.5.1 Sampling Procedures

In sampling procedures the simple random sampling and purposive sampling methods were used to obtain samples for the study. Simple random sampling was applied because a population from which a sample was to be drawn constituted a homogeneous group that all experienced domestic waste from their homes; simple random sampling technique was generally applied in order to obtain a representative sample (Kothari 2004). The technique was found to be helpful in selecting 60 respondents from each ward that is Uhuru and Mazengo. Kothari (2004) asserts that

purposive sampling is a deliberate selection of particular units of the universe for constituting a sample that represents the universe. Purposive sampling was used in order to obtain the 6 key informants 2 Ward Executive Officers, 2 Ward Health Officer, 1 Environmental Officer and One Health Officer. This made a total sample size to be 126 respondents.

3.5.3 Sample Size

According to population and housing census (2012), Dodoma Municipality had a total population of 410,956 people. For statistical analysis, a sample size of 126 respondents was used to obtain information required in the study. 126 respondents were all people and their leaders in their areas whereas 2 respondents (Ward Executive Officer and Ward Health Officer) were leaders from Majengo ward; 2 leaders (Ward Health Officer and Ward Executive Officer) from Uhuru ward and 2 leaders (Environmental health officer and Health Officer) from the Municipality headquarters. Bailey, (1994) reported that for studies in which statistical analysis is to be done, a sample of 30 is required regardless of population size. For this reason, a sample size of 62 respondents from each ward were used and considered in this study.

3.6 Data collection methods

In this study open-ended semi-structured interview (face to face), written questionnaires, observation and documentary review techniques were used to obtain data relevant to the study's objectives and research questions in a conclusive way. Patton (2002) advocates the use of triangulation by stating, triangulation strengthens a study by combining methods. This means using several kinds of methods or data, including using both quantitative and qualitative approaches.

3.6.1 Primary Sources of Data

Primary data were collected in the field by using interview guides, questionnaires and observation guides. The open-ended semi structured interviews were used for gathering data from the key informants such as the Ward Executive Officers, Ward Health Officers, Municipal Health Officers and Municipal Environmental Officer. Questionnaires were used to collect the required information from respondents of Majengo and Uhuru wards. However, observation was used and employed in the field to tape information about concerning waste collection and dumping.

3.6.2 Secondary Source of Data

A review of documents related to this study was conducted in order to cross- check and complement the information obtained from primary data. Secondary data for this study were collected through library and internet search, other data were collected from the municipal office, District Hospital Officer. Here both published data and unpublished data about the waste management and the impact of waste to health were reviewed.

3.7 Data Collection Techniques

Data collection techniques allow systematic collection of information about objects of study (people, objects, phenomena) and about the setting in which they occur. In the collection of data, we have to be systematic. If data are collected haphazardly, it will be difficult to answer the research questions. Data were collected through the following data collection techniques: Documentary reviewing, observing, interviewing (face to face) and administering written questionnaires.

3.7.1 Data Collection Instruments

The following instruments were employed in order to gather adequate information about the study. The data were collected through Documentary review checklists, interview guide, questionnaires and observation. The advantages of using a combination of instruments are to make the data more valid and reliable, since the complementary nature of multiple methods can counteract their respective shortcomings. However, researchers often use a combination of flexible and less flexible research techniques (Cohen & Crabtree, 2006). Hence, using multiple methods can help facilitate deeper understanding of the phenomenon and increase the reliability of the study.

3.7.1.1 Interview Guide

An interview is a data collection technique that involves oral questioning of respondents, either individually or as a group. Under this technique of data collection there were a direct contact between researcher and respondents (Adam and Kamuzora, 2008). The interviewer (researcher) and respondent (interviewee) were engaged in oral questioning and telephone interview. However, there were three types of interviews, namely structured, semi-structured and unstructured interview.

This study employed open ended semi-structured interviews for gathering data from Ward Executive Officer, Ward Health Officer, Municipal Health Officer and Municipal Environmental Officer. The guides for interview questions are included in the appendices (see Appendix III).

Open-ended interviews were chosen in order to collect data in depth data about waste management in the wards and in Dodoma municipality. The key informants were

selected purposely because of being endowed with vital information relevant to this study.

Yin (2003) commended the use of open- ended interviews as it allows discussion to flow and show the complexities that exist uniquely to a context or may give rise to patterns across the contexts. Moreover, the method was considerably flexible, had wide coverage, high respondents rate, appreciation of non verbal and thus enabled the researcher to probe a deeper understanding of the interviewee's experiences, feelings and perspectives (White,2000). Furthermore, in semi-structured interviews, participants were able to relevant information in a natural way and had the opportunity to qualify their answers and explain the underlying meaning of their responses in detail.

3.7.1.2 Questionnaires

Questionnaire is the most widely used techniques in our country. It involves the written down items to which the respondent individually responds in writing. White (2002) states that questionnaire is regarded as a series of questions, each one providing a number of alternative answers from which a respondent can choose. The method enabled the respondents to disclose more on a questionnaire as it did not involve talking to other persons. It also enabled the researcher to collect a lot of information within a short time.

For the purpose of this study, questionnaires with open-ended questions and closed questions were administered to all respondents from Uhuru and Majengo wards (Appendix II). The method was appropriate used to collect data that could not be gathered through other research instruments. It also enabled the researcher to collect a lot of information within a short time. All respondents managed to return their

questionnaires in time, because the questionnaires were administered to respondents during the day time.

3.7.1.3 Focus group discussion,

According to the nature of the study, focus group discussion was done, where by group of six to ten people from each ward was conducted. According to Krueger (2006), the purpose of focus group discussion is to gain knowledge about a particular issue by interviewing a group of people directly affecting them.

In this study, focus group discussions have been facilitated by means of open- ended questions related to the research objectives, in order to allow study populations to answer based on their best experience and practices. In qualitative research, guide questions are employed to give participants the opportunity to respond in their own words by evoking responses rather than forcing them to choose from fixed responses (Nkwi *et alia*, 2001). One of the advantages of focus group discussions is that study is provided with a great opportunity to appreciate the way people see their own reality and hence get closer to data (Wong, 2008; Kruger & Casey, 2009). There is no consensus on number of participants for focus group discussion. Campbell (2007) recommends 6 – 10 participants as ideal number for focus group discussion to take place for one or two hours.

3.8 Validity and Reliability

3.8.1 Validity

Validity refers to the extent to which an account accurately represents the social phenomena to which it refers. It is concerned with whether measurements provide

information needed to answer research questions (Cooper& Schindler, 2003)**.** Thus, the researcher applied the content and face type of validity to measure the validity information provided by the respondent's through questionnaires.

Also researcher used Kiswahili and vernacular language where necessary so as to build confidence to respondents in providing information and to easy communication between researcher and respondents.

3.8.2 Reliability

Reliability refers to quality of measurement that leads to repeatability and accuracy of the answers to the questions. Reliability is the extent to which the study findings will be the same if the research will be repeated with a different sample of subject (Veal, 1997). To increase reliability and minimize measurement error, pre-testing of the questionnaires was conducted to six participants before full scale data collection so as to ensure that questions are understandable and mean what they were intended to. Also, to increase reliability data was collected by using multiple methods including questionnaires, focus group discussion, observation, interview and documentary review so as to overcome the errors.

3.9 Data Analysis

Informations obtained from the study were processed using Ms Excel and analysed using SPSS. Results were summarised and presented both qualitatively and

quantitatively using frequencies, tables, graphs and charts to verify the effectiveness of decentralised solid waste management scheme in Dodoma municipality.

3.10 Ethical Issues

All reasonable efforts were made to ensure the ethical treatment of respondents, and data are gathered sufficiently. Respondents' involvement was totally voluntary, and the option to withdraw at any time during the study was communicated to respondents. The researcher was confident that a reasonable degree of anonymity was assured for all study respondents and that no unusual risks existed for any respondents.

According to Stake (2005), Research studies often deal with matters that are of public interest but for which there is neither public nor scholarly right to know. Stake further observed that, a qualitative researcher must remember that he or she is a guest in the private spaces of the study participants and proceeds with strict ethical care.

The researcher ensured the trust from respondents by assuring the confidentiality by obtaining all relevant permission, Yin, (1994).

Merriam (1998) cautioned, "Interviewing whether it is highly structured with predetermined questions or semi structured and open-ended carries with both risks and benefits to the informants". Participants may reveal things they never intended and feel that their privacy has been invaded. Others may gain increased self knowledge which may have positive or negative connotations for the individual.

From that point of view, researcher communicated to respondents about benefits of the study particularly to get knowledge on the effectiveness of decentralized solid waste

management scheme in Dodoma Municipality, and advised the respondents to be free to withdraw from participation at any time, or change their comments once they noted the risks of the study.

The following steps were taken to protect the anonymity of the study respondents:

- Voluntary, informed consents were provided to all interviewees.
- Survey papers to be filled by respondents were labeled by numbers, rather than by names.
- Indicators that identify the situation or participants were removed or changed.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.0 Overview

This chapter is basically designed to present and discuss the information obtained from the field. Discussions of the findings are based on the research objectives. Data were obtained through field survey and interview methods that involved structured questionnaires and interview guide. Data presented are matching with specific objectives of the study including, (i) To identify strategies at which local government use to implement the policy of solid waste management in Dodoma municipality (ii)To determine the effects of solid waste management land strategies on reducing solid waste disasters.(iii)To estimate the extent of waterborne diseases as a result of rampant solid wastes disposal in Dodoma municipality.

4.1 Profile of Respondents

The profile of respondents serve the purpose to provide brief description that summarizes the characteristics of people involved in the study. It was imperative important to examine the profile of respondents so as to grantee the reliability of their responses. Therefore, the study had to look into some information such as sex, age, marital status and education level of respondents, so as to understand how they influence nature and types of responses. In this regard, profile of respondents provides the parameters with which analysis of responses is based on for this chapter and in the subsequent chapters.

4.1.1 Distribution of respondents by sex

Respondents were asked to indicate their respective sex in order to ensure that, analysis considers cross checking of opinions based on issues that may be influenced by sex of respondents. Data presented in Table 4.1 below show that the number of female respondents by 16. Out of 126 participants who filled in the questionnaires and those who were interviewed, female respondents were 71 (56.3%) while that of males were 55(43.5%). Sex of an individual is used to determine the role which a person should be subjected. Based on gender equality perspective, women and men should perform similar roles relating to socio-economic development of particular society. From these findings, it implies that females are likely to be the main participants in domestic waste collection and management in the study area. However, there is high disparity between women and men, therefore it can be said that there is no gender balance on waste collection in the study area

Figure 4.1: Distribution of respondents by sex

Sex	Frequency (n=126)	Percentages (%)
Male	55	43.7
Female	71	56.3
Total	**126**	**100**

Source: Field findings, 2014

Regarding the influence of sex on solid waste management, this reflects the true situation that domestic waste from houses like remains of foods and other garbage's the main collectors and making cleanliness around the houses are women especially who are normally cooks as well at their homes. However, females are also

environmental keepers around their houses therefore they are the main stakeholders who are responsible for the management and preservation of solid waste. On gender base, culturally and historically women are the ones to deal with home activities not men.

4.1.2. Distribution of respondents by age group

Results on the distribution of respondents based on age group are shown in Table 4.2. It was found that respondents with ages of between 30 to 35 years dominated in the study area totaling 55(43.6%) of all age groups found in the study area. This group is regarded as heads of the family who are active to carry out the supervision on how to keep environment at their homes clean compared to youths of age between 15 to 20 and 20 to 25 who composed 20(15.8%) and 29(23%) respectively from the study area. These are believed not to own their own houses instead a large number of them live in renting houses where the heads of the houses are the controller on the waste management at their homes. However, the age between40 to 45 was composed of 12(9.5%) of respondents. An age has an influence on the socio-economic activities in a given society. These results indicate that majority of respondents who participate in solid waste management are in the productive age group and that had families with responsibilities as well had energy to participate in solid waste management at their families level.

Table 4.2 Distribution of respondents by age group

Age	Frequency(n=126)	Percent
15-20	20	15.8
20-25	29	23
25-30	10	7.9
30-35	55	43.6
40-55	12	9.5
Total	**126**	**100.0**

Source: Field findings, 2014

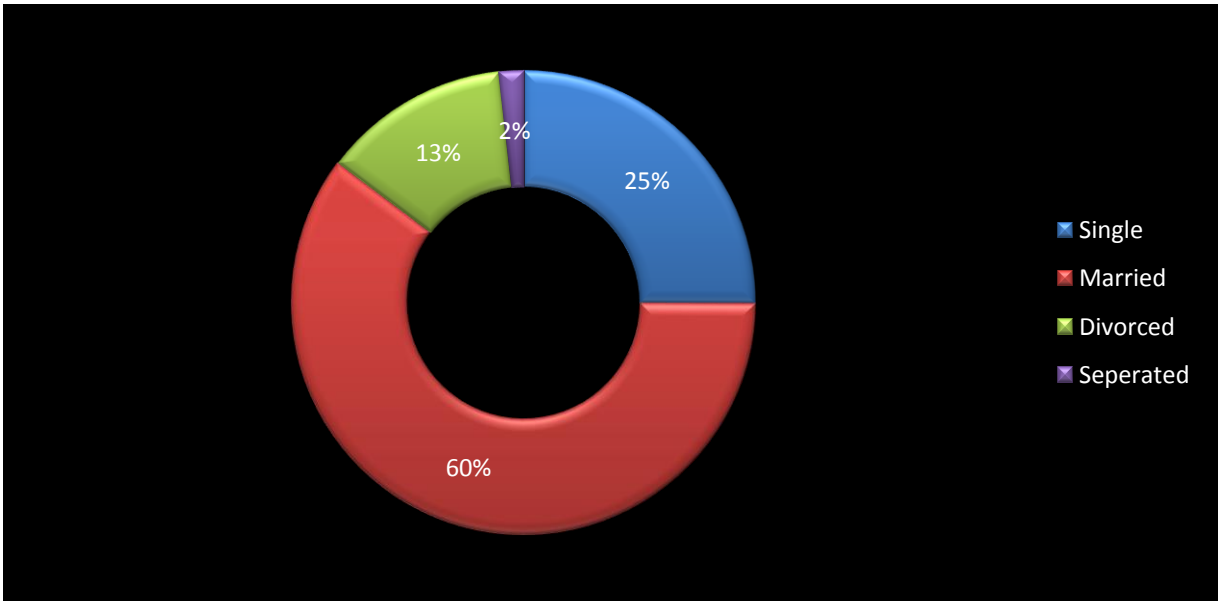
4.1.3. Distribution of respondents by marital status

It was found that the majority of the respondents were married 76 (60%) compared to 16(13%) of the respondents who were divorced and single (Fig.4.2). The need for enough earnings to sustain family members and availability of family labor might have contributed to the involvement of large proportion of married respondents in solid waste management compared to the single respondents who are rarely pressurized by family responsibilities and have low release of solid waste materials at their homes. Chung and Lo, (2008) reported that the lager the family the larger the release of solid waste in the streets, but among the married couple the ones to deal with these waste collection from their are more women and children in many areas.

The presence of small proportion of divorced and separated individual suggests that household based violence in the municipality is minimal. But this might have been caused by poor management of solid waste for women at their homes that may have led to the occurrence of divorces and the family to separate.

Since the majority of respondents are of married there is a great potential of population growth in future and consequently accelerated the preservation of the environment through solid waste management schemes that are provided by the municipal officers. However, also may lead to the increase in number of population that will lead to the increase of solid waste in streets that call upon the attention to the municipality on this in future. DTU (2003) reported that rapid population increase exerts more pressure for expansion of solid waste in the environment.

Figure 4.2. Distribution of respondents by marital status



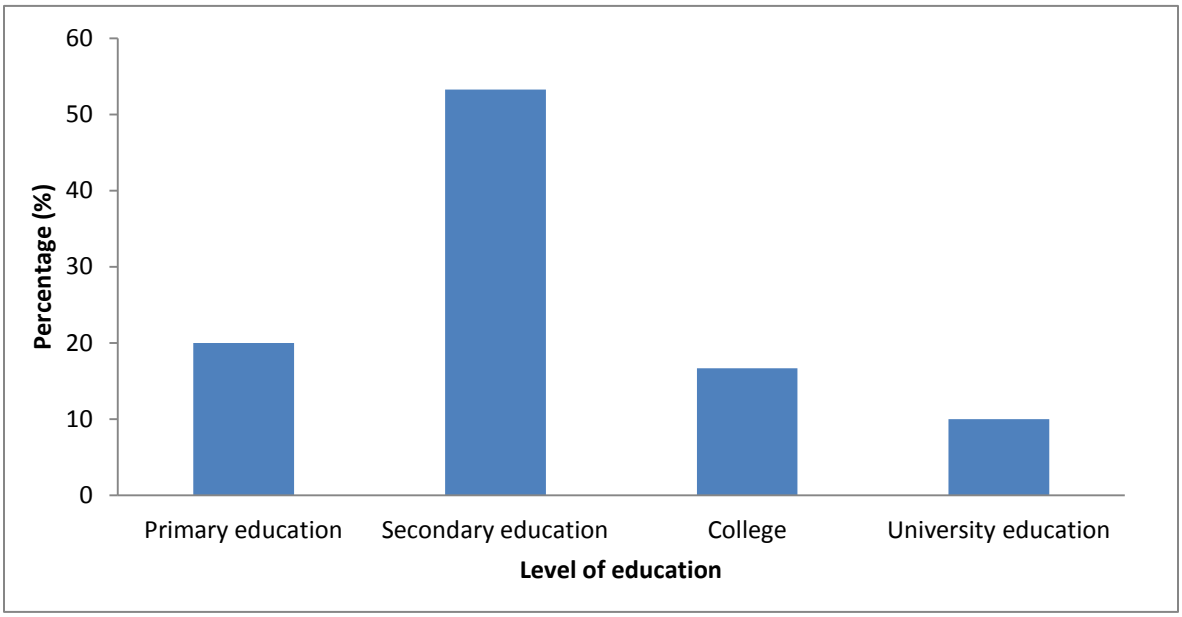
Source: Field findings, 2014.

4.1.4. Distribution of respondents by education level

It was found that most of youths in the study area had secondary school education by 53.3% compared to 16.7%, 20% and 10% of college education, primary school education and university education (Fig.4.3). This implied that education policy on ward schools that is being implemented since 2006 has produced many form four secondary

school leaders who have failed to advance to higher education levels. High school fees and poor infrastructures to support other forms of education might have been the major reasons for low proportion of individuals with other forms of education as well.

Figure 4.3 Distribution of respondents by education level



Source: Field findings, 2014

The respondents' low level of education implies that their capacity to attract white color jobs is low. These implies that a large number of people participate in agriculture as well in small business which release solid waste which have to managed from the place where they are released to the dumping area.

4.2 The strategies at which local government use to implement the policy of solid waste management in Dodoma municipality.

LGAs are the main implementers of the National Environment Policy. It was noted that the role of the LGAs in the achievement of environmental policy goals as recognized by the National Environment Policy includes oversight on planning processes, and

establishing local environmental policies and regulations, enhancing the participatory role of local governments and the communities in environ mental protection, building partnerships with the local communities in environmental management, mobilizing resources and ensures co-ordination for effective use of natural resources.

4.2.1 Policy that guide municipal on solid waste management

It was revealed from respondents that the Dodoma municipality is guided by regulations like provision of punishments of paying 5000 Tshs if a person does not collect solid waste around the house and streets. When asked from respondents if they know any policy that a municipal has on solid waste management 82(68.3%) of respondents affirmed to have been informed about this information (see Table 4.3).

Table 4.3 if there is a policy that guide municipal on solid waste management

Response	Frequency	Percent
Yes	82	68.3
No	38	31.7
Total	**120**	**100.0**

Source: Field findings, 2014

From the interview conducted with key informants. It was revealed that the municipal solid management was being guided by National Environmental Policy of 2008. However, from the main National policy it was affirmed that all the sub strategies or policies in the municipality are guided by main objectives from the National Environmental Policy which are to:

"*ensure sustainability, security 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."*

"to prevent and control 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 the unique ecosystems of Tanzania; to improve the condition and productivity of degraded areas including rural and urban settlements in order that all Tanzanians may live in safe, healthful, productive and aesthetically pleasing surroundings; to raise public awareness and understanding of the essential linkages between environment and development, and to promote individual and community participation in environmental action; 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 as cited in sub 18 of chapter three in National Environmental Policy 2008".

From the above objectives the leaders from the municipality affirmed that they had their objectives at the municipal level that were being guided by the policy, this is because the objectives were designed targeting on what the National Environment Policy intended to archive. The main objectives at the municipal level were mentioned by six key informants as shown on table 4.4.

Table 4.4 Objectives that guide the municipal on solid waste management

Strategies	Frequency (n=6)	Percent (%)	No response	Percent (%)	Total Freq	Total Percent (%)
Public sensitization on solid waste management	04	66.6	02	33.3	06	100
To involve community on the environmental cleanness	05	83.3	01	16.6	06	100
To remove un official waste collection points	02	33.3	04	66.6	06	100
To involve other stake holders on the waste management	03	50	03	50	06	100

Source: Field findings, 2014

It was reported by majority of leaders that the community is being involved on the environmental cleanness as the objective among the municipal designed objectives on solid waste management. Here the community participate in environmental cleanness whereby they contribute 1000 Tshs per month as the fee for the groups who go round the street with wheel bellow collecting waste. However, public sensitization on solid waste management was also mentioned by 66.6% of leaders being among the objective that is being implemented in the municipality. The removal/or termination of unallocated waste collection points was affirmed by 33.3% of municipal leaders. It was found that all unwanted waste collection points were terminated. It was reported that there is a developed sanitary land fill at Chidaya area which is 15km from Dodoma town near Mvumi road. Furthermore, the solid waste

collection points in Dodoma town were three which were Chang'ombe, Mlezi and Area D. From these cites the waste are carried by trucks to the dumping cite which is in Mbwanga 7km from Dodoma town. Moreover, only 40 large street waste bins were found in urban area. However, 50% reported that there is the involvement of other stake holders on the waste management. These stake holders were private sectors that deal with collection of waste by trucks to Chidaya which is the dumping area.

Figure 4.4 Mlezi solid waste collection point

Source: Field survey photo 2014

4.2.2 Ways that municipal use to collect solid waste

It was revealed that waste collected from waste generators to the collection points by the municipal council were 39 tons of waste and by CBOs were 120 tons per day. The general waste generated per day was 305 tons whereby in urban areas 159tons and in rural areas was 128 tones and recyclable waste 17 tons (Municipal Environmental Officer, 2014). It was revealed by different respondents from Uhuru and Majengo wards that there were different ways used to collect waste in the municipality such as people rounding with wheel bellow, a family gathering the waste and taking them to dumping area, through street groups and local points around the houses (Table 4.5).

Different ways were reported like groups rounding with wheel bellow were reported by 46 (38.3%) of all respondents that these were collecting waste from houses whereby move from one house to another collecting solid waste in streets to solid waste collection points which are at Mlezi, Area D and Chang'ombe . From these collection points the waste are carried by the trucks to dumping cite that is in Mbwanga area. As MEHO reported that

> "*Among the ways used to collect solid waste is the use casual labor that use wheel bellow rounding in streets from one house to another house whereby now there are casual labor manpower of 124 people and technical staffs that supervise these casual labor 30 people all these operate in urban areas.*

Figure 4.4 Casual labors dumping solid waste at Mlezi solid waste collection point

Source: Field survey photo 2014

The other way that was used to collect solid waste was reported that was dinging local pits around the houses whereby the solid waste was dumped there and when the pit becomes full was covered with soil and another pit dug again on the other area. This was reported by 14(11.6%) respondents who were asked this question (Table 4.5). This was reported to be the way that is highly discouraged by health municipal leaders.

Figure 4.5 Pits dug around the houses to dump solid waste

Source: Field survey photo 2014

Trucks were another way that was mentioned by 16.6% of respondents. The trucks were mentioned to be used to collect solid waste from the solid waste collection points which are Chang'ombe, Mlezi and Area D whereby from these areas the solid waste are taken to Mbwanga which is 7km from Dodoma town. As reported by MEHO,

> *"The trucks are used to collect solid waste from the collection points like Chang'ombe, Mlezi and Area D to Mbwanga now but later will be dumped to Chidaya area that is 15km from Dodoma town. However the municipality has one truck and one wheel loader"*

Streets groups were mentioned by 10(8.3%) of respondents that these groups participate in collection of these solid wastes to collection points or to street bins. It was

mentioned that these are known as CBOs which are Community Based Organizations. As MEHO clarified that,

> "*There are 17 CBOs that operate in the urban area who are active now on solid waste collection and there are 40 street bins whereby the solid are waste are deposited there so as they can be carried by trucks to Mbwanga area"*.

Table 4.5 Ways that municipal use to collect solid waste

Ways used	**Frequency**	**Percent**
Trucks	28	23.3
People rounding with wheel bellow	46	38.3
You gather them and take them to dump	22	18.3
Through street groups	10	8.3
Local pits around the houses	14	11.6
Total	**120**	**100**

Source: Field findings, 2014

Furthermore, Majengo Ward Executive Officer on waste collection also reported that

> *"It involves door to door collection done by a community based organizations (CBOs) employed to serve the purpose. There is terms of agreement between CBOs and Dodoma municipal council, whereby the CBOs has to pay 10,000/= Tshs to the council, While CBOs has to collect monthly contribution from the households as per by laws established by the municipal*

council on 2005. This is the only source of income to the CBOs that enable them to cover the cost of running day to day activities such as wages and buying hand push cars as well as repairing and maintenance The door to door collection is done on Monday. Wednesday and Saturday." where, wastes collected is sent to the collection points. There is four collection points which are situated at Kiwanja cha ndege, Bahi road, Mlezi and chang'ombe.168 tons of crude wastes are collected per day in these collection points.

4.2.3 Methods used to manage solid waste

The waste generated end up in the environment in an unacceptable ways of disposal which accentuates environmental and public health risks. Consequently, it was reported that different diseases attended in health facilities in the country are water and sanitation related. Different methods were reported by municipal leaders who were interviewed (Table 4.6). Fifty percent of respondents affirmed that recycling method was used especially the plastic bags. This was reported as a process to change waste materials into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce air pollution by reducing the need for conventional waste disposal, and toxic gas emissions as compared to plastic production. In Dodoma municipality the plastic bottles were the ones reported as the waste materials that are mainly recycled.

Figure 4.6 Plastic bottles ready to go for recycling

Source: Field survey photo 2014

Incineration was reported by 16.6% of respondents as one of the methods used in different areas in the municipality especially in hospitals and in other institutions. It was reported as one of the most common waste treatments. This involves burning of waste material. The incineration process converts wastes into ash, flue, gas, water vapor and carbon dioxide. One among the six municipal leaders reported that

> "*Incineration method has a number of advantages such as it quickly reduces waste volume, lessens transportation costs and decreases harmful toxic gas emission*

Figure 4.7 The place of burning solid waste through incineration process

Source: Field survey photo 2014

Table 4.6 Methods used to manage solid waste

Methods	Frequency	Percent
Recycling of solid waste	03	**50**
Incineration of solid waste	01	**16.7**
Open burning	02	**33.3**
Total	**06**	**100**

Source: Field findings, 2014

It was reported by 33.3% of respondents that the method used was open burning is another method which involves burning waste materials in a way that causes smoke to be released into the open air directly without passing through a stack or chimney. This

particular method is regarded very harmful, environmentally, as the incinerators used in such process have no pollution control devices. As MEHO reported that

> *"The harmful gas released by this method of waste treatment include, carbon monoxide, articulate matter, volatile organic compounds, polycyclic aromatic compounds, and ash. Still this method is practiced by many local authorities to reduce volume of wastes very quickly, without spending much collection and transportation costs".*

4.2.4 Strategies used to implement the policy.

The strategies used to implement the Policy that is used are shown on Table 4.7. The strategies mentioned were formulation of bylaws affirmed by 74% of respondents. These bylaws guide the people in the municipality on how to handle and collect solid waste around the municipality. These bylaws are elaborated in Dodoma Municipal Commission (Solid Waste Management) (Collection and Disposal of refuse) bylaws of 2005 which is under the local government (Urban Authorities Act), 1982 (No.8 of 1982). Under these bylaws there are payments or charges that a person is expected to pay under number 9.as cited that

> *"There shall be paid by every household or occupier a refuse collection of a charge and in such manner as provided in Second Schedule to these by charge laws. Any person who fails to pay refuse collection charges on time shall be liable to a penalty of 25% of the refuse collection charge and in each case s1:all also be guilty of an offence under By-law 19 hereof*."

However, it also reported by one among 120 respondents that

"No action is taken on the available bylaws despite the people to refuse of fail to implement what is needed to be done no action/penalty is taken to the people who do not comply to the bylaws, only 1000 Tshs is being collected from the people each month as the contribution or fees to waste collectors."

Involvement of community on environmental cleanness this was reported by 80% of respondents. The community is involved in solid waste management because of decentralization process that needs the community to participate in the process. Penalties charges to people who do not manage solid waste were also affirmed by 39.2% of respondents. The penalties were given in forms of money whereby a person who does not manage solid waste may be punished by the provision of money that is put as the penalty or may be sent to court of law. On the penalties allocated on the bylaws under number 19 for a person who fails or refuses to comply with these bylaws it is stated that

"Any person who refuses or fails to comply with the provisions of offence these By-laws, who obstruct on officer or agent or gives false information relation to any requirements of these By-laws shall be guilty of an offence. and shall be liable on conviction to a fine not exceeding- fifty. thousands shillings or imprisonment for a term not exceeding six months or to both such fine and imprisonment."

This is in hand with environmental management act implementation support program of 2009 part vii sub 50 (3) Any person who contravenes a prevention order commits an offence and shall on conviction, be liable to a fine of not less than five hundred

thousand shillings or to imprisonment for a term not exceeding one year and where that person fails to comply with a requirement specified in the prevention order within the time specified, that person shall be liable to a further fine not exceeding one hundred thousand shillings for every day or part of a day after the date specified in the order during which the offence is continued. It is was affirmed that even if the people are penalized the money is not used or it is not known where the money are taken to.

Involvement of other stakeholders on the waste management was also reported by 35% of respondents. Other stakeholders are private sectors especially CBOs that collaborate with the municipality. In Dodoma municipality especially in Uhuru and Majengo wards there are four groups or private sectors which are Mazingira women group, Jitegemee mazingira group, Comra Enterprises and Jipe Moyo (See Table 4.7).This is done under the Public Private Partnership policy (PPPs) that encourages private sector to intervene on terminating solid waste problem (URT, 2009).

Table 4.7: The number of groups that collect sewage around the Study area.

Name of group	**Ward**	**Service area**
Mazingira women group	Majengo	Kitunge and Mausi
Jitegemee mazingira group	Madukani	Relini
Comra Enterprises	Majengo and Chamwino	Soko la Majengo and Bonanza
Jipe Moyo group	Uhuru	Mji Mpya na Kati

Source: Municipal Data

Here each group has its area of collecting waste from the study area Mazingira women group collects waste from Kitunge and Mausi areas, Jitegemee Mazingira

group collects the sewage around Relini area. Comra Enterprises collects around Majengo and Bunanza market while Jipe Moyo group works around Mji Mpya na Kati.

Table 4.8 Strategies used to implement the policy.

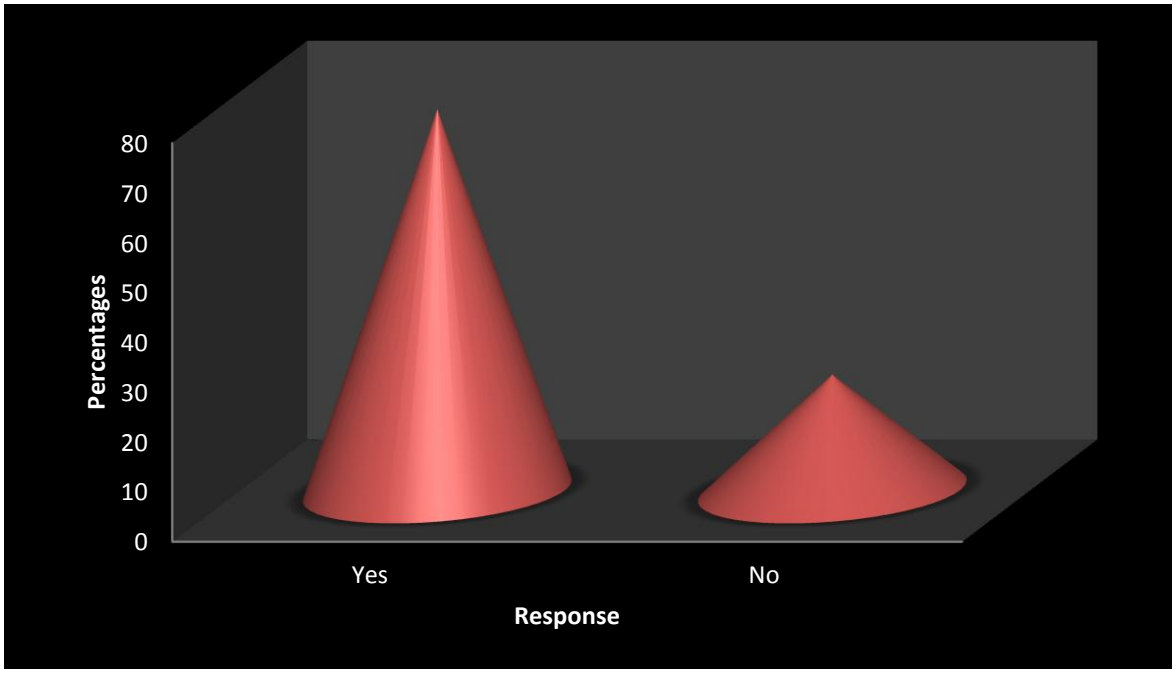
Strategies	Frequency	Percent	No respons	Percent	Total Freq	Total Percent
Formulation of by laws	89	74.2	31	26	120	**100**
Penalties charges to people who do not manage solid waste	47	39.2	73	61	120	**100**
Involvement of community on environmental cleanness	96	80	24	20	120	**100**
Involvement of other stakeholders on the waste management	42	35	78	65	120	**100**

Source: Field findings, 2014

4.2.5 Disease caused by improper management of waste

It was reported that there are diseases that are caused by availability of waste around the environment. When asked on this question 76% of respondents affirmed that there are these diseases while 24% of respondents affirmed that there were are no diseases that erupt (Figure 4.8).

Figure 4.8: If there are diseases erupting because of waste around the environment



Source: Field findings, 2014

The availability of a large number of respondents affirming that there are diseases this means that there are different types of diseases like typhoid, dysentery and Diarrheal diseases that occur in Dodoma municipality because of waste that are not collected from the environment.

Table 4.9: Typhoid Admitted Cases and Deaths

Years	**2010**		**2011**		**2012**		
Population	**2004,544**		**2163760**		**2163,760**		**Total**
	Males	**Female**	**Males**	**Female**	**Males**	**Female**	**Combination**
Admission cases on Typhoid	220	480	300	240	420	380	1820
Death	12	04	08	09	07	04	44

Source: Dodoma General Hospital Data, 2014

From Dodoma government hospital the typhoid admitted cases were 220 males and 480 females in 2010, in 2011 were 300 males and 240 females while in 2012 there were 420 males and 380 females. The once that passed away or deaths because of typhoid were 16 people in 2010, 8people in 2011 and 11people in 2012. About dysentery, it was affirmed that 60 people were admitted in 2010, 36 people in 2011 and 30 people in 2012. Diarrheal diseases were reported to have admitted 159 people at the government hospital in 2013. This shows that these diseases are mostly affecting people around the study area.

4.2.6 Types of diseases that erupt regularly

From table 4.10:Different types of diseases were affirmed by the respondents that erupt regularly in the study area due to remains of solid waste which are not managed well. Typhoid was reported by 86.6% of respondents whereby this is the bacterial disease spread through contact with food or water contaminated by fecal matter or sewage; victim's exhibit sustained high fevers; left untreated, mortality rates can increase this. Food can become contaminated with the bacteria by being washed in contaminated water or by being touched by an infected person with unwashed hands. Drinking water can become contaminated from raw sewage containing *Salmonella* Typhi which comes from the remains of solid waste which are not well managed.

However, 60% of respondents reported that cholera was another disease that erupts regularly due to remains of solid waste. A bacterium called Vibrio cholerae causes cholera infection.. This causes the body to secrete enormous amounts of water, leading to diarrhea and a rapid loss of fluids and salts. Contaminated water supplies are the

main source of cholera infection, although raw shellfish, uncooked fruits and vegetables these main be from the unmanaged solid waste. This was also reported by WHO (2008) that the first 10 cholera cases were reported in 1974 and since 1977, cases were reported each year with a case fatality rate (CFR) averaging 10.5% (between 1977 and 1992) .The first major outbreak occurred in 1992 when 18'526 cases including 2'173 deaths were recorded. (CFR 11.7%) In 1997, an epidemic which started an the end of January in Dar es Salaam accounted for 40'249 cases and 2'231 deaths (CFR 5.54%). Seven regions were affected and Vibrio cholera El Tor Ogawa was confirmed (WHO, 2008)

Table 4.10Types of water borne diseases that erupt regularly

Diseases	Frequency	Percent	No response	Percent	Total Freq	Total Percent
Typhoid	104	86.6	16	13.3	120	100
Bilharzias	56	46.6	64	53.3	120	100
Cholera	72	60	48	40	120	100
Dysentery	24	20	96	80	120	100

Source: Field findings, 2014

Dysentery was reported by 20% of respondents that this disease is an inflammation of the intestine characterized by the frequent passage of feces with blood and mucus. Like cholera, dysentery is spread by fecal contamination of food and water, usually in impoverished areas with poor sanitation. This comes from poor management of solid

waste that get contaminated with water especially in the areas like Dodoma whereby water system is a problem.

Moreover, bilharzias was another diseases to be reported by 46.6% of respondents as the erupting diseases this was reported to have been caused by extreme poverty of people whereby instead of managing the solid waste are remained uncovered that lead to contamination. Other causes were mentioned as unawareness of risks, inadequacy or lack of public health facilities, unsanitary living conditions where the solid waste are only thrown everywhere. Increase in number of people living in a town because as the number of people increase the number of solid waste increases as the number of people in Dodoma town has increased.

4.3The major effects of land strategies on reducing impact of solid waste disasters.

This objective shows the major effects of land strategies used on reducing impact of solid waste disasters. There are some ways that were found to have been used to reduce the impact of solid waste disasters like ways of reducing impacts of solid waste management.

4.3.1 Ways of reducing impact of solid waste management.

It was revealed that there were different ways that were being used to reduce impact of solid waste. This was affirmed by 55% of respondents who agreed on this (Table 4.9). These ways of reducing negative impacts of solid waste in the study area were also reported by leaders from the municipal that.

"*In the municipality we are developing sanitary land fill at Chidaya area and construction of 98 skip pads in urban areas. However, the solid are collected and transported to the specific areas of dumping. Recycling of solid waste, incineration of solid waste and Open burning are other good ways used to reduce impact of solid waste in the municipality of Dodoma"*(Municipal Health Officer).

It was also revealed by 30% of respondents who disagreed that there were no any good ways conducted or practiced in the area . This means the solid wastes are not properly managed which lead to negative impact to the environment. This was reported to have been caused by shortage of fund of managing solid waste.

Table 4.11: Ways of reducing impact of solid waste management.

Response	Frequency	Percent
agree	66	55.0
strongly agree	12	10.0
disagree	36	30.0
strongly disagree	06	5.0
Total	**120**	**100.0**

Source: Field findings, 2014

4.3.1 Effects of solid waste in Dodoma municipality

Solid waste disposal is one of those rare endeavors where success breeds anonymity. To the credit of local waste management agencies and contractors, their service is

highly inconspicuous in the municipality. This low profile belies the importance and complexity of efficient trash collection, and veils many impacts of municipal solid waste policy from everyday lives.

From table 4.12 respondents reported different impacts that come from solid waste. It was revealed that solid waste lead to eruption of diseases like cholera and typhoid which have been the main water borne diseases in the municipality. When solid waste are not well managed contaminate with water whereby lead to eruption of diseases.

However, air pollution was another effect reported by 9% of respondents whereby the respondents affirmed that the solid waste are collected to some areas and remain there without being transported to the dumping place. This has become the a problem especially in urban areas that they release bad smell which is very dangerous to the people living on those place. It was reported that solid waste especially around Majengo market are not carried in time something that result into a bad smell that make people not to live comfortable.

Table 4.12: Effects of solid waste in Dodoma municipality

Impacts	Frequency	Percentages
Eruption of diseases like cholera and typhoid	28	23.
Bad smell in some areas	11	09
Rise of conflict between municipal and community	18	15
Creation of employment	20	17
Destruction of plants	19	16
Increase of wild animals and birds	24	20
Total	**120**	**100**

Source: Field findings, 2014

Rising of conflict between municipal and the community members was another effect reported by 15% of respondents from the municipality. The conflict that occur between the municipal and community members is when the community members are being punished after not being implementing the ways or regulations given from the municipal headquarters. As well this occur due to some people living near the dumping areas if the solid waste are not treated in time release smell which make community people to react on this immediately.

The creation of self employment was also reported by 17% of respondents, it was affirmed that different urban dwellers of different age and sex deal with the collection of plastic bottles that are sold for recycling, this gives urban dwellers

money for sustaining their lives whereby one kilogram of plastic bottles is sold at the price of 400 Tshs. This has created self employment to different people who go round the streets collecting the plastic bottles. However, through the groups that are registered at the municipal for collecting waste such as Mazingira women groups, Jitegemee Mazingira group, Comra Enterprises and Jipe Moyo were reported to have created employment to around 85 employment to youths who have to go around with wheel bellow to collect waste in streets (See Figure 4.4).

Destruction of plants was also reported by 10% of respondents who affirmed that where the solid waste are accumulated like the dumping area, the plants around the place are destructed by the waste. It was mentioned that around the dumping sites such as Chang'ombe, Mlezi and Area D no vegetation is still existing there. Furthermore, 19% of respondents affirmed that there is the increase of wild animals like hyenas and birds like "Kunguru wa Zanzibar" and "Korongo" that stay around the dumping areas to searching for the domestic waste like food remains.

Figure 4.9 Number of birds around the dumping area.

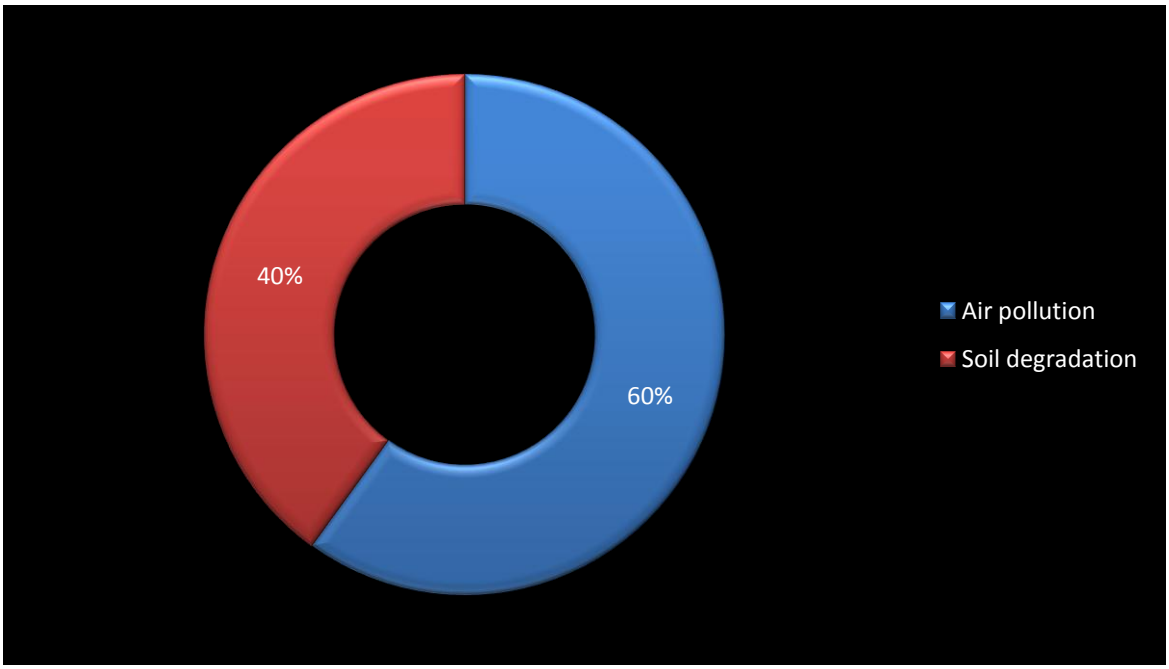
Furthermore, from the interview conducted from municipal leaders more effects were reported in Figure 4.9. From the interview conducted to six municipal leaders 60% of leaders reported that the main effect was air pollution that affect the air because of the gases released from solid waste. MEHO, Mr Francis Bugijika reported that

‘‘*Solid waste pollution is when the environment is filled with no biodegradable and non-compostable biodegradable wastes that are capable of emitting greenhouse gases, toxic fumes, and particulate matters as they accumulate in open landfills. These wastes are also capable of leaching organic or chemical compositions to contaminate the ground where such wastes lay in accumulation. Solid wastes carelessly thrown in streets, highways, and alleyways can cause pollution when they are carried off by rainwater run-offs or by flood water to the underground water tanks. Stronger evidences have connected the acceleration to the mounting presence of greenhouse gases, namely: Carbon Dioxide, Methane and Nitrous Oxide”*.

Furthermore, it was also reported that sold waste result into soil degradation as reported by 40% of respondents. It was affirmed that solid waste is complex because refuse consisting of various materials with different properties. Some of the components are stable while others degrade as a result of biological and chemical processes. Leach ate resulting from this is hazardous pollutant to the soil and ground water underlying. Leaching of this leach ate and heavy metals into the soil lead to the contamination of both soil and groundwater. This also ready to the destruction of plants and becomes more dangerous to human being resulting into cancer and eruption of

diseases, this may be caused by the use of ground water which is contaminated by pollutants.

Figure 4.10 Effects of solid waste in Dodoma municipality



Source: Field findings, 2014

4.4 The extent of occurrence of waterborne diseases from solid waste that remains without being collected in the municipality.

After the solid waste which are not well managed being contaminated into water were reported to lead to water borne disease. When asked if the water borne diseases from solid waste erupting regularly 60% of respondents affirmed that this was occurring regularly. It was only 40% of respondents who rejected this (Table 4.12). The types of diseases that were reported to have occurred regularly were cholera, typhoid, bilharzias and dysentery. The information from the Dodoma government hospital showed that the number of patients affected by the mentioned diseases were

reported to have been admitted even some passed away as shown on Table 4.9. Although there are some other factors that may have caused these diseases even improper managing of solid waste is among of the factors that accelerated this.

Table 4.12 If the water borne diseases from solid waste erupting regularly

	Frequency	Percent
Yes	72	60.0
No	48	40.0
Total	**120**	**100.0**

Source: Field findings, 2014

With regards to the issues of refuse collection and disposal, the Dodoma Municipal Council is among many Tanzania urban local government authorities (ULGA) which is facing a bigger problem of refuse accumulation heaps. This was reported by Uhuru Ward Executive Officer.

In regard to the explanation about the diseases that erupt in Dodoma like Cholera and dysentery the Principal Health Officer from General Hospital reported that

> *"Cholera survive for a long time in a place where there is high improper of faecal matter disposal. Therefore, due to improper management of faeces, this attracts housefly to feed on it and breed there. During feeding, the housefly which is the mechanical vector of the cholera causative agent, picks*

this agent with pores of its body to either food or water whereas, when human being eat or drink an infected food or water, acquire the diseases and within as short time, a patient starts to vomit and diarrhea a watery profuse diarrhea (known as rice water). But it is not urgent to the cholera to be spread by only houseflies; even human being managing the patient unhygienic ally can spread the disease while dysentery was explained as an inflammation of large intestine (colon), causing severe diarrhea, usually with blood and mucus. The disease is most often caused by the shigella bacillus and can give rise to epidemics. Also the disease spread by faecal contamination of food and water, where sanitation is poor"

Therefore, the poor management of solid waste participate in regular eruption of diseases although different ways of protecting this situation is done in the municipal as much efforts is forced to the proper managing of domestic solid in Dodoma mucipality.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This chapter presents a summary of the major findings of the study followed by conclusion, and recommendations. The overall aim of the study was to assess the effectiveness of decentralized solid waste management scheme in Dodoma Municipality.

5.2 Conclusion

It was found that the municipality was being guided by National Environmental Policy 2008 to manage solid waste management and by laws that were enacted 2005 . The municipality had objectives that guided it o n solid waste management like removal an official waste collection points. However, involvement of community on the environment of community on the environmental cleanness occupied 83% of all what was reported.

Ways used to collect solid waste were reported that there were at least five ways used which were by trucks people rounding with wheel bellow which was found to dominate other ways. Furthermore, other ways were people gathering them at home and take them to dumping place and through street groups as well as local pits around the houses. Different methods were reported to have been used to manage solid waste. These methods were recycling of solid waste, incineration of solid waste and open burning. Recycling occupied 50% of respondents.

However, different strategies were used to implement the policy of environmental preservation or solid waste. Seventy percent of reported formulation of by laws. Moreover, different diseases were identified to have been caused by sup proper solid

waste management the diseases were typhoid, bilharzias, cholera and dysentery. Finally, the water borne diseases were identified to have been erupted regularly were from poor management of solid waste.

5.3. Recommendations

On the basis of the findings of this study, the following recommendations are made:

a) **Policy guiding the municipal**

The municipal should construct the policy that guide the decentralized solid waste management. The policy will pave a way on how to overcome all problems that hinder solid waste management in local community.

b) **Community Participation**

The municipality should highly involve the community totally in solid waste management system that will help in giving the solution to the problem. This will result to the community to participate fully in community development and will make the community to feel that the projects are theirs..

c) **Additional of trucks**

The municipality should increases the number of trucks that are used to carry solid waste. This will result into reduction of solid waste that remain at the dumping places for long time because of the shortage of trucks.

d) **Pits dug around the houses**

The municipal leaders should implement the laws that do not allow a person to dig a pit near the house because this lead to eruption of diseases. This is caused by poor management of the pits that are dug near the houses which lead to the increase of flies that lead to eruption of disease like diarrhea, typhoid and others.

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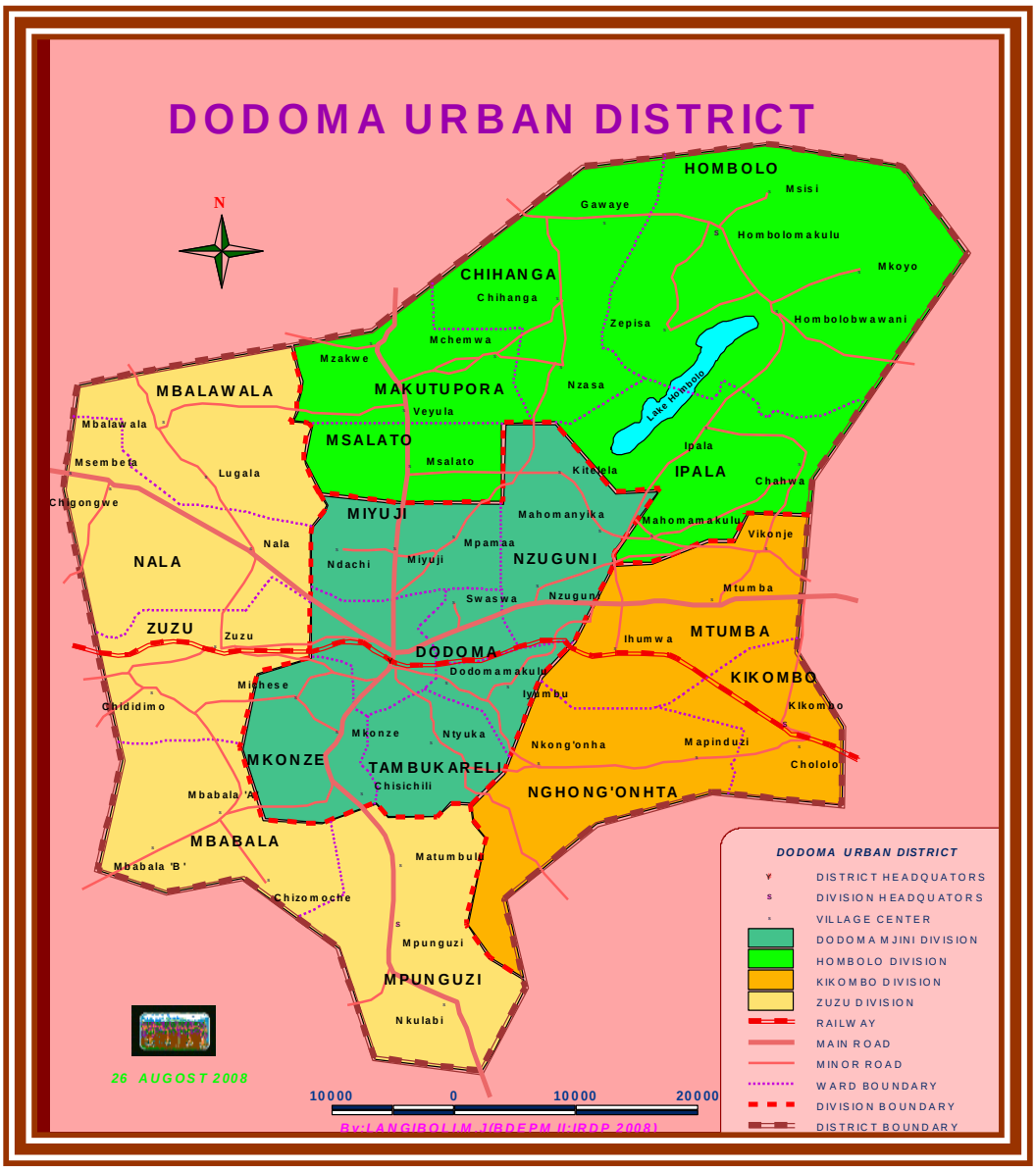
APPENDICES

Appendix I: Dodoma Urban District Map



Appendix II: Questions for local people in Dodoma municipality.

1. Sex

   (i) Male

   (ii) Female ☐

2. Age

   (i) 15 – 20

   (ii) 20 – 25 ☐

   (iii) 25 – 30

   (iv) 30 – 35

3. Marital status**.**

   (i) Single

   (ii) Married

   (iii) Divorced ☐

   (iv) Separated

   (v) Widowed

4. What is your highest level of education?

   (i) Informal education

   (ii) Primary school

   (iii) Secondary education ☐

   (iv) College

   (v) University

5. Do you know any policy that a municipal has on solid waste management

   i) Yes

   ii) No

6. What are the ways do municipal use to collect waste?
    i) Trucks
    ii) People rounding with wheelbarrow
    iii) You gather them and take them to the dump yourself.
    iv) Through street groups
7. Is the policy of waste management implemented in Dodoma municipality?
    i) Yes
    ii) No
8. Which do you think are the strategies used to implement this policy?

    _____

    _____

    _____

    _____

    _____-
9. Do you think there are diseases that are caused by availability of waste around the environment?
    i) Yes
    ii) No
10. W hat are those diseases?
    i) Typhoid
    ii) Bilharzias
    iii) Cholera
    iv) Dysentery

11. Dodoma municipality use positive ways of reducing impact of solid waste management?

    i) Agree

    ii) Strongly agree

    iii) Disagree

    iv) Strongly disagree

12. What do you think are the major effects ofsolid waste in Dodoma municipality?

    _____

    _____

13. Are the water borne diseases from solid waste erupting regularly?

    i) Yes

    ii) No

14. Do solid waste that remain without being collect affect the environment?

    i) Yes

    ii) No

    If yes how…….....

15. Are there solid waste that remains without being collected in municipality?

    i) Yes

    ii) No

16. If Yes how are those remains preserved?

    _____

    _____

Appendix III: Interview for administrative staff at Dodoma municipality

1 General Information

i) Name ……..

ii) Title …….....

iii) Date ……

2 Do you have any policy for solid waste management at the mucipality?

i) Yes

ii) No

4 If Yes how is this policy implemented?

_____

_____

_____

_____

5 Do you have any strategies that can be used to implement the policy?

i) Yes

ii) No

6 If Yes what are those strategies?

_____

_____

_____

_____

7 Do you think there are diseases that are caused by availability of waste around the environment?

iii) Yes

iv) No

8 W hat are those diseases?

v) Typhoid

vi) Bilharzias

vii) Cholera

viii) Dysentery

9 Dodoma municipality use positive ways of reducing impact of solid waste management?

v) Agree

vi) Strongly agree

vii) Disagree

viii) Strongly disagree

10 What do you think are the major effects of solid waste in Dodoma municipality?

_____

_____

_____

_____

11 Are the water borne diseases from solid waste erupting regularly?

iii) Yes

iv) No

12 Do solid waste that remain without being collect affect the environment?

iii) Yes

iv) No

If yes how…….....

13 Are there solid waste that remains without being collected in municipality?

14 Yes

15 No

16 If Yes how are those remains preserved?

_____

_____

_____

_____

Appendix IV: Questionnaires for Group Discussion.

1. What are the strategies used to implement policy for solid waste management at the municipality?

2. Is there any policy for solid waste management at the municipality?
3. What are the effects of solid waste?
4. What are the ways used to reduce impact of solid waste management?
5. What are the diseases that are from solid waste?
6. Are the water borne diseases erupting regularly?
7. Are there solid waste that remain without being collected?
8. How are they preserved?