ASSESSMENT OF COMMUNITY PARTICIPATION IN SOLID WASTE MANAGEMENT: THE CASE OF MBEYA CITY COUNCIL TANZANIA.

BY

MARIETHA NDELE MLOZI

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF ARTS IN RURAL DEVELOPMENT OF THE SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

2011

ABSTRACT

A study was conducted to assess the extent of community participation in solid waste management (SWM) in Mbeya City, Tanzania. Data were collected using both structured and non-structured interviews. Field observations and secondary data supplemented the data collected using questionnaires. Purposive sampling procedures were used to obtain three representative wards. At ward level, 60 respondents each from different households were picked at random for the study leading to a sample size of 180 respondents. The collected data were analysed using SPSS software. Results of the study indicated that more than 60% of the solid waste generated is of vegetable and food remains origin. The city authorities can only collect and dispose off 44% of the generated SW. The major limitations at household and community levels are lack of collection and storage facilities which could lead to serious health and environmental problems. Community members perceive SWM as a sole responsibility of local government authorities. Their perception towards SWM is quite low and their attitude in SWM is also unfavourable. It is, therefore, recommended that efforts should be directed towards training and awareness creation for purpose of enhancing their participation in SWM. The formation and strengthening of Environmental committees is crucial in order to increase the participation in SWM at a lower level. In any case, a strong link between the community and local government authorities should be created. For sustainable and meaningful SWM emphasis should be directed towards composting which should be carried out by site specific groups. This could be an attractive alternative in terms of production of fertilizer for the growing sub-sector of urban agriculture as well as income generation.

DECLARATION

I, Marietha Ndele Mlozi, do hereby declare to the Senate of Sokoine University of Agriculture, that this dissertation is my original work and that it has neither been submitted nor being concurrently submitted for degree award in any other institution.

_____ _____

Marietha Ndele Mlozi, Date

(MA. Candidate)

The above declaration is confirmed by:

_____ _____

Supervisor: Prof. Kimbi, G. G. Date

(Supervisor)

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ACKNOWLEDGEMENTS

I extend my sincere appreciation to all who contributed to the successful completion of this work. I am also grateful to extend special thanks to my supervisor Prof. Kimbi, G.G. for his useful support and guidance at all stages of preparing this dissertation. This dissertation will make me proud throughout my academic life. May the almighty God bless him.

My sincere appreciation is also extended to the Government of Tanzania through the Embassy of Belgium; Belgium Technical Cooperation (BTC) for supporting my study. I also thank the extension officers in the Department of Health in Mbeya City Council and other officials in Mbeya District Council for their cooperation during conducting this study. My special thanks also go to all the academic members of staff from the Institute of Development Studies of Sokoine University of Agriculture for their advice during the entire period of the study.

My special thanks go to my parents, brothers, sisters and relatives for their moral support during the whole period of study. Finally my appreciations goes to my loving husband Godwin H. H. Mwamkinga, my children Itika, Elizabeth, Anyelwisye and Baraka for their tolerance while I was away pursuing this study.

DEDICATION

I dedicate this work to Almighty God, my parents, the late Ndele Mlozi and Elizabeth Magomelo Mlozi who laid the foundation for my education.

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LIST OF ABBREVIATIONS AND ACRONOMY

CBOs	-	Community Based Organizations
CORE	-	Center for Organic and Resource Enterprise
FGD	-	Focused Group Discussion
HH	-	Household
HBS	-	Household Budget Survey
LGA	-	Local Government Authority
MSEs	-	Medium and Small Enterprises
NBS	-	National Bureau of Statistics
NGO	-	Non Governmental Organization
NSGRP	-	National Strategy for Growth and Reduction of Poverty
SPSS	-	Statistical Package for Social Sciences
SUA	-	Sokoine University of Agriculture
SW	-	Solid Waste
SWM	-	Solid Waste Management
TSHS	-	Tanzanian Shillings
UN	-	United Nations
UNEP	-	United Nations Environmental Program
URT	-	United Republic of Tanzania
US$	-	United States Dollar
NA	-	Not Applicable

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Solid waste management is one of the greatest challenges facing humankind in modern times in spite of the numerous technological achievements that have been well documented. One of the consequences of the global urbanization is increasing volume of solid waste. It is estimated that about 1.3 billion metric tones of municipal solid waste was generated globally in 1990 (Buenrostro, 2011). A considerable amount of money goes into managing such huge volumes of solid waste. Asian countries alone spent about US$25 billion on solid waste management per year in the early 1900s. The figure is expected to grow to about US$50 billion by 2025 (Hoornweg and Thomas, 1999). These figures suggest that solid waste management (SWM) has become a large, complex and costly service. In developing countries it is estimated that one to two thirds of the solid waste generated in most urban areas is not collected (Zurbrugg, 2003). As a result, the uncollected waste which is often mixed with human excreta is dumped indiscriminately in streets and in drains, contributing to spread of diseases.

Solid waste management can be defined as a discipline associated with control of generation, storage, collection, transfer, processing and disposal of municipal solid waste in a way governed by the best principles of public health, economics, engineering, aesthetics and other environmental considerations (Daskalopoulos, 1999). In developing countries, solid waste management is considered to be one of the most serious environmental problems confronting most urban areas (Sinha and Enayetullah, 2000a).

In most African countries, management of solid waste is the responsibility of local authorities which have low capacity in terms of financial, operational, institutional

structures, management and inappropriate technologies which affect the availability or sustainability of solid waste management services. Recent events in major urban centres in Africa have shown that the problem of waste management has become serious that has aborted most efforts by city authorities to collect and dispose the generated solid wastes (Onibokun, 1999). The problem is compounded as these countries continue to urbanize rapidly. The population increase inserts the pressure on local authorities on the management of solid wastes. It is estimated that most municipal authorities can collect and dispose off 20 – 30% of the generated solid waste (Chinamo, 2003).

Like in many other countries, waste management is a problem of major concern in most municipalities in Tanzania. For example, about 200 metric tones of solid waste is generated daily in Morogoro municipality, but the municipal authorities can only collect and dispose less than 35% of the generated waste. Of the uncollected waste, 35% is disposed in refuse pits while 30% is dumped in streets, streams and rivers (SUMO, 2003a). If not properly managed, solid waste creates favourable breeding ground for vermin and insects and causes a serious risk of communicable diseases. In addition, solid waste in waterways causes pollution of the water as well as blocking the flow of water causing flooding during heavy rains. Hospital wastes are separated and partly incinerated at the hospital, but some other health facilities still mix hospital waste with other solid wastes, other types of solid wastes are usually not separated**.**

Most common solid waste management practices in Tanzania includes incineration, land fill (dumpsites), left uncollected in housing compounds or in open spaces, on streets and in drains contributing to flooding, health and environmental problems (Zerbock, 2003). Solid waste management problem in most cities and towns in Tanzania relates to handling at source, collection, transportation, disposal, financing as well as capacity of the City and

other key players. At the household level there is no mechanism for waste sorting which make it difficult to minimise waste through recycling and safe disposal of waste including the hazardous ones (UN-HABITAT, 2006).

Due to the threat posed by solid waste management in urban areas, Tanzania has set National Strategy for Growth and Reduction of Poverty (NSGRP) and health policy. Among many things addressed in NSGRP in urban areas is the target to improve solid waste management. The challenge which is facing most urban areas in Tanzania in solid waste management is the involvement of community and other stakeholders, sensitization of people on solid waste management, financing, and infrastructure for waste management.

In Tanzania, community participation has been introduced since 1960s, however much emphasis has been given in late 1990s. Therefore community participation in development activities has been widespread in the country, yet very little is known on operational strategies, success and challenges of community participation in solid waste management.

This research was an attempt to provide a comprehensive review of community participation in solid waste management with the objective of assessing the extent of community participation in solid waste management and come up with suggestions for improvement of SWM.

1.2 Problem Statement and Justification

Population increase in urban areas of Tanzania has largely resulted from the increase of rural- to-urban migration**.** Increased population is positively correlated with increased generation of different types of wastes. Furthermore, a large proportion of solid wastes generated in most urban areas of Tanzania originate from agricultural products. Solid

waste management in Tanzania is largely carried out by municipal authorities. This is the mandatory activity which is provided under the Local Government Act, No. 8 of 1982 (Urban Authorities Act).

However, municipal authorities have very low capacity in solid waste management. It is estimated that most municipal authorities can collect and dispose off 20 – 30% of the generated solid waste (Chinamo, 2003). As it is the case in most municipalities and cities in Tanzania, in Mbeya city the cost of managing solid wastes is quite high and significant proportion of the generated waste is left unattended. There is, therefore, a need to involve communities in solid waste management. In any case, large proportion of solid waste is generated by communities. If well organised and planned, communities can effectively and profitably manage solid waste. The most profitable and sustainable way is composting which can be used for urban agriculture and source of income. Previous studies demonstrated that about 70 - 80 % of the generated urban waste produced in developing countries is of agricultural origin which is biodegradable (Akinmoladun and Adejumo, 2011).

This biodegradable waste can be turned into compost manure for Urban and peri-urban agriculture. This sector is rapidly expanding in Tanzania mainly due to increasing demand for food as well as the means of income supplementation and employment especially for women and youth (Mlozi, 1995). Composting as a biological approach will not only result in the restoration of essential soil nutrients but will also help in solving environmental, sanitary and soil conservation problems associated with waste mismanagement. Composting also could minimize the need for costly waste disposal methods such as land filling and incineration.

The output of this study will provide useful recommendations to stakeholders to improve the coherence between the perception of community participation and the actual implementation of development activities including SWM.

1.3 Objectives of the Study

1.3.1 General objective

To assess the extent of community participation in solid waste management.

1.3.2 Specific objectives

Specific objectives were to:

(i) Identify the major sources of solid waste.

(ii) Examine the current solid waste management practices and their limitations.

(iii) Evaluate the level of awareness and attitude towards community participation in solid waste management.

1.4 Research Questions

1. What are the sources, amounts and types of solid wastes generated?
2. What are the current solid waste management practices and their limitations?
3. What is the level of awareness and attitude towards community participation in solid waste management?

1.5 Conceptual Framework for the Study

In an attempt to put this study in context, the conceptual framework as shown in Fig 1 was developed for the sake of getting information relevant to the study objectives and to identify the measurable variables. The dependent variable which is the status of community involvement in solid waste management is influenced by independent variables

which include; solid waste generated (source, amount and types), solid waste management practices, level of awareness about community participation and participation of key stakeholders. However, there are other variables (background variables) that are responsible for determining the influence of independent variables these are age, sex, marital status, occupation, level of education and income.

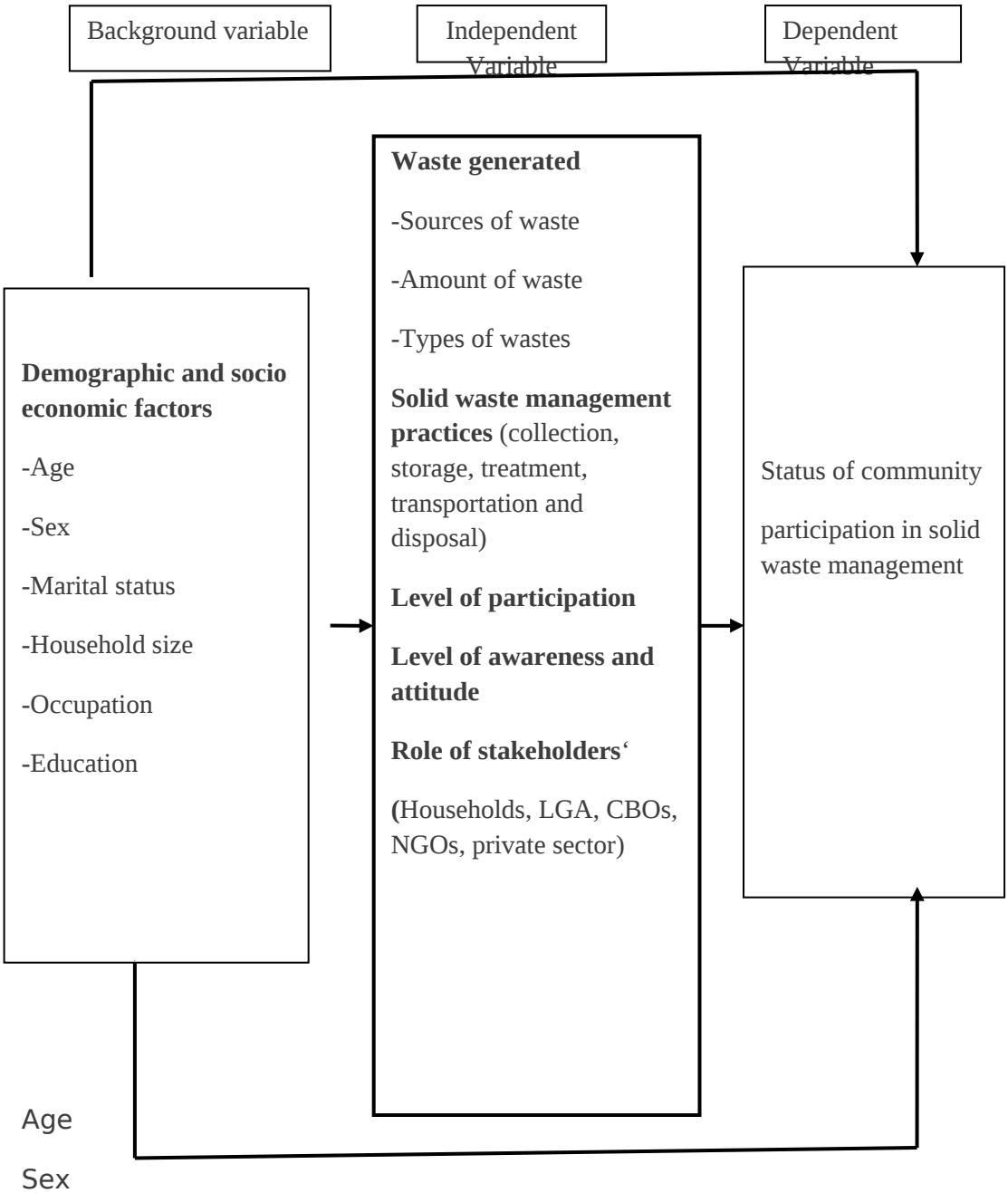

Figure 1: Conceptual framework for community participation in SWM

Income

S

Abstinence

Use of condom

One faithful partner

Fidelity

CHAPTER TWO

2.0 LITERATURE RIVIEW

2.1 The Concept of Community Participation

Bray (1996) defines community as a group of people living in a specified geographical area such as village or district and sharing some common values, may face some similar problems, share some common facilities, may be of different background, experiences and skills but living together.

The concept of participation is widely used in the theory and practice of development but it is clear that perception of participatory approach varies considerably (Mikkelsen, 1995); Toner and Cleaver (2005) argue that, participatory and community- driven approaches are claimed to offer improved equity, sustainability and effectiveness in development activity; specifically they empower the power in collective activities which concern their lives (URT, 2003b). World Bank (1994) defines participation as a ’process, through which stakeholder’s influence and share control over development initiatives, decisions and resources which affect them’. Participation involves a significant number of persons in situations or actions, which enhance their well-being.

2.2 Major Sources of Solid Wastes Generated

Solid waste is an overall term used to include litter and refuse or garbage. Municipal solid waste includes the waste generated from residential areas, commercial, industrial, agricultural, institutional, construction, demolition process and municipal services (Hoornweg and Thomas, 1999). In developing countries municipal solid waste include refuse from households, institutions like hospitals and hotels, market places, street sweepings and wastes from industrial and commercial establishments (Tam and Tam, 2008).

A large proportion of solid wastes generated in most urban areas of Tanzania originate from residential areas and agricultural products. Solid waste arises from human activities such as consumption and production activities. Agricultural wastes accumulate in market places, households, livestock markets and slaughterhouses. Agro-waste generated at market places includes remains of fruits, vegetables, fish, livestock products, packaging materials and others resulting from value adding processes. At the household level, agro-waste includes food remains and animal manure in addition to the above. Livestock markets and slaughterhouses generate dung and other gastrointestinal wastes. Although there is no detailed information, previous studies demonstrated that agricultural wastes accounts for about 70 - 80% of the urban waste generated in developing countries (Akinmoladun and Adejumo, 2011). The rest is inorganic waste which includes plastic bags (5%), scrap metals (4%), waste papers (3%), plastic containers (2%), hospital waste (2%), bottles (2%) and other industrial wastes (2%).

For example, in Dar es Salaam City markets alone, 1200-1400 tons of solid waste is generated daily out of which 95% is of organic origin (Mbuligwe *et al*., 2003). This implies that if appropriate collection, separation and processing arrangements are in place, the rotting garbage heaps that are common in market places could be turned into a valuable resource for agricultural production as well as providing income to hundreds of urban and peri-urban dwellers, especially youth and women**.**

The composition of waste depends on a wide range of factors such as food habits, cultural traditions life styles, climate and income (Vidanaarachhi *et al.,* 2005). Waste generation rates per person depend upon the socioeconomic conditions of the particular urban society, its cultural background, climatic condition and seasonal variations. Seasonal variation may increase fresh vegetables and fruits availability, thereby giving rise to varying rates of waste generation.

2.3 Current Common Solid waste Management Practices and their Limitations

Solid waste management involves control of generation, storage, collection, transportation, processing and disposal in a manner that is in accordance with the best principles of public health, economic, engineering and other environmental concerns (Afroz *at el*., 2010). Inappropriate waste handling, storage, collection and disposal practices pose environmental and public health risks in urban and peri-urban areas.

Wastes are unwanted or discarded materials that arise from human activities. As applied to this study, domestic solid waste will be unwanted solid material that arises from human activities originating from domestic consumption and production activities. This includes food preparations, sweepings, cleaning, animal manure and disposal of old cloth, just to mention a few. Over the years, Tanzania urban and peri-urban areas have suffered a low standard of service regarding collection and disposal of solid waste. This low level of service is a potential threat to community health and environment. The most serious of these are urban pollution and sanitation. Problems in these fields manifest themselves in the form of water and air pollution and the unhygienic disposal of solid waste emanating from densely populated and mostly unplanned areas with poor environment (Kishimba and Mkenda, 1995). The health and environmental aspects which are associated with solid waste, give rise to the importance of solid waste management. In studying solid waste management the following elements have to be considered: solid waste composition, generation, storage, collection, and disposal.

2.3.1 Collection and transportation of solid waste

Transportation of waste from households, factories, and other generation sites is a growing problem. The rapid urbanization of many of the developing countries contributes to the problem of SWM. Most rapidly growing parts of cities are at the periphery of existing

settlement. Garbage dumps, with their associated diseases, odour and frequent fires (in some cases) would ideally be located on suitable land away from the most densely populated areas. These areas are becoming harder to find as population urbanize and municipal traffic increases, transportation of wastes becomes more time consuming, and therefore more expensive and less efficient. Many cities employ neighbourhood-level collection points, where households are responsible for transportation to the transfer point and the municipal or private enterprise transports the waste from there to the ultimate disposal location (Meidiana, 2010). Transportation also relies on operational vehicles, and frequent breakdowns coupled with parts shortages which can immobilize collection vehicles for extended periods of time. UNEP (1996) estimates that in cities in West Africa, up to 70% of collection/transfer vehicles may be out of action at any one time.

In areas where there is collection services in which wastes are removed from individual households or streets, often there are no standardized containers used to store waste prior to pickup. Boadi and Kuitunen (2005), observed that in Barbados, there are no containers designated by municipalities or collection companies to “set out” waste for collection. It is up to individual residences to designate some sort of collection containers. Largely, these are plastic barrels or discarded oil drums. Most of municipalities in developing countries typically lack financial and skills needed to cope with solid waste management crisis. Several countries have realized that the way they manage their solid waste does not satisfy the objectives of sustainable development (Qdais, 2006). However, the majority of households simply place grocery bags full of waste on the street to await collection. Sanitary and efficient waste management must ensure that all and in some cases entire neighbourhoods are sited on top of existing landfills. For example, the Smoky Mountain dump in Manila, Philippines had as many as 10 000 families living in shacks on or

adjacent to the dump households use some form of corrosion-resistant container with lids in order to facilitate collection.

A major problem is that of development at or on top of landfills; many shanty towns are built from disposed waste and in some cases the entire neighbours are sited on top of existing landfills sites (UNEP, 1996). Aside from the obvious health implications, these concentrations of people further complicate transport and unloading procedures and present numerous safety and logistical concerns (Blight and Mbande, 1996). UNEP estimates that approximately 100 000 people currently scavenge wastes at dump sites in the Latin American region alone.

Further, many people, not only those residing near landfills, make their living from scavenging on solid waste before it enters the municipal waste stream. Street-level waste picking often removes recyclables and other ‘high-value’ waste items from items set out for collection. Although these practices serve to reduce the overall quantity entering the waste stream, they often scatter waste about, compounding problems for pickup and transfer operators (Pfammatter and Schertenleib, 1996).

Knowledge on the source and type of solid waste, along with data on composition and rates of generation, is basic to the design and operation of the functional elements associated with management of solid waste. The decisions on solid waste collection, transportation and disposal cannot be reached at without knowledge of generation, density and composition. According to Mato (2002) the composition of solid waste in Dar es salaam were as follows; vegetable waste/organic waste (62.5%), papers (6.2%), glass (0.3%), metal (1.2%), textiles (1.2%), plastic and rubber (1.8%), bones (0.3%) and inert matter (27.3%).

Waste management rates per person depend upon the socio-economic condition of the particular urban society, its cultural background, climatic and seasonal variation. Most in developed countries consume greater quantities of goods and hence higher rates of waste generation. Culture, history and climate influence types and consumption habits. Seasonal variations may increase fresh vegetables and fruits availability, thereby giving rise to varying rates of waste generation. According to Baruti *et al.* (1992), quantities of domestic solid waste generation in Dar es Salaam city alone are 870 tons per day. This figure is much higher than other sources like market sites, which generate 200 tons per day, industries 100 tons per day, and street cleaning which generate 40 tons per day. According to Mato (2002) only 35 percent of generated wastes were collected and properly disposed off in Dar es Salaam. Uncollected wastes disposed haphazardly on the streets roadsides and in open spaces.

There are several some human health risks associated with solid waste handling and disposal particularly in developing countries. Cointreau (1982) classified these risks into four main categories: presence of human fecal matter, presence of potentially hazardous industrial waste, the decomposition of solids into constituent chemicals which contaminate air and water systems, and lastly air pollution caused by consistently burning dumps and methane release.

There is perhaps one major approach to solving the problem of municipal solid waste in Tanzania which has not been adequately explored so far, waste recycling. This approach has greatly helped to ease the problems of urban solid waste management in Uganda (Baruti *et al.*, 1992). Apart from partial recycling of metallic wastes, there is hardly any recycling of solid waste in Tanzania. It is high time recycling could be studied and

subsequently institutionalized in the waste management strategy in urban and peri-urban of Tanzania. One of the most potential possibilities is composting of biodegradable component of solid waste.

2.4 Community Participation in Solid Waste Management

Maya and Thomas (2007) pointed out that different people according to their cultural context define community participation in communal activities differently. This is emphasized more by Njau and Mruma (2004) who asserts that community participation means involving people; men and women in the development process as active participants and not as passive recipients at all levels**.** Peck and Scott (1998) also defined community participation as the process by which individuals and families understand responsibility of their own health and welfare of societies.

Community should be motivated enough to solve their common problems themselves. This enables them to become agents of their own development instead of positive beneficiaries of development aid (Kwawe, 1995). The key to the success of solid waste management system in any urban area is the cooperation of citizens. Citizens ought to be involved in proper collection storage, and safe disposal of waste Moningka (2000). In the solid waste management context, the term community participation means active and meaningful involvement of the beneficiaries in the management of solid waste. Participation of the community is generally limited to activities associated with primary collection of domestic refuse. Examples of some of the most common roles that communities could undertake are managing waste within the household and removing them from their premises, reducing waste production and facilitating recovery for the purpose of recycling and keeping public areas around the neighbourhood clean (Sylvaine, 1999).

Howlett and Nagu (2001) said that participation is one of the critical components of success. It has been associated with increasing mobilization of ownership of polices and project; greater efficiency, understanding and social cohesion; more cost-effective services; greater transparency and accountability; increasing empowerment of the poor and disadvantaged; and strengthened capacity of the people to learn and act.

However, the success of community participation in solid waste management depends on other actors involved, such as municipal authorities, Community Based Organizations (CBOs), micro enterprises, and local leaders. In particular, the municipal authorities play a vital role since in most developing countries the local government is responsible for the delivery of basic services, like waste collection and disposal and for the implementation and enforcement of environmental legislation (Kinyashi, 2006).

Community Based Organizations also can be involved in various activities such as promoting re-use and recycling of materials, hiring waste collectors, collecting fees for waste removal and making arrangements with local authorities (Pfammatter and Schertenleib, 1996). These organizations can be in a form of Local nongovernmental organisations (NGOs), community based organisations (CBOs) or local associations such as Resident Welfare Associations (RWAs), Women's Associations and youth groups. They often use simple equipment and labour intensive methods, and, therefore, can collect waste in places where the conventional trucks of large companies cannot enter; they may be initiated by community members who wish to improve the immediate environment of their homes. Experiences from other parts of the world show that if well planned and executed urban wastes can profitably be re-cycled. In Latin America, for example, cooperatives and NGOs are actively engaged in the collection and separation of wastes in small scale

composting enterprises. In Brazil and Argentina CBOs have emerged with a component of refuse collection, separation and composting (Cofie, 2006).

Development which requires participation can no longer be left to chance or to a few groups of individuals. Initiatives from actors working together as stakeholders of development are the rightful means to the development on the right path. Any effective and meaningful participation in development must involve different players (Mabula, 2007).

Moreover, literature suggests that voluntary or other forms of contributions are indeed fundamental to any development activity success (Nyangira, 1970 and Oakley, 1991). The authors assert that voluntary contributions of labour may cover a wide range of practices, from forced labour with a legally enforceable penalty for default, to work in a group voluntarily joined without pressure.

Also, as for the benefit of participatory approaches, Supe (1990) points out that if the people participate in kind they develop a sense of belonging towards the community activity; develop leadership in the village and the confidence of the people increases. Moreover, involvement of beneficiaries ensures that the activities design reflects the peoples' real priorities and the community activities itself reaches, and listens to the voice of the people. Peoples' participation further increases ownership, motivation and ultimately sustainability. The community activities become accountable to the people, generate learning and facilitate advocacy at all levels.

2.5 Level of Awareness and Attitude about Community Participation in Solid Waste Management

2.5.1 Community awareness

Awareness means exposure of an individual to an idea. A study conducted by Supe (1990) indicates that awareness exposes individuals to an idea but may lack detailed information about it. For instance, the community may know the name of an activity but may not know the details. Awareness makes one develop interest that is he/she becomes motivated to find more information about the new idea. Studies by Taneja (2006) suggest that lack of awareness is one of the barriers to community participation. The author noted that any development programme could be effective only when people are aware about it and the benefits that will accrue to them as a result of implementing it. Reid (2000) also emphasized that the business of participating communities is open to all and widely publicized. Citizens are informed by a variety of means about the community's work and opportunities for citizens to find meaningful roles in contributing to that work. Also Clark and Thomas (1987), cited by Nanai (1993) viewed participation as a conscientization process in which people achieve a deepening awareness of the reality which shapes their capacity to transform that to reality.

Awareness and attitudes to SWM can affect the population's willingness to cooperate and adequately participate in waste management practices. General environmental awareness and information on health risks due to ineffective solid waste management practices are important factors which need to be continuously communicated to all sectors of the communities. Participation of the community can be by carrying waste to a shared container, by segregating waste to assist recycling activities, or even only by paying for waste management services. Public awareness and community participation would assist in obtaining guidance in carrying out strategic planning of SWM and to enhance appropriate

levels of community participation and a two-way communication in planning and implementing of integrated SWM services (World Bank, 2004).

Some examples of continuous education and awareness campaigns are the regular "Green and Clean" campaigns to promote environmental awareness by the Metro Manila Women Balikatan Movement and the Green Forum in Manila (UNEP, 1996). Another example is the Environmental Pioneer Brigade Programme in Sri Lanka where children are made aware of environmental problems and shown how to manage the problems, or how to be preventative that the problems**.** The education program builds on the knowledge, values, skills, experiences and determination of human capacity needed to work on solving waste management issues at an individual and community level Syagga (1992). Community education plays the role in developing the community's interest and participation in SWM.

2.5.2 Composting as an alternative solid waste management strategy and source of income

Composting is a dynamic biological process in which a mixed microbial population converts heterogeneous organic matter into stable humus like product useful as a soil conditioner and fertilizer (Ngeze and Ruttle, 1983). Golueke (1972) defines composting as the biological decomposition of the organic constituents of wastes under controlled conditions. The finished compost is an environmentally safe, humus-like material that is free of malodours and can be beneficially used as a fertilizer and soil conditioner. Unlike most other organic sources, it can be conveniently stored, easily handled and uniformly spread on land with conventional equipment. Microbial decomposition of volatile organic fractions (found in most agricultural wastes) during composting eliminates malodours and produces a stable humus-like organic material which is a source of a wide range of nutrients and provision of long term effect on soil fertility, soil structure, tilth and

permeability (Muller and Ruttle, 1994). The heat produced during composting effectively destroys several pathogens, which are harmful to livestock and humans. Composting could minimize the need for costly waste disposal methods such as land filling and incineration. Composting reduces the quantity of waste going to landfill, biological decomposition of most of the solid waste generated in urban centres is probably the most attractive and sustainable alternative to waste re-cycling. According to CORE (2008), composting can reduce the amount of materials discarded to landfills by up to 50%.

Utilization of composted organic waste materials as fertilizers will not only result in increased production through its potential for contribution of essential nutrients but will also help in minimizing sanitary, environmental and soil conservation problems. Compost could provide an easily available and affordable source of fertilizer and soil conditioner for low-income earners in urban and peri- urban areas. Processing of solid waste could serve as one of the best fertilizer alternatives if well processed and managed, since inorganic fertilizers are in most cases unaffordable to resource poor farmers (Kimbi and Semoka, 2004).

Successful composting requires among other things, suitable materials and construction of appropriate bio-digestion facilities. Previous studies observed that about 70 - 80% of urban solid waste generated is agricultural wastes which are biodegradable (Akinmoladun and Adejumo, 2011). It is also important to develop a system of waste separation and hauling to the composting facility.

2.5.3 Possibility of forming groups for composting

Experiences from other parts of the world show that if well planned and executed urban wastes can profitably be re-cycled. In Latin America, for example, cooperatives and NGOs

are actively engaged in the collection and separation of wastes in small scale composting enterprises. In Brazil and Argentina CBOs have emerged with a component of refuse collection, separation and composting (Fiensten and Morris, 1975). Urban agriculture is seen as a survival strategy whereas the more affluent classes see it as a form of recreation (Lober, 2011). It is against this background that many groups are particularly urging authorities to integrate agriculture in urban planning. The objective of such groups is to offer the municipalities an alternative waste management tool and creation of micro enterprises based on compost making. Such groups seek to create sustainable recycling of solid wastes to produce affordable organic fertilizer (Nzeadible, 2009). The idea is to mobilize communities to collect and make compost out of the generated solid wastes.

Composting could be a very viable recovery alternative over solid waste management (Mbuligwe and Kasenga, 2002)**.** Most of local authorities have become economically constrained in providing efficient management of solid waste. Therefore, the possibility of converting municipal solid wastes to organic earth like material by means of composting can provide a significant contribution to the solution (Linzner *et al.*, 2007)**.** As indicated earlier that about 80% of solid waste generated in Tanzania is biodegradable which can be turned into compost if appropriate strategies are in place. This approach reduces pollution and provides a valuable substitute for chemical fertilizers. Successful composting for urban agriculture and source of income to urban dwellers can sustainably be done under specific groups. In order to form organised and systematic groups several stages must followed. Some of the reasons that might influence formation of groups include shared interest or common goal and specific needs such as composting for fertilizer and generation of income (Meika, 2011).

2.6 Urban Agriculture

Farming in urban and peri-urban areas is a common feature of Sub-Saharan Africa (Mlozi, 1996). Also it is estimated that as many as 40% of the urban population in Africa is involved in urban agriculture (Akinmoladun and Adejumo, 2011). In Tanzania urban agriculture whereby urban dwellers produce food, earn extra income and use available land and labour resources (Mlozi, 1996). Tanzania's towns, urban agriculture is very common and involves the raising of livestock (dairy cattle, chickens, goats, pigs, etc.) and the cultivation of crops (maize, cassava, legumes, vegetables and fruits).

According to Edwards (2004) urban agriculture is defined as the practice of crop cultivation and livestock raising within the boundaries or the immediate periphery of the city or Municipality. Urban agriculture is increasingly becoming an important sub sector in the Tanzanian economy. Most urban dwellers engage in urban agriculture as a source of food and income supplementation (Sawio, 1993)**.** Mlozi (1996) argued that urban and peri-urban agriculture is rapidly expanding in Tanzania mainly due to increasing demand for food as well as the means of income supplementation and employment especially for women and youth**.**

Agriculture in Tanzania remains the largest sector in the economy, the sector accounts for about half of GDP and exports. Food crop production has grown at a rate of 3 percent which is about the rate of population growth and accounts for about 65 percent of agricultural GDP, with cash crops accounting for only about 10 percent (Sawio, 1993). Though not well established urban agriculture contributes significantly to GDP.

A substantial proportion of urban agriculture is crop production, such as fruits, vegetables, maize, beans bananas that require application of fertilizers which is the major limitation to

increased productivity. Previous studies demonstrated that organic wastes accounts for about 70 - 80% of the urban waste produced in developing countries (Akinmoladun and Aadejumo, 2011). With the increasing rate of human population in urban and peri-urban areas it is evident that this sector will continue to grow calling for more elaborate management strategies. As the sector continues to grow, it calls also for more sustainable management strategies for the limited resources especially land in line with safeguarding public and environmental health. Agricultural activities in urban areas of Tanzania generate huge amounts of different forms of wastes and significantly contribute to the waste management problem. Re-cycling bio-degradable solid waste is one of the most attractive alternatives in solid waste management.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

This research was conducted in Mbeya City Council, Mbeya region. Mbeya City covers a total of land area of 214 km^2. It is located between latitudes 8^0 50' and 8^0 57' South of the Equator and 33^0 30' and 35^0 35' longitudes East of Greenwich. It is subdivided into 2 divisions, 36 wards and 180 hamlets. According to the year 2002 Census, Mbeya City Council had a total population of 266 422 people. The City population growth rate was 4.0% per annum compared to the national average of 2.9% per annum. Population projection for year 2009 is approximately 352 511 people of which 183 306 are females and 169 205 were males. The major economic activities in the City include commerce and trade, agriculture and livestock keeping, small-scale industrial production and service provision for example transport hotel, medical and civil service. It is estimated that 33.3% of City residents depend on agriculture for their livelihood while 21% are employed in the public sector which is mainly service provision. About 43.4% are engaged in the informal sector which is mainly small scale production, petty trade and selling of agricultural crops whereas 2.3% are home works and others. Income per capita is estimated at Tshs. 675 000 per annum which is equivalent to US$ 675 a little bit higher by Tshs. 75 047 ($75) to the internationally accepted poverty line of Tshs. 600 000, or about US$ 600 per annum.

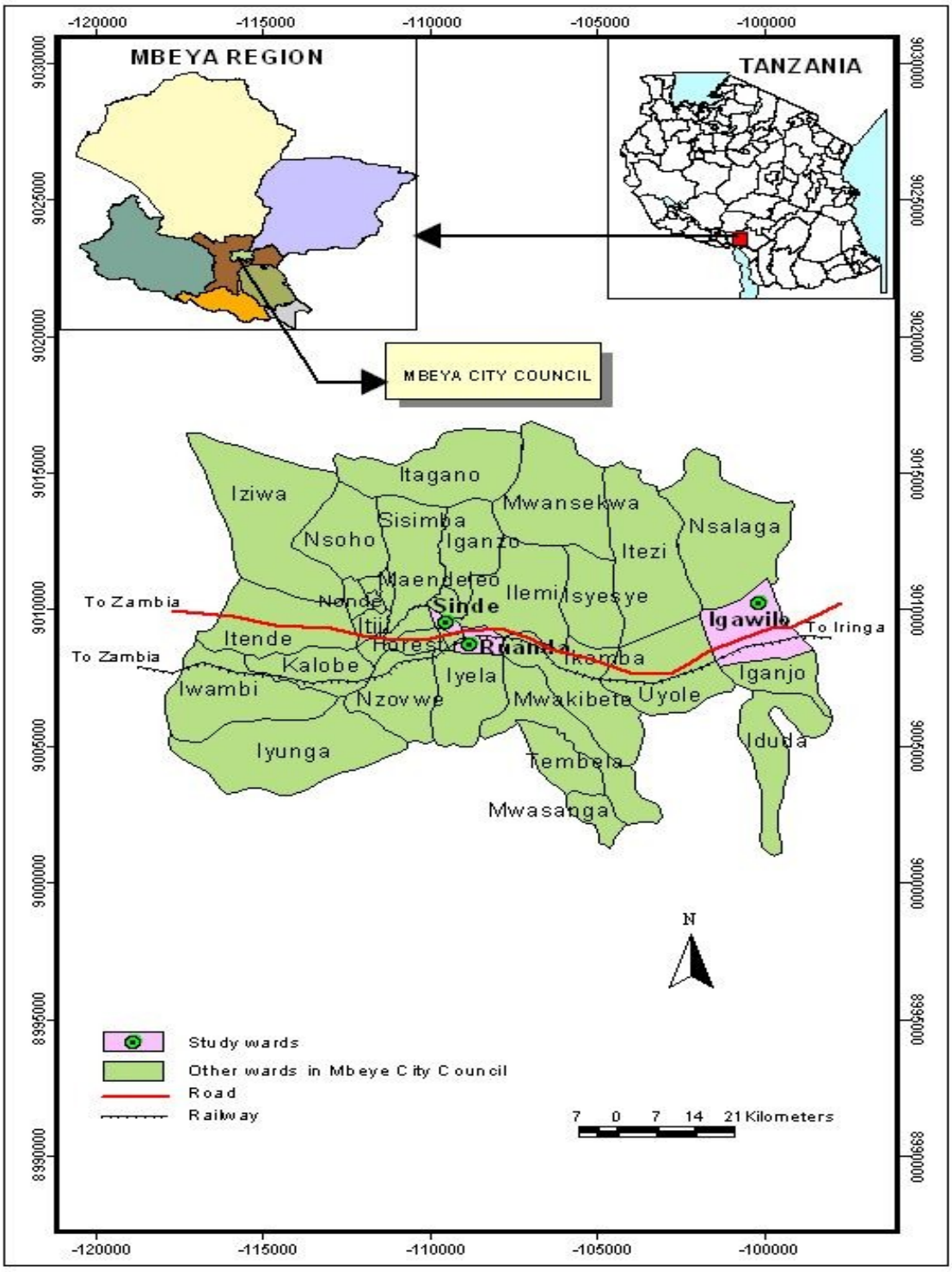

Figure 2: A map of Mbeya City Council showing study wards.

Study wards
Other wards in Mbeya city
Read
Railways

3.2 Research Design

The research design of the study was cross sectional survey. The design consisted of administering questionnaire to representative samples of the population at a single point in time (Robert and Tripez, 2005). The design is useful for descriptive purposes as well as for determination of relationship between and among variables (Bailey, 1998).

3.3 Sampling Techniques and Procedures

The study was carried out in Mbeya City. The study area was selected based on population growth rate of 4.0% per year which is greater than the national growth rate of 2.9% (NBS, 2002), leading to the rate and extent of expansion of urban agriculture and volume of waste generated. Three wards, namely Ruanda, Igawilo and Sinde were purposefully selected in order to ensure that both urban and peri-urban areas are included and also based on existing potential in terms of waste generation and intensity of urban and peri-urban agriculture. Random sampling was undertaken whereby representative sample of residents was included in the sample units. A sample size for each ward was 60 respondents. This procedure was used to obtain 180 respondents who were then interviewed to collect the desired information. Bailey's (1998) observed that regardless of population size, a sample should not be less than 30 respondents in which statistical data analysis is to be done.

3.4 Data Collection Methods and Instruments

3.4.1 Primary data

Several methods were used for primary data collection. These included household questionnaire survey, focus group discussions (FGD) with the key informants using checklist of questions and physical observation. The aim was to cross check and verify information obtained through these different methods based on the objectives of the study.

A reconnaissance survey was conducted in order to get basic information related to the study objectives.

3.4.2 Household questionnaire

The main instrument used for data collection was a structured questionnaire designed to address specific objectives of the study. Pre-test of the questionnaire was conducted prior to household survey. The pre-test was done in the ward with similar conditions to the study area. The purpose of pre-testing was to check the validity of the instrument. Based on the results of the pre-testing, the questionnaire was adjusted accordingly. Open and closed-ended questions were included in the household questionnaire. Data were collected from 180 respondents as representatives of the residents in the study area (Appendix 2).

3.4.3 Focus group discussions (FGD)

Focus group discussions were conducted after carrying out individual interviews. Groups of twenty members in each ward based on gender and age were used. The purpose was to obtain more clarification and details of the collected data from the respondents. A checklist (Appendix 3) was used to guide the discussions as per specific objectives.

3.4.4 Physical observations

Few selected representative fields were visited to assess the existing types of solid waste generated and solid waste management practices. Field observations were done in order to verify and supplement the information collected during household surveys and focus group discussions. Documentation was mainly through taking photographs.

3.4.5 Secondary data

Additional information was obtained from several publications and reports to get secondary information such as types and sources of wastes generated, common practices of solid waste management, extent of community awareness and attitude towards solid waste management, community awareness on composting and suggested solutions. Main sources of information included; Department of Health in the City and Mbeya Region. Sokoine University of Agriculture (SUA) library, journals and electronic sources.

3.4.6 Data analysis and presentation

The data collected were edited, summarized and coded. Analysis was done using the Statistical Package for Social Science (SPSS). Descriptive statistics (frequencies, percentages and means) were used to analyze and summarize the findings. Data were presented in tables, charts, figures and photos.

A Likert scale of 5-point scale which was developed by social scientist called Rensis Likert was adopted to gauge views of respondents on the concept of community participation. The scale has five alternative answers, that is, strongly disagree (1), disagree (2), undecided (3), agreed (4) and strongly agreed (5). In this study, such method was adopted and the respondents were asked 12 questions to ascertain their attitude of participation towards community solid waste management. The responses were recorded in Likert style format in which the respondents were asked to indicate whether they strongly disagree, disagree, undecided, agreed or strongly agreed with each statement. For simple comparison, the responses were clustered into three categories with the scale of three alternative answers namely disagree (1), undecided (2) and agree (3) Therefore, the level of awareness of community and the extent to which communities participate in the

management of solid waste were assessed based on the set of questions that was analysed through 5-point scale.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the results and discussion of the study. A series of tables, charts and histograms are used. Results from the following subsections are; Household characteristics, major sources of solid waste generated, common solid waste management practices and their limitations, level of community awareness and community participation, composting as an alternative means of solid waste management and source of income, possibility of forming groups for composting and suggestions for improving solid waste management.

4.1 Household Characteristics

The population characteristics examined in this study were; age, sex, marital status, education level, main occupation and income. The purpose of choosing these characteristics was to get the general overview of what the respondents are composed of and how that influence solid waste management practices.

4.1.1 Age and sex of respondents

Age is an important demographic variable and is a primary basis of demographic classification in vital statistics, censuses and surveys (URT, 2005c). Table 1 presents age groups of respondents participating in community activities ranging from 20 to 70 years and above. Results in Table 1, indicate that about one third (35.3 %) of respondents in the study area were aged between 40 – 49 years followed by 22% of the respondents aged 30-39 years and 20% of the age group of 50-59 years. This implied that apart from the age group of 20 – 29 years (6.7%) of the respondents, the other three age groups were within the active age group as compared to rest of age groups of 60 – 69 years (11.3%), 70 years and above (4.7%) of total respondents. The results also reveal that the mean age of

respondents was 46.6 years. The findings therefore show that adults have more potential labour contribution in agriculture production, environmental conservation and other social communal activities such as solid waste management. They also have more experience and are able to access characteristics of new technologies/ideas (Adesina and Baidu, 2003). This finding supports the observation made by URT (2005c) that the age between 26 – 57 years is within the labour force age group, that is, people in this age group tend to be active, creative and participate in many social and economic activities. In addition, the findings in Table 1 show that 6.7% of the respondents were between the ages 20–29 years. Similarly, findings indicate that 16 % of the respondents aged 60 years and above account for low percentage which is in line with Nanai (1993) who reported that the level of participation in social and development activities tends to increase with the optimum age group, after which participation starts to decline with increase in age.

Table 1: Age category of respondents (N=180)

Age category (Years)	Frequency	Percentage
20– 29	10	5.5
30 – 39	43	24.0
40 – 49	63	35.0
50 – 59	40	22.2
60 – 69	17	9.3
≥ 70	7	4.0
Total	**180**	**100.0**

Fig. 3 shows the sex of respondents in the study area. Out of the 180 respondents interviewed, the highest proportion was females (68 %) and 32% were males. Agricultural activities whether in rural or urban areas are largely carried out by women. These results are similar to what was observed by Mlozi (1995) that urban and peri-urban agriculture is largely carried out by women and youth. This is probably due to the fact that, large proportion of SW is generated at household level where women are key actors in terms of household activities.

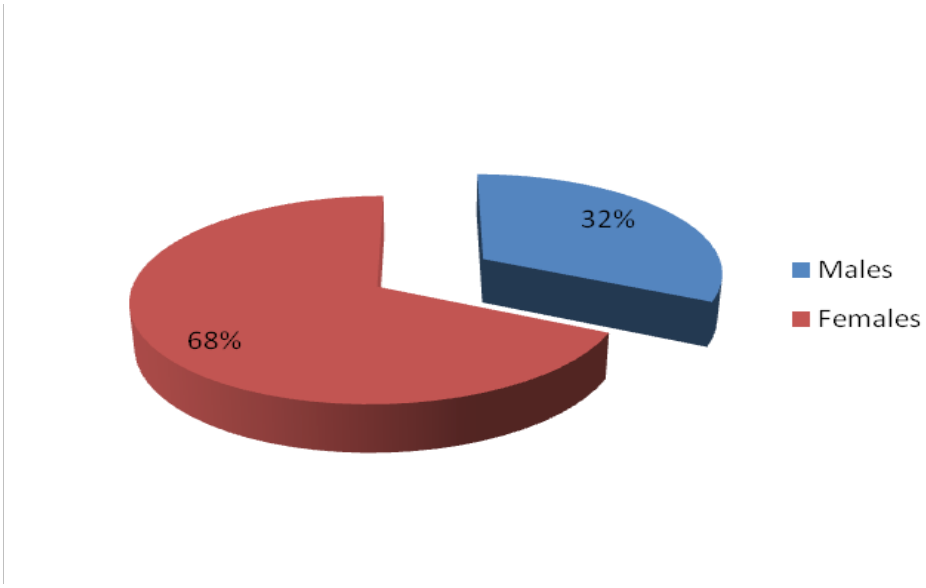

Figure 3: Distribution of respondents by sex

4.1.2 Marital status of the respondents

Respondents were asked to state their marital status based on the option of whether they are single, married, separated, divorced or widowed. The findings in Table 2 indicate that about 60% of respondents were married, 18.3% widowed, 11.3% single, 8.2% divorced and 2.2% separated. The higher proportion of the married couples may suggest that there is high possibility of participation in solid waste management due to complementarities of men and women labour roles within the household as observed by Mandara (1998). Phillip and Abdillahi (2003) observed that married couples show a high level of participation in community development activities probably due to cooperation among them in the marriage institution in the society.

Table 2: Marital status of the respondents (N=180)

Marital status	Frequency	Percentage
Single	21	11.3
Married	106	60.0
Divorced	15	8.2
Widowed	33	18.3

Separated	5	2.2
Total	**180**	**100.0**

4.1.3 Education level

Education is always valued as a means of deliverance from ignorance and enables one to perform effectively to any given task within a specified period (Kasanga, 2005). Respondents were asked to state their level of education. Results in Fig. 4 indicate that the majority of the respondents (64%) had attained primary education whereas 18% of the respondents had no formal education. The rest (15%) and 3% of the respondents interviewed had attained ordinary level of secondary education and certificate/diploma, respectively.

The results therefore suggest that the majority of community members had basic education and therefore likely to adopt new practices and ideas. Most of the respondents in the study were therefore expected to be more helpful in relation to participation in solid waste management in their communities. The results further reveal that high literacy level of the respondents (64%) with primary education is higher than the average for Mainland Tanzania which is reported to be 56% (NBS, 2002), suggesting the likelihood of effective participation in community activities.

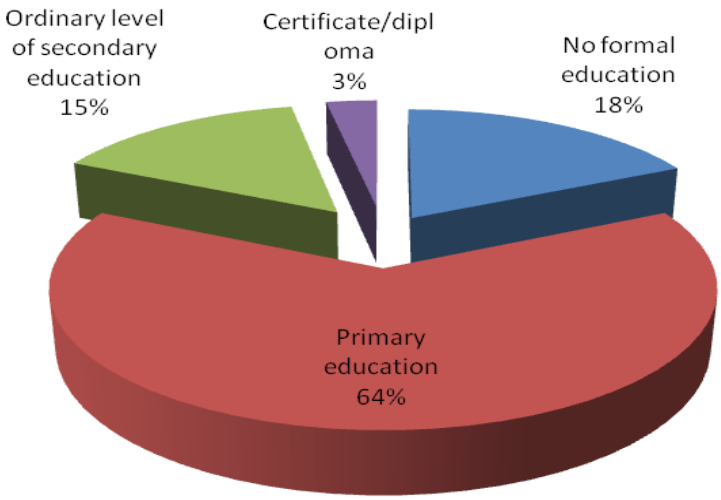

Figure 4: Distribution of respondents by level of education

4.1.4 Household size

Respondents determined household size by considering all members who live in their household including parents, children and dependants. Fig. 5 indicates that 1.3% of the interviewed respondents had equal or less than two people (≤ 2), 40.3% had between 3 to 5 people, 48.4% had 6 to 8 people, 7.5% had 9 to 11 people and 2.5% had 12 and more than 12 household members. This indicates that about 48% of the respondents had household average size of six to eight people which is much higher when compared with 2007 HBS of Tanzania in which the average household size of the Tanzania mainland is about 4.8 members. NBS (2007) reported that average household size has declined appreciably in all areas since 1991/92, from 5.7 to 4.8 members in 2007). These results suggest a possibility of high participation in solid waste management for the larger household sizes. If properly utilized they may provide labour for community activities such as solid waste management.

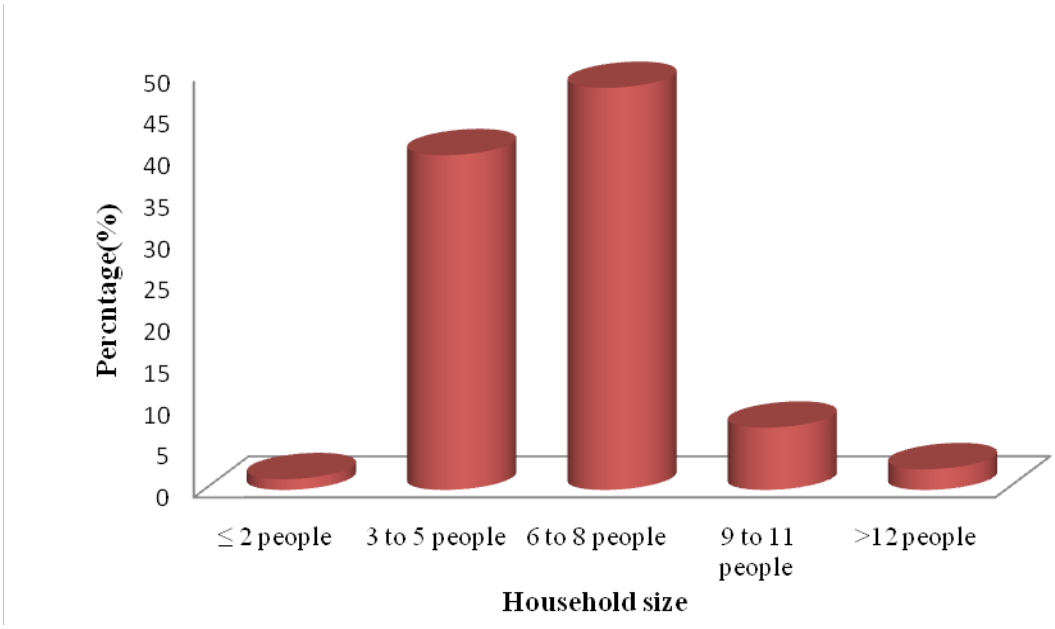

Figure 5: Distribution of respondents by household size

4.1.5 Main occupation and income generated from different sources

The Living standards of Mbeya City people is mainly supported by income generating projects/small enterprises, Wage/salaried employment, urban farming and livestock activities. This implies that people in Mbeya City employ different livelihood strategies in meeting their daily lives as clearly indicated in Table 3. According to African Development Bank (2002), livelihood strategy is defined as a range of activities adopted and choices made by smallholders/people in pursuit of household economic and social security.

The results presented in Table 3 show that 41% of the respondents were employed in income generating activities. These results are consistent with the Mbeya City profile which estimates that 43.4% of the residents in the City are engaged in informal sector for their livelihood. The second highest proportion, which constituted 36% of respondents, included farming/livestock activities as the main occupation. In this category of

farming/livestock, it is highly due to the contribution of vegetable growing (31%), cattle raising (27%), maize growing (21%) and beans growing (17.7%).

Table 3: Main occupation and income of respondents

Category	Frequency	Percentage
Main occupation N= 180		
Farming/livestock	65	36.0
Small enterprises/IGAs	73	41.0
Wage/Salary	25	14.0
Labour based works	17	9.0
Total	**180**	**100.0**
Type of crops grown and livestock kept		
Cattle raising	49	27.2
Banana growing	27	15.0
Maize growing	38	21.0
Poultry keeping	11	6.1
Potatoes growing	12	6.6
Vegetable growing	56	31.1
Cowpea growing	6	3.3
Beans growing	32	17.7

NB: For the type of crops grown and livestock kept, some of the respondents gave more than one answer categories, number of cases will not add to 180 (data set was based on multiple responses)

Also the results indicate that about 36% of Mbeya City people are engaged in urban farming. This means that agricultural activities in urban areas of Tanzania generate huge amounts of different forms of wastes and significantly contribute to the waste management problem. If carefully utilized it could be the source of materials for composting which could be ploughed back to urban agriculture as a fertilizer source. Previous studies by Akinmoladun and Adejumo (2011) demonstrated that, about 70 - 80 percent of the generated urban waste produced in developing countries is of agricultural origin which is biodegradable and therefore can be composted.

Results in Fig. 6 indicate income generated from different sources. Results indicate that

there is small variation in household income in the study area. Most of the households in the study area (38%) had income ranging from 200 000 to 500 000 Tshs. per year. Respondents with an income higher than 500 000 Tshs per annum constituted 33% whereas about 29% of respondents had income less than 200 000Tshs.

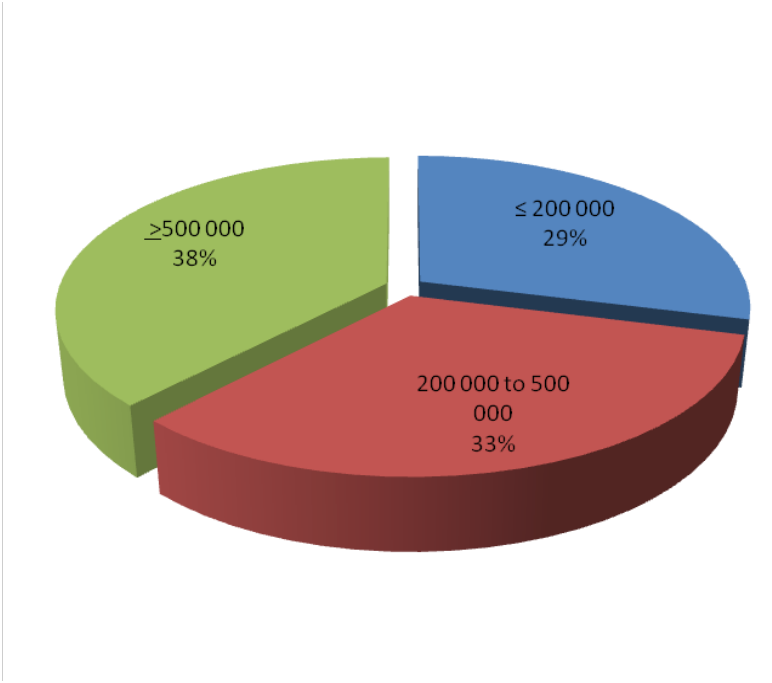

Figure 6: Distribution of respondents by categories of income from different sources per year

These results indicate that a significant proportion of the population in the study area has moderate income. According to World Bank (2004), Tanzanian Per Capita averages US$330 which is about 390 000 Tshs. per year. This is in conformity with the results which indicate that the majority of the respondents have income ranging from 200 000 to 500 000 Tshs. per year.

4.2 Major Sources of Solid Waste Generated

4.2.1 Solid waste generation and composition

The composition of waste depends on a wide range of factors such as food habits, cultural traditions, lifestyles, climate and income (Vidanaarachhi *et al.,* 2005). In the study area, the results revealed that the composition of most of household solid waste is of organic or vegetable waste which makes up highest proportion. Results in Table 4 indicate that about 60% of the solid waste comes from the kitchen and 33% come from the backyard, large part of it being crop residues.

About 2% comes from other sources such as paper, textiles and rubber remains. The results are consistent with previous studies which indicate that about 70 - 80% of the urban waste produced in Tanzania is of organic origin (Akinmoladun and Adejumo, 2011). Sawio (1993) observed that urban agriculture is increasingly growing as an important sub sector in the Tanzanian economy. Most urban dwellers engage in urban agriculture as a source of food and income supplementation. Also, Mato (2002) who conducted research in Dar es Salaam observed that large portion of domestic solid wastes (62.5%) in the city come from the kitchen and most of it is of organic nature.

Table 4: Household solid waste generated categories in Mbeya City (N=180)

Solid waste type/category	Source	Frequency	Percentage
Vegetables and food remains	Kitchen	108	60.0
Leaves/grass	Backyard	59	33.0
Plastics/bottles/canes	Kitchen	9	5.0
Others	Various	4	2.0
Total		**180**	**100.0**

The results, also, show that about 5% of solid waste generated is largely plastics and bottles. This is largely caused by changing lifestyles whereby most of the urban residents use packed products such as water, juice, butter, cooking oils and tomato paste, compared to rural areas. Mato, (2002) observed that solid waste composition in Dar es salaam city was as follows; vegetable waste/organic waste (62.5%), papers (6.2%), glass (0.3%), metal (1.2%), textiles (1.2%), plastic and rubber (1.8%), bones (0.3%) and inert matter (27.3%). He further concluded that the current trade liberalization policy and increase in consumerization are slightly changing the waste composition in urban areas with a result of elevated levels of plastics and cans.

Waste generation rates per person depend upon the socioeconomic condition of the particular urban society, its cultural background, climatic conditions and seasonal variations. Seasonal variation may increase fresh vegetables and fruits availability, thereby giving rise to varying rates of waste generation. According to Gidde *et al*. (2008) it is estimated that every person generates 0.5 kg of solid waste daily. Table 5 indicates that 167 tons of solid waste is generated daily in Mbeya City, (MCC, 2008/09). The composition of solid waste from different places is as shown in Table 5.

Table 5: Amount of solid wastes generated and collected/disposed per day by Mbeya City Council from different sources

Composition of generated solid waste	**Amount of generated SW per day (Tons)**	**Percentage**	**Amount of SW collected and disposed per day (Tons)**	**Percentage**
Residential and market areas	125.1	74.9	NA	NA
Commercial	3.0	1.8	NA	NA
Institutional	0.8	0.5	NA	NA
Street sweepings	33.0	19.8	NA	NA

Others	5.0	2.9	NA	NA
Total	**167**	**100.0**	**74**	**44.3**

Source: MCC; Mbeya City Health Department Annual Report, 2008/09.

According to MCC (2008/09), it is indicated that only 44% of the generated solid waste is collected and disposed off in a mixed form, whereas the rest (56%) is left unattended resulting to health and environmental problems. The attended SW is higher compared to what was reported by Chinamo (2003) in Sri –Lanka, which indicated that most municipal authorities can collect and dispose off only 20 – 30% of the generated solid waste. The rest is not properly managed causing environmental and health problems.

4.3 Current Solid Waste Management Practices and their Limitations

4.3.1 Current solid waste collection, storage, transportation and disposal practices

Results from focused group discussion indicate that the majority of residents in the study area perceive that the overall process of solid waste management is a serious problem in Mbeya City. This is expected given the dilapidated infrastructure that together makes the problem more complicated. Most of the municipal authorities have very low capacities of waste collection and disposal. Recent studies in major urban centres in Africa have shown that the problem of waste management has become serious that has aborted most efforts by city authorities to collect and dispose the generated solid wastes (Onibokun, 1999). The problem is compounded as these countries continue to urbanize rapidly. The population increase, inserts the pressure on local authorities on the management of solid wastes. Concerning storage of solid waste at household level, most cities and towns in Tanzania are facing problems of similar nature. The equipments used for solid waste storage are of poor quality. In most cases plastic bags and plastic buckets are used. These containers are not properly covered as a result they act as a good breeding sites for micro organisms and insects. They are also characterised by bad smell.

Focused group discussion results (Table 6) indicate that the majority of residents in the surveyed area access solid waste collection services through city council. These results are consistent with results in Table 5 which indicate that the city council is able to collect and dispose off only 74 tons out of 167 tons per day which is equal to 44%. The rest 93 tons (56%) used on site disposal methods, which include open dumping, disposal pits and incineration (MCC, 2008/09). Composting as an alternative means of managing solid waste seems to be not familiar to the majority of residents and therefore not practised in the study area at all.

According to Malisa (2007) most parts of urban areas are not easily accessed by refuse trucks, because they are unplanned and these parts carry about 60 - 70 % of the urban population in Tanzania. This means that, the remaining solid waste has to be managed by other means like disposal pits, incineration and disposal in open spaces Plate 1. show wastes dumped in an open space near residential area.

Plate 1: Solid waste dumped in an open space near residential area

Table 6: Pairwise ranking of major practices of solid waste management

	Collected by City Council	**Disposal pits**	**Open dumping**	**Incineration**	**Composting**	**Scores**	**Rank**
Collected by City council	X	Collected by City	Collected by City	Collected by city	Collected by City	4	1
Disposal pits		X	Open dumping	Disposal pit	Disposal pit	2	3
Open dumping			X	Open dumping	Open dumping	3	2
Incineration				X	Incineration	1	4
Composting					X	0	5

Source: Focused group discussions

These findings are consistent with those of Kironde and Yhdego (1997) which indicated that most of the solid waste generated in urban and peri-urban areas is left unattended. Results in Table 7 indicate that reasons for insufficient collection and disposal of solid waste among others include inadequate collection trucks, inadequate budget, shortage of staff, poor urban planning /infrastructure and lack by-laws enforcement.

Results suggest that the major reason for inefficient solid waste management by City council is inadequate collection points and refuse trucks. This is probably due to the increasing urban population resulting into increased generation of solid waste. This is consistent with the study findings by Onibokun (1999) who observed that, due to rapid urbanization, the population increase inserts the pressure to local authorities on the management of solid wastes.

Table 7: Pairwise ranking on major reasons for inefficient collection and disposal of solid waste by Mbeya City council authority

	Inadequate trucks for SW collection	**Shortage of staff**	**Poor urban planning**	**Poor infrastructure**	**Inadequate budget**	**Score**	**Rank**
Inadequate trucks for SW collection	X	Inadequate trucks for SW collection	Inadequate trucks for SW collection	Poor infrastructure	Inadequate trucks for SW collection	4	1
Shortage of staff		X	Inadequate trucks for SW collection	Poor infrastructure	Inadequate budget	0	5
Poor urban planning			X	Poor urban planning	Inadequate budget	1	4
Poor infrastructure				X	Poor infrastructure	3	2
Inadequate budget					X	2	3

Source: Focused group discussion

4.3.2 Waste separation and recycling

There are several ways to reduce, re-use, and recycle organic materials. Excess food can be donated to feed hungry people. Yard trimmings, food waste, and waste can be made into mulch compost and used to prevent soil erosion and provide valuable nutrients to plants. Manufacturing paper using recycled materials conserves resources for the future. By examining current landscaping, food preparation and disposal practices, communities, businessmen and individuals can find creative ways to reduce and better manage municipal solid waste (USEPA, 2011). The study results in Table 8 indicate that about 66% of the respondents do not separate their waste for the reason they perceive that all kind of wastes to have similar characteristics. This is consistent with UN-HABITAT (2006) observations that, at the household level there is no mechanism for waste sorting which make it difficult to minimise waste through recycling and safe disposal of waste including the hazardous

ones. About 34% of the respondents separate their solid waste into organic and inorganic components before disposing and use them for various purposes. Results in Table 9 indicate that the majority (74%) of the respondents do not reuse/recycle solid waste generated. However, 15% of the respondents use it as source of energy for instance cooking and heating, whereas 7% re – use them directly, for example use of plastic bottles and other containers for storing drinking water, cooking oil and kerosene. A negligible proportion of the respondents (4%) use it as soil conditioner/compost manure which they apply in their gardens.

Table 8: Separation of solid waste before disposal (N=180)

Separation of solid waste	**Frequency**	**Percentage**
Do separate	61	34.0
Do not separate	118	66.0
Total	**180**	**100.0**

Table 9: Recycling and re-use of separated waste (N=180)

Use of separated waste	**Frequency**	**Percentage**
Not applicable (do not recycle)	134	74.0
Soil conditioner (Composting)	7	4.0
Source of energy	27	15.0
Direct re-use	12	7.0
Total	**180**	**100.0**

Plate 2: Scavengers collecting various types of wastes at the main dumpsite for re- use/recycling

4.3.3 Major solid waste management limitations

The significant role played by community in the solid waste management at household level has been discussed earlier. The major limitations associated with solid waste management at household and the community levels were alluded to. Focus group discussion results (Table 10) indicate that, the major limitations associated with SWM were; lack of collection and storage bins, lack of separation techniques, lack of by-laws enforcement, lack of transport facilities and lack of collection centres. Blight and Mbande (1996) observed that most cities in developing countries are facing problems of waste management which is largely caused by low capacity of municipal authorities. Collection,

storage facilities are in most cases not adequate leading to the possibility of environmental and health problems.

Table 10: Pairwise ranking on major limitations for solid waste management at household and community levels

	Lack of collection and storage bins	**Lack of separation techniques**	**Lack of By-laws**	**Lack of transport facilities**	**Lack of collection centres**	**Score**	**Ra**
Lack of collection and storage bins	X	Lack of collection and storage bins	Lack of collection and storage bins	Lack of collection and storage bins	Lack of collection and storage bins	4	1
Lack of separation techniques		X	Lack of separation techniques	Lack of separation techniques	Lack of separation techniques	3	2
Lack of By-laws enforcement			X	Lack of transport facilities	Lack of transport facilities	0	5
Lack of transport facilities				X	Lack of collection centres	2	3
Lack of collection centres					X	1	4

Source: Focus group discussions

Results also suggest that lack of separation techniques and facilities could also compound SWM problem. UN-HABITAT (2006) observed that at the household level there is no mechanism for waste sorting which make it difficult to minimise waste through recycling and safe disposal of waste including the hazardous ones.

4.4 Level of Awareness and Attitude of the Community towards Solid Waste Management

4.4.1 Community awareness and perception about solid waste management

Awareness is a key factor for effective participation and successful implementation of community activities. Studies by Teneja (2006) suggest that lack of awareness is one of the barriers to effective community participation. The results in Table 11 show that about 49% of the respondents have low perception towards solid waste management. They are of the opinion that SWM solely implies collection and disposal of the wastes by municipal authorities. The results are consistent with the observations from the focus group discussions which indicated that most members of the community perceive SWM to be the responsibility of Local government.

A significant proportion of respondents (20%) perceive SWM simply as disposal in open and undesignated places such as water streams, market places and roadsides. This is consistent with earlier observations that local government authorities are only capable of collecting and disposing 20 -30% of the generated solid waste. The rest is not properly managed leading to serious health and environmental problems (Chinamo, 2003).

The rest (12%) and 17% perceive SWM as incineration and dumping in designated landfills all of which are unsustainable practices. They all involve around shifting a problem from one place to another. Most of the solid waste in urban areas is generated by members of the households. It is, therefore, their primary obligation to ensure that they participate in SWM. Unfortunately most of the community members do not adequately participate in SWM due to reasons such as perception that it is largely a responsibility of local authorities and lack of appropriate by-laws enforcement and even enforcement of the existing by-laws.

Table 11: Perception of SWM as perceived by respondents (N= 180)

Perception of SWM by respondents	Frequency	Percentage
Collection of solid waste by local authorities	87	49.0
Largely by incineration	21	12.0
Dumping wastes in designated landfills	32	17.0
Disposal of garbage in open places	36	20.0
Proper collection, recycling and disposal of solid waste	4	2.0
Total	**180**	**100.0**

Irrespective of the low awareness and misconception about responsibility with regard to SWM, respondents were asked how they became aware of SWM. The results in Table 12 indicate that the majority (70%) of the respondents became aware through campaigns by Ward development Committee and few (23%) and (7%) familiarized themselves through fellow community members and their own initiatives. This implies that there are little efforts to sensitize the community members about the importance of solid waste management in most of urban and peri-urban areas. It would appear that environmental issues such as SWM are largely left to Ward development committees. Teneja (2006) observed that sensitization of communities on development matters calls for use of variety of information dissemination techniques. The results could also imply that if proper sensitization strategies are in place there is a room for changing the attitudes of community members towards SWM.

Table 12: How respondents became aware of solid waste management (N= 180)

Means of awareness	Frequency	Percentage
Through Ward development committee campaigns	126	70.0
Through fellow community members	41	23.0
Through my own initiatives	13	7.0
Total	**180**	**100.0**

4.4.2 Attitude of community participation towards solid waste management

Attitude towards solid waste management among respondents were measured using Likert scale which had 12 statements (Table 14). Every respondent was asked to indicate if he/she strongly disagreed (1), disagreed (2), was undecided (3), agreed (4) or strongly agree (5) with each item of the scale. The responses were grouped into three categories, strongly agree and agree were regrouped into agree; strongly disagree and disagree were regrouped into disagree while undecided was left to stand alone. A total of twelve (12) statements were constructed to show the frequency of attitudes towards solid waste management, The scores in disagree ranged from 10-29 points, undecided lied within 30 points and agree ranged between 31-50 points.

Table 13 shows that, 149 (82%) of respondents had unfavourable attitudes towards solid waste management (that is, they scored less than 30 out of 50), 30 (17.5%) had favourable attitudes towards solid waste management (that is, they scored less than 30 out of 50) and 1(0.5%) had neutral (that is, they scored 30 out of 50 points). The overall mean of attitude towards solid waste management was 26.2 out of 50 which implies that the overall attitude towards solid waste management was unfavourable; therefore most residents had negative response towards solid waste management. The results are consistent with those in Table 11 which indicate that community members do not adequately participate in SWM due to the perception that it is largely a responsibility of local government authorities.

Table 13: Three categories of overall attitude

Attitude scales	Frequency	Percentage
Unfavourable attitude	149	82.0
Indifferent attitude	1	0.5
Favourable attitude	30	17.5
Total	**180**	**100.0**

Table 14 shows that with exception of the responses of first statement having 70.5% of respondents (127), the rest of the respondents in each statement disagreed with almost all the statements that sought to measure their attitude towards community participation. For instance, the statement number 5, 6, 8 and 9 with their correspondence number of respondents 173, 177, 174 and 178 as presented in Table 14 shows that there were no differences in their perception towards community participation. These findings conform to earlier results (Table 11) about perception on SWM. There is therefore a need to sensitise communities in urban and peri-urban areas about their responsibility regarding SWM.

Table 14: Attitude of Community participation towards solid waste management

Attitudinal Statements	Disagree	Undecided	Agree
1. Community awareness and education alone cannot improve community participation	20.5(37)	8.8(16)	70.5(127)
2. Participation through cash and/or in kind is necessary because City Council has no enough funds to cater for the whole cost of solid waste management	88.0(158)	0.5(1)	11.5(21)
3. Solid waste management is not of immediate priority	92.2(166)	Nil	7.8(14)

4. Participation in solid waste management is not time consuming to the community	91.6(165)	1.6(3)	7.0(12)
5. Usually communities have tendency of attending meetings to discuss environmental issues	96.1(173)	0.5(1)	3.3(6)
6. Communities do participate fully in the contribution of cash and/or in kind for solid waste services	98.0(177)	0.5(1)	1.5(2)
7. Community's sometimes do not contribute their views when meetings are conducted as Ward chairman and few influential individuals have a tendency of dominating the discussion	83.8(151)	14.4(26)	1.8(3)
8. Communities have adequate knowledge about solid waste collection, storage, separation and disposal	96.6(174)	2.0(3)	0.7(1)
9. Communities are involved in solid waste collection, storage, separation/treatment and final disposal	98.8(178)	1.1(2)	Nil
10. Solid waste services should not be paid for	91.1(164)	3.3(5)	7.4(11)
11. Leaders do not influence residents to participate in solid waste management activities	61.1(110)	8.3(15)	30.6(55)
12. Workload does not lead to poor community participation in development activities	92.2(166)	0.5(1)	7.2(13)

According to Thompson (1985), negative attitude towards SWM can be attributed to the colonial past when the government was expected to do everything. Yet, communities have a significant role in terms of participating in development activities.

4.4.3 Opinions on types of contributions as a means of community participation in solid waste management

Voluntary or other forms of contributions are indeed fundamental to development activities success (Nyangira, 1970 and Oakley, 1991). Responses were sought from the respondents about the mode of contribution to SWM. Results in Table 15 indicate that the majority

(77%) of the respondents were not of the opinion that there is no need for any type of contribution/involvement in SWM agreeing with earlier observation that SWM is perceived as a task of local government authorities.

Table 15: Opinions on types of contributions and participation in solid waste management (N=180)

Opinions on types of contributions	Frequency	Percentage
No need for any type of contribution/involvement in SWM	138	77.0
Cash payment upon collection at HH level	2	1.1
Labour contribution during collection and disposal	32	17.4
Material contribution e.g. provision of wheel barrows	1	0.5
All forms of contributions are necessary	7	4.0
Total	**180**	**100.0**

Results in Table 16 indicate that a significant proportion (about 76.6%) of the households interviewed only participate at the level of collection and storage of the generated solid waste. Insignificant proportion participates at other levels such as separation, transportation and recycling. The results are consistent with early observations (Table 7 and 10) which indicated that SWM at household level is a serious problem due to inferior storage facilities which are mostly plastic bags posing serious health problems. Very few households are expected to participate beyond collection and storage level due to inadequate transportation and associated facilities.

Table 16: Level of participation in solid waste management by households (N = 180)

Level of participation by community at HH level	Frequency	Percentage
Participate in collection and storage of SW	138	76.6
Participate in transportation and disposal/ treatment	30	16.4
Participation in separation, re-use/recycling	12	7.0
Total	**180**	**100.0**

4.4.4 Level of Community Awareness about Using Composting as an Alternative Solid Waste Management and Potential income generation

4.4.4.1 Level of Community awareness on composting and potential benefit

As indicated earlier composting could be one of the potential and sustainable solid waste management strategies, in addition to income generation. Composting could be a very viable recovery alternative over solid waste management (Mbuligwe and Kasenga, 2002)**.** Since most local authorities have become economically constrained in providing efficient management of solid waste, a possibility of converting a significant proportion of municipal solid wastes to organic earth like material by means of composting can provide a significant contribution to the solution of the problem (Linzner *et al.,* 2007). Respondents were asked about their level of awareness on composting. The results in Table 17 indicate that a significant proportion of respondents are completely unaware that composting could be used as means of waste management and income generation. This was expected since this alternative is rarely practiced in most of urban areas in Tanzania. If well planned and executed composting could be a sustainable alternative of solid waste management in most of our urban and peri – urban areas since about 70 - 80% of the generated solid waste is bio-degradable hence a possibility of composting. This will provide fertilizer to about 33.3% of City residents who depend on urban agriculture for their livelihood (MCC, 2010). Also composting could play a role of source of organic fertilizer and income to urban/City dwellers.

Table 17: Level of awareness about composting and potential benefits

Level of awareness on composting	Frequency	Percentage
Completely unaware	107	60.0
Moderately aware	57	31.2
Aware	16	9.3
Total	**180**	**100.0**

4.4.4.2 Possibility of forming groups for composting purposes

Groups are a key factor for effective participation and successful implementation of community activities, groups are used to urge authorities to integrate agriculture in urban planning (Lober, 2011). The purpose of such groups is to offer the municipalities an alternative waste management tool and creation of micro enterprises based on compost making. Such groups seek to create sustainable recycling of solid wastes to produce affordable organic fertilizer. The idea is to mobilize communities to collect and make compost out of the generated solid wastes. Results in Table 18 indicate that 68% of respondents were of the opinion that there is a possibility of forming groups for composting, the rest (32%) did not agree on the possibility of forming groups for composting. Focused group discussions indicated that there is a high possibility of forming groups for purposes of composting provided members of the community are well sensitized. Such groups could be site specific. For example, in market places vegetable vendors could form groups that are targeted in composting crop/vegetable remains hence reducing biodegradable solid waste. These results are consistent with study findings conducted in Brazil and Argentina which indicated that, CBOs and site specific groups have emerged with a component of refuse collection, separation and composting which apart from addressing the problem of SWM have also generated income to most of the city dwellers (Fiensten *et al.*, 1975).

Table 18: Possibility of Forming Groups for Composting

Possibility of forming groups	Frequency	Percentage
Yes	123	68.0
No	57	32.0
Total	**180**	**100.0**

4.5 Suggestions for Improvement of Community Participation in Solid Waste Management

Focused group discussions were conducted in which respondents were asked to give proposals for improvement of community participation in solid waste management. Results in Table 19 indicated that the provision of community education and awareness creation ranked highest followed by provision of collection containers and allocation of adequate funds to municipal for purposes of building their capacity in SWM. Enforcement of existing by-laws ranked forth. These results suggest that if communities are made aware and educated on issues such as their role in SWM and formation of site specific groups which could address issues like compost making, participation in SWM will be enhanced. Focused group discussions indicated that compost making could be an entry point for increased participation. Previous studies by Akinmoladun and Adejumo (2011) indicated that about 70 - 80% of the generated solid waste in urban areas is of organic nature which can be turned into organic fertilizer and source of income if well planned and organized.

Table 19: Pairwise ranking for suggestions/proposals for improving community participation in solid waste management

	Make regular supervision	**Provide community education and awareness**	**Law enforcement to defaulters**	**Allocate adequate containers/collection points in streets**	**Allocate adequate funds for SWM services**	**Total score**	**Rank**
Make regular supervision	X	Provide community education and awareness	Law enforcement to defaulters	Locate adequate containers/collection points in streets	Allocate adequate funds for SWM services	0	5
Provide community education and awareness creation		X	Provide community education and awareness	Provide community education and awareness	Provide community education and awareness	4	1
Law enforcement to defaulters			X	Locate adequate containers/collection points in streets	Allocate adequate funds for SWM services	1	4
Allocate adequate containers/collection points in streets				X	Locate adequate containers/collection points in streets	3	2
Allocate adequate funds for SWM services					X	2	3

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The objective of this study was to assess the extent of community involvement in solid waste management. Results indicated that vegetable and food remains accounts for about 60% of the generated solid waste. However, the city authorities can only collect and dispose off about 44% of the collected SW. The rest is not properly managed pointing to a possibility of environmental and health problems. Results also indicated that at household and community levels, lack of collection and disposal facilities is a major problem. Solid waste management is largely perceived to be a responsibility of local government authorities. Most members are not aware of their role in SWM and their attitude towards participating in SWM is quite unfavourable. Results further suggest that since the traditional SWM practices can not be sustained; there is a need to look for other alternatives such as composting. There is a possibility of forming site specific groups which could address the issue of composting. This could be an attractive alternative since apart from providing fertilizer source it could also generate income for the majority of the city dwellers. In any case, there is a need to educate and sensitise the community if meaningful and sustainable SWM is to be achieved.

5.2 Recommendations

Based on the study findings the following recommendations are pertinent:

(i) Efforts should be directed towards educating and sensitizing community members about their role in SWM activities. This will enhance their participation in SWM matters.

(ii) Active and empowered environmental committees should be created for purposes of enhancing participation at lower levels.

(iii) Community waste management fund should be established for purposes of meeting some of the SWM costs such as the provision of basic facilities for collection and storage.

(iv) A strong link /liaison between the community and local government authorities should be encouraged for purposes of enhancing community participation in SWM.

(v) Emphasis should be targeted to promote sustainable alternative approaches of managing solid waste such as composting and recycling through use of site specific groups. This will also contribute to enhanced urban agriculture as well as income generation.

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APPENDICES

Appendix 1: Key variables and their operational definitions

Variable	Operational definition	Level of Measurement	Units of measurement
Age	Number of years since one was born	Ratio	Absolute years
Sex	Being male or female in biological term	Nominal	1=Male 2=Female
Education level	Number of years attended by an individual in formal education	Ratio	Absolute years
Marital status	State of having a spouse around or away	Nominal	1=Married 2=Single 3=Divorced/separated 4=Widow/widower
Household size	Number of household members	Ratio	Absolute number
Occupation	Source of income of a person/ State of engaging in a particular work	Nominal	1=Salaried employ 2=Self employed 3=Unemployed 4=None
Role of stakeholders	State of playing part in a particular communal work activity	Ordinal	Less taking part More taking part
Community participation	A process through when all stages of development and decision making are involving community members and other stakeholders	Ordinal	Participating Not participating
Community awareness	State of knowing what is prevailing in the community about SWM	Ordinal	Less familiar More familiar
		Nominal	Methods used in managing solid waste
Community empowerment	Process of building people's ability in order to get what they want from the environment, given what is available	Nominal	1=Village assembly meetings 2=Facilitation of training 3= both meetings and training 4=none
Attitude of community	Readiness to perform certain obligation concerning SW	Ordinal	Less willing More willing
Type of community participation	Style of contributing towards SWM	Nominal	1=Cash 2=In kind (Labour and material) 3=Both

Appendix 2: Questionnaire for respondents

Questionnaire No...

Assessment of the extent of community participation in solid waste management. The case of Mbeya city Council. Tanzania

Section A: Respondent personal characteristics

Please tick [ ] circle and, or fill where appropriate

1. Sex of respondent

    1. Male
    2. Female

2. What is your age in years?.....

3. Marital status

    1. Single 2. Married 3. Divorced 4. Widowed 5. Separated

4. What is your level of education?

    1. No formal education 2. Primary education
    3. Ordinary secondary education 4. Certificate/Diploma

5. What is the size of your household?

    1). ≤2 persons 2). 3-5 persons. 3). 6-8 persons 4). 9-11 persons
    5). ≥12

6. What is the major source of income for your livelihood? (Tick one)

    1. Salary/wage 2. Income generating project
    3. Farming/Livestock 4. Others (Specify)……

7. If farming, in which activity are you engaged? (Tick one)

    1. Cattle rising 2. Poultry keeping 3. Banana growing
    4. Maize growing 5. Others (Specify)……...

8. What is your estimated income per year?

1. Less than 200, 000/=
2. 200, 000 – 500,000/=
3. More than 500,000/=

Section B: Information on existing situation concerning solid waste management (generation, collection, storage, transportation, separation and final disposal)

9**.** What is the main type of generated solid waste in your household?

1. Vegetable and food remains 2. Leaves/grass
3. Plastics/bottles/cans 4. Others (Specify)

10. Is the solid waste collected from your house?

1. Yes 2. No

11. Does your household have a storage facility for storing household solid waste?

1. Yes 2. No

12. What type of storage facility does your household (or establishment) have for waste storage on your household?

1). Metal or plastic container

2). Concrete (immovable) container

3). Basket or carton container

4). Plastic bags

5). Other type of container

6). No container

13. How do you dispose wastes after collection/storage?

1). Incineration

2). Communal centres/collection points

3). Refuse pits

4). Open dumpsites

5). Others (specify)

14. Who from the members of your household usually discharge garbage at the collection point?

1). Male head of household

2). Female head of household

3). Any adult

4). Any child between the age of 12 and 18

5). Don't know

15. Do you have a communal collection centre/ point in your area?

1). Yes 2). No

16. What is the distance from your home to your collection point?

1). Less than 100 meters

2). 100 to 300 meters

3). 300 to 500 meters

4). More than 500 meters

5). Do not know

17. Who has provided the collection facility?

1). Community itself

2). City council

3). Others

18. How do you transport solid waste from the household to the communal collection centre?

a) By wheelbarrow. b) On head

c) By bicycle d) Others (specify)

19. What is your opinion about the communal containers in your neighbourhood?

1. They are too far away from the house

2. They are too small to contain all solid waste

3. They produce unpleasant odours

4. Nothing is wrong with the communal containers

5. No opinion

20. Do you separate solid waste into organic and inorganic components before disposal?

1. Yes, do separate 2. No, do not separate

21. If yes in Qn. 20, what is the use of the separated solid waste components?

a) Not applicable (do not re-use/recycle)

b) Soil conditioner (composting)

c) Source of energy

d) Direct re-use

22. Who has primary responsibility for collecting solid waste once it is brought to the transfer point?

1). Local government/City Council 2). Private company

3). Neighbourhood group 4). Other ….. 5). Don't know

23. What would you say is the most important environmental problem in your ward?

1). Unsafe drinking water

2). Insufficient water supply

3). Inadequate sanitation (sewerage)

4). Inadequate solid waste collection

5). Unsafe solid waste disposal

6). Unsafe disposal of hazardous waste

7). Other.

24. Are there any by-Laws, rules and regulations which govern community participation in SWM?

1. Yes 2. No

Section C: Community awareness on solid waste management

25. What do you understand by solid waste management?

1). Collection of solid waste by Local authority

2). Incineration

3). Dumping wastes in landfill

4). Collection of garbage in open places

5). Proper collection, recycling and disposal of solid waste

26. How did you happen to know about solid waste management (Tick one)

1). Through ward development committee awareness campaigns

2). Through fellow community members

3). Through my own initiatives

4). Workshops, seminars, training and guidelines

5). Others (Specify)…….

27. Do you know the concept of community participation in solid waste management?

1). Yes, I know it……... 2). No, I do not know……

28. If yes, what is all about? .....

29. Does the City Council provide training, guidelines or awareness on community participation in solid waste management? (Tick one).

1). Yes…….. 2). No……

30. Have you ever attended any seminar, training/workshop, awareness creation on issues related to solid waste management?

1). Yes…… 2). No……..

31. If yes in Qn. 30, how often did you attend the training?.....

32. From Qn. 30, was the training relevant to you?

1). Yes 2). No…….

33. Do you know whether other people in the ward are aware about solid waste management?

1).Yes …… (If yes, go to Qn 34) 2). No……

34. How did they know? (Tick one)

1). By using variety of media including meetings, radio and television

2). By use of village assembly meetings only

3). Through group discussions, poetry, storytelling, debate, street theatre, soap operas

4). Others (specify)……

Section D: Community as a key stakeholder

35. Do you know that you are among of the key stakeholders in enhancing the success in solid waste management in your community?

1). Yes, I know…… 2). No, I don't know……...

36. If yes in Qn 35 what are your main responsibilities?

37. Do you know any other key stakeholders who are necessary for the management of solid waste?

1). Yes…… (If yes go to Qn 38) 2). No …….

38. From Qn 37, what are the main roles for those key stakeholders?.....

39. Are those key stakeholders participating fully particularly in mobilization of community to participate in solid waste management?

1). Yes…….. 2). No……

Section E: Community attitude towards participation in solid waste management

40. Please, rank the following statements to determine attitude and extent of communities' participation towards solid waste management by ticking in appropriate box by using the scale provided: 1 = Strongly disagree (SD), 2=Disagree (D), 3 = Undecided (U), 4 = Agree (A) and 5 = Strongly agree (SA)

S/ No	Attitudinal statements	SD (1)	D (2)	U (3)	A (4)	SA (5)
1.	Community awareness and education alone can not improve community participation					
2.	Participation through cash and/or in kind is necessary because City Council has no enough funds to cater for the whole cost of solid waste management					
3.	Solid waste management is not of immediate priority					
4.	Participation in solid waste management is not time consuming to the community					
5.	Usually communities have tendency of attending meetings to discuss environmental issues					
6.	Communities do participate fully in the contribution of cash and/or in kind for solid waste services					
7.	Community's sometimes do not contribute their views when meetings are conducted as Ward chairman and few influential individuals have a tendency of dominating the discussion					
8.	Communities have adequate knowledge about solid waste collection, storage, separation and disposal					
9.	Communities are involved in solid waste collection, storage, separation/treatment and final disposal					
10.	Solid waste services should not be paid for					
11.	Leaders do not influence residents to participate in solid waste management activities					
12.	Workload does not lead to poor community participation in development activities					

Section F: Community members' participation in solid waste management

41. Between men and women, whom do you think participate more in the Solid waste management activities? (Tick one)

1). Men 2). Women

42. What type of contribution did you make during the management of solid waste? (Tick one)

    1). Cash contribution

    2). Labour contribution

    3). Material contribution

    4). Contribution of cash and/or in-kind (labour and material)

    5). others (specify)…….

43. With all of the above types of participation, what is your opinion/comment? (Tick one)

    1). No need for using any type of contribution/involvement in SWM

    2). only cash payment upon collection at HH level

    3). Labour contribution during collection and disposal

    4). Material contribution e.g. provision of wheel barrow

    5). All forms of contributions are necessary

44. Who motivated you to participate in solid waste management? (Tick one)

    1). Friends

    2). Relatives

    3). LGA staffs (Health officers)

    4). Ward environmental committee

    5). Others (specify)……

45. Do you know the advantages of community participation in the management of Solid waste?

    1). Yes…… 2). No……

46. If yes in Qn 45, mention them……

47. Do you know the concept of community participation in solid waste management activities?

    1). Yes, I know it……..... 2). No, I do not know……

48. If yes in Qn 47, what is all about? .....

49. Are those key stakeholders participating fully particularly during mobilization of community to participate in solid waste management?

    1). Yes…… 2). No……

50. As a stakeholder, were you involved in the election of Ward Environmental? Committee members (WEC)?

    1). Yes……. 2). No……

51. Is there any environmental committee in your ward?

    1). Yes 2). No……

52. How do you rank the performance of ward environmental committee?

    1). Adequate

    2). Inadequate

    3). Undecided

53. Are there any groups for strengthening solid waste management activities?

    1). Yes ……. 2). No……

54. If Yes to what extent the groups enhanced solid waste management?

    1). Very high 2). High 3). Moderate 4). Low 5). Very low

55. Are there any by-Laws, rules and regulations which govern community participation in SWM?

    1). Yes…… 2). No……..

56. Who is the regulatory authority of the by- laws?

1). Ward 2). City council

57. Are there any measures for defaulters in the ward?

1). Yes 2). No

58. If yes, what are the measures for defaulters?

1). Penalty 2). Sent to court 3). Others (specify)

Section G: Levels of Participation

59. Have you ever participated in any means/level in solid waste management?

activities in your ward?

1). Yes 2). No

60. If yes in Qn, 59 what were the means/ levels of participation?

1). Participation in collection and storage of SW

2). Participation in transportation and final disposal

3). Participation in separation and re-use/recycling

61. Are you satisfied with the type of participation by the community in solid waste management in your ward?

1). Yes 2). No

62. If No in Qn. 61, what are your comments?

Section H: Community awareness on composting and its benefits.

63. Do you know the concept of composing?

1). Yes…….. 2). No

64. If yes in Qn. 63 to what extent are you aware about composting?

1). Completely unaware 2). Moderately aware 3). Aware

65. What are the benefits of composting technology?.....

66. Are there any possibilities of forming groups for composting strengthening Solid waste management activities?

1). Yes…… 2). No……..

67. If yes in Qn.66, how groups can be formed? ……

Appendix 3: The checklist for focus group discussion

1. Are you aware about the concept of solid waste management?
2. Which solid waste management practices commonly used/introduced in the ward? Rank them.
3. Which are the reasons for inefficient solid waste management services in the City? Rank them
4. What do you think are main problems/limitations in managing solid waste at Household and community level? Rank them
5. Do you know the concept of composing?
6. What are the benefits of composting technology?
7. Do you have any suggestions to improve the situation of community participation in solid waste management?

Thank you for participating and your concern