

Dar es Salaam City and Challenges in Solid Waste Management. The Case of Manzese and Sinza Wards in Dar es Salaam

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Abstract: *The focus of this paper is on challenges facing solid waste management in Manzese and Sinza wards, in Dar es Salaam city. In this paper different ways of generating, disposing waste and the associated problems are surveyed. About 102 people were interviewed. Different methods were employed in data collection which included direct observation, focus group interviews and questionnaires. Moreover, both secondary and primary data were collected. Sources of solid wastes are domestic, commercial and industrial enterprises. About 60% of domestic and industrial waste is deposited in landfills; the rest is burned, incinerated, taken to the dump or recycled. In major urban cities and centres, land suitable for waste disposal is becoming increasingly scarce and expensive. The study found that poor waste management is coupled with a number of problems such as eruption of diseases and foul smell. Stern measures must be legally instituted, reinforced and enforced to ensure that all residents adhere to them. Residents should be sensitized and educated on the importance of managing their waste in a proper and sustainable manner.*

Keywords: Solid waste, solid waste management, urbanization.

INTRODUCTION

Urbanization is a global challenge that is an irreversible process (Kironde, 2000). Urbanization is also perceived in different dimensions. The first challenge is that, urbanization is a result of increasing proportion of urban population in a country. The second challenge is the economic dimension that is associated with the concentration of economic activities within a limited geographical space that has been triggered by enhanced industrialization. The third challenge is related to the spatial expansion of settlements including the increasing population density. The fourth challenge is the social dimension that involves change in people's lifestyles as for instance demonstrated by the consumption style. Urbanization processes in most sub-Saharan cities - including Dar es Salaam, is highly unguided as reflected by the rampant changes in land and building uses, settlement development on marginal and hazardous land, unguided densification, urban sprawls beyond existing servicing capacity, deterioration of social services and public utilities, proliferation of informal and poorly serviced settlements (Mhache, 2007). The unguided urbanisation coupled with poor governance systems in these cities has increased residents' vulnerability to disaster to the extent that very few communities are able to cope with any hazard when they occur.

Solid waste management is the discipline associated with control of waste, storage, collection, transfer and transport, processing and its disposal in the manner that is accordance with the principles of public health, and economic, engineering, aesthetic and environmental considerations (Kironde, 2000). Solid waste management is one of the challenges facing cities in developing countries. Urban solid waste in Tanzania in general as well as in Dar es Salaam city in particular, is a serious environmental problem (Yhdego, 1999). The assessment and fieldwork studies undertaken by Kaseva and Mbuligwe (2005) indicated that current solid waste generation rate in the city is estimated to be 2,425 tons/day. However, this study indicated that about 957 tons of waste is generated per day. Out of this total, 231 tons of waste generated is daily collected by the municipalities of Ilala, Temeke and Kinondoni. Private contractors collect 592 tons of solid waste generated per day and 134 tons of waste produced per day is recycled.

Solid waste which is not collected by local government authorities is more than 50% of the total solid waste generated in Tanzania (Majani, 2002). Literature has it that, in Dar es Salaam, about two thirds of all solid wastes from both residential and commercial enterprises remain uncollected (Hardoy *et al.*, 1997). Thus, waste generation is not in line with the ability of urban authorities to collect and deposit them in the allocated disposal areas. The Dar es Salaam City Council was reported to have failed to provide adequate solid waste collection services for its fast growing population (Majani, 2002).

Solid waste comprises all the wastes arising from human and animal activities that is normally solid and that is discarded as useless or unwanted materials. However, the Tanzania Bureau of Standards (TBS) has not yet develops solid waste management standards. The Environmental Management Act (1997) stipulates that standards need to be developed and adhered to. Lack of standards implies that, it is to a large extent, for each local Government authority to decide how to manage solid waste.

STUDY PROBLEM

Solid waste management is one of the many problems facing large cities like Dar es Salaam, in Tanzania. About 50% of the waste generated in urban areas is not collected or is inappropriately disposed. In most urban cities population is increasing at alarming rates in such a way that the available mechanism or measures in place are unable to collect and properly dispose all the waste generated in a timely manner. This situation results in accumulation of waste every where in urban areas including the market places. Manzese and Sinza wards also face poor solid waste disposal and management problems. Thus, this paper aimed at identifying the major sources of solid waste and the ways of which the waste generated can be properly managed in these two wards.

OBJECTIVES OF THE STUDY

The objectives of the study were three-fold, viz:

- To identify and evaluate the main sources of solid waste in Manzese and Sinza wards,
- To examine the impact of solid waste in the study areas,

- Come up with recommendations on how to manage solid waste in urban areas.

RESEARCH METHODOLOGY

The researcher used different methods in gathering data. Information was gathered through literature review and field data collection. Secondary data was collected from published and unpublished materials. Literature review was done at the REPOA library, The Open University of Tanzania Library and the Main Library of the University of Dar es Salaam. The secondary information enabled the researcher to familiarize with the study area and to identify what has been done and what has not been done so far. Primary data collection methods involved direct observations, questionnaire interviews and interviews with key stakeholders, focus group discussions and the ranking method. Sampling was carried out in Manzese and Sinza wards (Figure 1). In total 102 residents were randomly selected and interviewed, 51 respondents per ward. A purposive sampling was used for key informants (local government officials, elderly people, and solid waste collectors and contractors). Information gathered from the internet search was also used in this study.

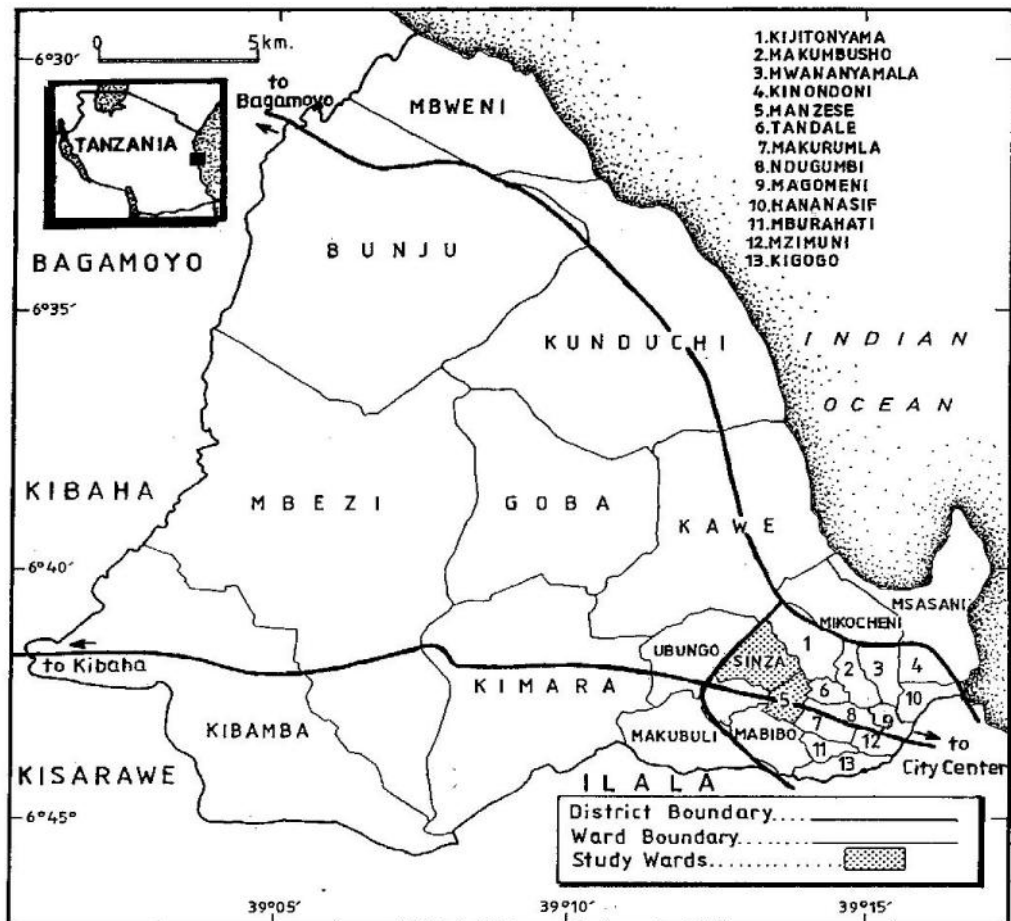


Figure 1: Map of Kinondoni district showing the study wards

JUSTIFICATION OF THE STUDY

Manzese and Sinza wards were selected because they are some of the wards in Dar es Salaam with serious problems of solid waste management (Figure 1). This situation is intensified by the high population growth rates, existence of many unplanned settlements and different human activities taking place in these wards which include among others; food vending, shops found every where, hotels, restaurants, bars, groceries, guest houses, stationeries and hair saloons. Also the areas have several institutions ranging from nursery schools, primary schools to colleges. All these activities contribute to pile-ups of waste found almost every where in these wards.

The two study areas were found to have numerous piles of solid waste in most areas resulting in outbreaks of diseases during rainy seasons and are characterized with bad odour emanating from increasing solid wastes. It is said that frequent outbreaks of diseases-like cholera and dysentery, is due to improper waste management in those areas. Lastly, accessibility was another reason which influenced the selection of Manzese and Sinza wards as the areas are accessible throughout the year. The above reasons influenced the selection of the two study areas.

CONCEPTUAL FRAMEWORK OF WASTE MANAGEMENT SYSTEMS

Figure 2 presents the activities associated with management of solid waste from the point of generation to disposal stage. The activities depicted in Figure 2 can be grouped into six functions. According to Kironde (2000), solid waste management is a necessary undertaking in modern day urban areas. Solid waste management (*ibid*) involves the control of waste generation, waste storage, collection, transportation, processing and final disposal as seen in Figure 2.

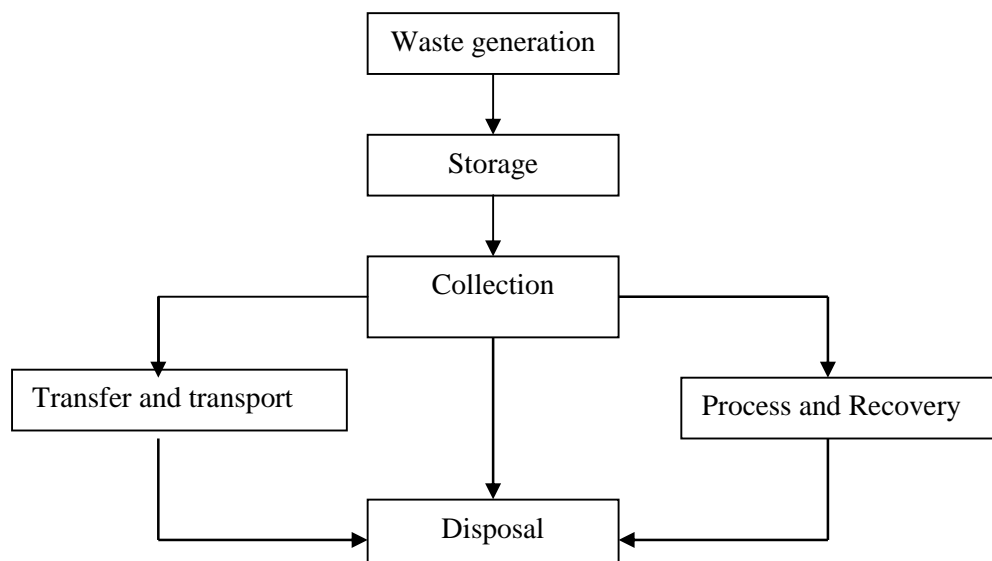


Figure 2: Inter-relationship of functional elements constituting Solid Waste Management (SWM). Source: Kironde, 2000

Waste management is everyone's business. We all produce wastes in nearly everything we do. Solid waste starts at a point referred to as waste generation (Figure 2). Waste generation is a point in which materials are identified as no longer of value and are either thrown away or gathered for disposal. The solid wastes generated are processed or stored; in other words onsite waste handling/storage and process is performed. Solid waste generated is processed closely to the point of generation. According to the interviews and focus group discussion held in Sinza and Manzese wards indicated that all residents are generating waste. The differences exist in the quantities and type of waste produced, the way waste is stored, collected and disposed.

Collection refers to the activities involving gathering of solid waste and the hauling of wastes to the location where the waste collection vehicles (dump-trucks) are brought to dump the waste. Then follows transfer and transport of waste to the dump site. Transfer and transport of waste involves taking waste from the collection point to the dump site. Waste transportation involves larger transport equipment which transport waste usually over a long distance to the disposal site. For example, waste collected in Manzese ward is transported to Mtoni dump or Pugu-Kinyamwezi dump located about 20 to 30 kms away.

The last step in solid waste management as depicted in Figure 2 is disposal. Disposal refers to those activities associated with ultimate disposal of solid wastes, including those waste collected and transported directly to the dump-site, landfill, semi-solid waste (sludge) from waste-water treatment plants, incinerators, residue, compost or other substance from the various solid-waste processing plants that are of no immediate use.

The waste disposal stage involves processing of the waste and making sure that the waste will not harm the environment and other living organisms including human beings. In the study wards as well as in Dar es Salaam at large, solid waste is not processed at all. The responsible authorities collect waste and take them to the dump site without processing it in any way.

LITERATURE REVIEW

Municipal solid waste sources

Municipal solid waste sources comprise the waste generated by residential sources, commercial and institutional sources. According to Ngiloi (1992) - cited in Kalwani (2009), solid wastes are classified into five main groups' which include commercial, domestic, hospital, industrial wastes and street sweepings. Commercial solid waste entails business and institutional wastes (except hospitals and industries). Domestic or household solid waste (garbage/refuse) is generated after the use of domestic materials both bio-degradable wastes such as remains of food, vegetables, rags, and paper; and non-degradable ones such as plastic materials, bottles and glass. Hospital wastes involve disposable syringes, pads, dressings and septic organic matter, which are hazardous (extremely dangerous to life). Industrial solid waste includes discarded raw materials and unwanted products generated in the production process whether hazardous or non-hazardous wastes. Street sweepings include different

wastes thrown or deposited on roads, streets and drains. They include, sand, tree leaves, fallen trees or branches, dead bodies mainly of strayed domestic animals and so on.

Box 1: In summary:

Municipal Solid Waste Sources = Residential + Commercial + Institutional

Other community wastes, resulting from the operation and maintenance of municipal facilities and the provision of other municipal services, include street sweeping, road side litter and the waste from municipal litter containers, landscape and tree trimming, dead animals and abandoned vehicles. Because it is impossible to predict where dead animals and abandoned automobiles will be found, such waste are often identified as originating from non-specific refuse sources. Wastes from non-specific sources can be contrasted to those from the residential sources, which are also refuse but specific in that the generation of wastes is a recurring event.

Improper disposal of solid waste by residents

Solid waste generation varies between households, countries and cities. Reliable data on the generated waste is hard to get. Waste is given different terms by different stakeholders. These include: waste, garbage, trash, junk, debris or refuse. These are different names given to the material that is no longer useful in its current form. In the contemporary society, many of the items used daily are designed to be discarded at the end. There are organic materials, such as yard and garden wastes, food wastes, and sewage sludge from treatment plants; disused cars; worn out furniture and consumer products of all types. Newspapers, magazines, advertisements and discarded office papers are some of the major source of wastes. Wood, concrete, bricks, and glass coming from construction and demolition sites, dust and rubble from landscaping and road building contribute to solid waste in urban areas.

Waste generation, disposal and management are challenges facing most urban cities today. These are environmental stresses as they are related to population explosion and unplanned settlements in urban areas. Through direct observation, different areas have been turned into intermediate dump sites which includes Mto Ng'ombe in Sinza ward, in the streets, along the road(s) different piles of waste were found along Morogoro road including Manzese Bridge. In most areas, solid waste is mainly haphazardly disposed at night. Most people put the waste in the plastic bags and pretend they are taking it somewhere, when they reach a point where they find no one; they just leave the rubbish or garbage wherever they are.

An overview of municipal solid waste management

Municipal solid waste management constitutes one of the most crucial health and environmental problems facing Governments of African cities. This is because even though these cities are using 20-50 percent of their budget to deal with solid waste management, only 20-80 percent of the waste is collected.

Numerous factors constrain the effective provision of infrastructure services such as municipal solid waste management (Kalwani, 2009). Kironde *et al.* (1997), drawing on the experiences from Dar es Salaam in Tanzania and other cities in Africa, argues that contrary to what is often claimed, solid waste management problems in these cities are not caused by lack of resources. Some of the problems include corruption, poor consultations between politicians and the general public. The style of waste management varies between one municipal authority to the other. Garbage is collected either by a government agency or private contractors. North Americans produce rubbish and garbage at a rate of 220 million tons per year, or about 2 kilogrammes (4.5 pounds) per person per day (Fellmann *et al.*, 2003). As the population grows, incomes rise and consumption patterns change with the volume of disposable materials continuing to increase. The problem comes when the urban population purchases packaged food stuff and favour plastic wrappings and containers for every commodity they buy. Manufactured goods and domestic use equipments such as refrigerators, automobiles and other equipment designed for single use and quick disposal, contributes to the solid waste found in different parts of Dar es Salaam.

The waste that communities dispose includes newspaper, cans, tooth-paste tubes, old television sets, broken stoves and rusted cars. Such ordinary household items and municipal trash are poorly or improperly disposed. Much of it however, does have a component of danger to health or to the environment. Paint and paint removers, used motor oils, pesticides and herbicides, bleaches, many kinds of plastics and the like pose problems significantly to people (Fellmann *et al.*, 2003).

Challenges associated with management of solid waste

The United Republic of Tanzania is one of the developing countries with a relatively high population growth rate that is lacking proper waste management system in urban areas. It is highlighted in various literature (Kironde, 2000; Majani, 2002, and Kaseva and Mbuligwe, 2005) that the amount of solid waste not collected in Tanzania by the Local Government Authorities is more than 50 percent of the total solid waste generated in the country. This is an indication of an increasing problem, since population continues to grow while solid waste management services or capacities are dwindling. The uncollected waste pose potential health hazards to the people because in many locations, authorities handle the waste inappropriately.

It is estimated that 30-50 percent of solid wastes generated in urban centres remain uncollected for sometime (Theodora and Theodora, 1996). Such refuse accumulates in the streets to the extent of sometimes blocking roads or streets. The resulting problems are given low or no priority by Municipalities, Government and Non-Governmental Organizations (NGOs). Problems associated with uncollected waste

include bad odour, support of disease vectors and pests attracted by garbage (rats, mosquitoes and flies), and the overflowing drainage channels are most of the times clogged with garbage. Uncollected garbage can be a serious fire hazard as well as a serious health hazard for children playing on the dump-site. It is often common practice for households to burn their wastes if there is no service to collect them, and this adds to air pollution.

It is in the unplanned areas of the city which generally have the least garbage collection service or no service at all. Most households in these areas have very limited space - especially in high-density illegal settlements, which make waste storage or transporting garbage to a supervised dump site difficult. Most of the poor settlements are also located on land sites making access by motor vehicles (especially large conventional garbage trucks) difficult or impossible. Specific challenges facing solid waste management include:

- Poor practice or inappropriate alternative waste management methods. There are no proper and well-known methods of collecting, disposing and treating waste in most urban areas.
- The lack of sites designated for carrying out waste activities such as collection points, transfer stations and sanitary landfills. In areas like Bonde la Mpunga in Msasani Ward and Alli Maua 'A' in Kijitonyama ward, solid waste is dumped indiscriminately leaving most of the area filthy.
- Shortage of proper vehicles for waste collection, waste haulage and dumping of solid and liquid waste. Most of the cars used in waste collection are in very bad state of repairs, they break down several times on the way to the dump site. Once such vehicles break down, it can stay in one area for number of days before being repaired.
- Poverty levels of most of the residents in Sinza and Manzese wards are also affecting the ability of the majority of the residents to meet refuse collection costs.

Solid waste management

Municipal solid waste (MSW) management has become a major issue of concern for many developing nations. The problem is compounded by rapid urbanization currently taking place in developing countries (Rakodi, 1997). Efforts by refuse collection agencies/contractors and the local authorities are frustrated by lack of resources needed to undertake the job. The level of poverty among the municipal residents is high. For example, a monthly service charge of Tshs 1,500/= is considered by many as high and most of them fail to pay it. This also contributes to the worsening situation (Makalle and Victor, 2003).

One of the key problems with solid waste management involves identification of the correct solid waste disposal method. The question to ask here is, where the generated waste going now? There is no specific area set aside for waste collection and waste disposal in most places in Dar es Salaam. As population increases, the volume of waste generated is also increasing but no proper space for disposing waste has been identified. In the world's poor countries, waste is thrown into open dumps, where vermin multiply, decomposition sends methane gas into the air, rain

and waste liquids carry contaminants into the groundwater, and fires pollute the atmosphere (Majani, 2002). In the well-off countries, open dumps have been replaced by proper sanitary landfills. The wastes are put in a piece of land or a hole dug and prepared for this purpose, including floor materials and treat most of the seeping liquids in addition to soil cover for each load as it is compacted and deposited. Several disposal methods are used to manage solid wastes. The methods listed in the next paragraphs are not exhaustive; they depend on a number of factors.

Several methods are used in waste disposal and management which include open dumping and sanitary landfills disposal. These two methods are extensively practised in most developing countries including Tanzania. Other solid waste disposal and management methods include incineration which involves the burning of solid wastes at high temperatures. Ocean dumping is also used as a dumping site of waste. This dumping method is discouraged in most countries but it is illegally practised in some cities including Dar es Salaam.

Generating less waste is obviously better than struggling with huge solid-waste to dispose, as all disposal methods have advantages and drawbacks. Different options are used in reducing waste produced every day which include recycling, reuse and reduction of wastes. In many cities including Dar es Salaam, glass and plastic bottles are routinely collected and returned to beverage producers for washing and refilling. This is better for the environment than re-melting and more profitable for local communities. Producing less waste is the best solution to waste found in different part of urban areas. Paper, plastic, glass, and metal packaging material make up to 50% of the domestic trash by volume. Manufacturers and retailers might be persuaded to reduce these wasteful practices if consumers agree to buy things and carry the items in the containers or packaging which can be used more than once.

DISCUSSION OF FINDINGS

Sources of solid waste

According to the 102 residents interviewed in Sinza and Manzese wards, four main sources of solid waste were identified. Majority of the respondents (49%) mentioned households as the main source of wastes while 25% of the respondents explained that commercial activities including markets as another source of waste (Table 1). About 17% and 9% of interviewees explained that institutional and industrial respectively, are the other sources of solid waste found every where in the study areas. The same situation is applicable in many unplanned settlements where solid waste is thrown every where because there are no areas designated for waste collection (Mhache, 2007). This study revealed - among other things, that per capita waste generation rates vary between individuals and institutions within the two study wards. These results imply that a large percent of the solid waste in the study areas were from households. The direct observation found heaps of waste in most streets in Manzese and Sinza wards. Very few households about 10% of the respondents were found using waste bins.

Table 1: Sources of solid waste

Sources of solid waste	Responses	Percentage of respondents
Residential/domestic source	50	49
Commercial source	26	25
Institutional source	17	17
Industrial waste	9	9
Total	102	100

Source: Field survey, 2011

Respondents were asked to show how they dispose waste. It was found that people dispose waste through burning, burying waste in the ground and taking the waste to the designated or accidental collection points waiting for trucks to take them to the dump site. Concerning where solid waste was collected in the study areas, this study revealed different waste collection points. About 19.6% of the people interviewed said that solid wastes generated were collected in backyard of their houses. 13.7% of the respondents collect waste in containers and waited for waste-trucks to come to take the waste to the dump sites. However, 22.6% and 24.5% of the respondents took solid waste to dumps and other part of the waste was buried in the land (land-fill), respectively. The remaining respondents paid some private people to dispose the waste while others dispose waste anywhere. In Zimbabwe, the Harare City Council contracted out waste management services to private contractors hoping that improved services to residents could be offered (Tevera *et al.*, 2002). However, this approach did not work contrary to the expectations (*ibid*).

The residents interviewed revealed different reasons which caused waste to be found every where in the wards studied (Table 2). Paying for the service of waste collection was mentioned as being the major reason for the heaps of waste found in the study area (wards). The majority of the respondents, 38% indicated that poverty of the residents in Sinza and Manzese wards made people not to pay for waste collection. Residents in Manzese and Sinza wards are supposed to pay Tshs 500/= and 1000/=, respectively per month, the cost which many people said is very high for some household to manage. About 19% of the respondents said that people are not adhering to regulations including by-laws because of absence of an enforcement system by the Local Government. Lack of proper or specific companies engaging in collection of waste is another reason for waste being found everywhere in the wards. The available companies for waste collection did not follow the routines. Lack of dumps in Manzese and Sinza wards is also a problem leading to waste being found everywhere. Twenty two percent of the interviewees revealed that, there is no proper or official dump site in the wards as a result residents dispose waste wherever they want. Some of the people using pull-carts (*mkokoteni*) collect waste from residents and dispose them in other areas. What they always do is transfer and then dumps the waste in other areas.

Table 2: Reasons for solid waste found in the study wards

Reasons for solid waste found in the study wards	Frequencies	Percentages
High waste collection cost	39	38
By-laws not adhered to	19	19
No proper companies	11	11
No dumps	23	22
Private collectors	10	10
Total	102	100

Source: Field survey, 2011

A claim was raised during the focus group discussion that private collectors or individuals engaging in solid waste collection contribute to solid waste found in the study area. These people collect waste from residents against payment, but they just drop them in the next street. These people have a tendency of collecting waste in their carts and park them for a while and they wait until late night to take the waste to other areas. They do not take them to the dump site or areas identified for temporary waste disposal if any. The urban councils are directly responsible for the total waste management process or contract parts of it to the private contractors (Kironde *et al.*, 1997). In most countries the urban councils remain poor, weak and are badly administered, as a result they fail to collect all the waste generated per day due to bad management techniques or non-involvement of experts.

Coping strategies towards solid waste management

Table 3 presents measures which can be used to control or reduce waste found in different part of cities. If all these measures are implemented the study areas will be clean and become healthier environment to live in. About 53.9% of the respondents indicated that the distribution of waste bins to every households; shops and markets is a major strategy towards solid waste management while 65.7% noted that an increase of the frequency of the solid waste collector vehicles would solve the waste problem in Manzese and Sinza wards as vehicles will be used to take waste to the dump. About 58.8% and 35.3% of the respondents explained that setting solid waste collection points and burning respectively are other strategies of reducing waste. Recycling and landfills can be other alternatives of controlling wastes as mentioned by 19.6% and 38.2% of the interviewees, respectively. Fines to any one found dumping solid waste haphazardly should be instituted and operationalized immediately in collaboration with the Local Government.

The study also found that different methods can be used to reduce waste. Buying foods that come with less packaging and by re-using own containers. Another measure is by separating cans, bottles, papers and plastics for recycling. Wash and reuse bottles, aluminium foil and plastic bags for personal use. If all these measures are implemented, the study areas would be clean.

Table 3: Measures instituted in controlling waste in the study wards

Controlling waste	Frequencies	Percentages
Increase solid waste collection vehicles	67	65.7
Distribution of waste bins to households, shops and markets	55	53.9
Burning	36	35.3
Setting collection points	60	58.8
Recycling	20	19.6
Landfills	39	38.2
Fines	12	11.8
Educating people	43	42.2

Source: Field survey, 2011

Awareness of importance of solid waste

During the interviews, 52% of the respondents said that lack of information regarding waste management is what contributed to waste being found every where in the studied wards. About 37% had the opinion that waste found in the study areas is due to recklessness of some residents. The remaining 11% did not know why waste is found every where. They agree that, every one has heard about proper ways of disposing waste, and the problems associated with improper disposal of waste. Radios, Televisions, magazines and others have contributed in advocating solid waste management. With all these efforts, the conclusion should be that, all residents should change their behaviour and attitudes towards waste generation and disposal. People should feel bad when waste is thrown haphazardly.

Problems associated with solid waste collection, disposal and management

According to interviews, focus group discussions and direct observation, the following problems were identified.

- The problem connected with waste management is that there is no national solid waste management strategy and consequently, the operational system for SWM is working without having clear policies and regulations that now seem to be unforceable.
- The Central Government has also been blamed for failing to adequately engage in monitoring and evaluation of solid waste activities in the country, among other problems.
- Local Governments are not taking actions to residents found disposing waste haphazardly.
- Residents are not willing or committed to pay for solid waste service collection.
- Vehicles used in solid waste collection are in poor state of repair to the extent that it is difficult to distinguish them from disused vehicles. It is very normal for those vehicles to get breakdown while on the way to the dump and they stay for a number of days on the road with solid waste which rots and smells very bad.
- Solid waste dumped close to residential buildings.
- Some of the problems related to poor solid waste management lead to outbreak of diseases, blockage of water channels and sewage systems.

CONCLUSION

This section presents the conclusion. With respect to the findings, it was established that a high amount of solid waste was found in unplanned settlements, markets places and along the streets and roads. Urbanization coupled with population increase is a challenge to solid waste found every where in the study area. Population increase leads to more production of solid waste since there are no areas designated for waste disposal. There is a negative correlation between city population size and both the percentage of waste moved and the households enjoying regular waste collection. This suggests that the increasing city size poses a great problem of solid waste management in Tanzania and in Dar es Salaam in particular. It was noted that an increase of solid waste collecting equipments such as waste bins, containers and vehicles to transport the solid waste to the dump sites were found to be the major strategies for solid waste management in the study area.

References

- Cunningham, W. P. and Cunningham, M. A. 2006. *Principle of Environmental Science: Inquiry and Applications*. Third edition. McGraw Hill.
- Fellmann, D. J., Getis, A. and Getis, J. 2003. *Human Geography: Landscapes of Human Activities*. The McGraw-Hill Companies Inc.
- Hardoy, J. E., Mitlin, D. and Satterthwaite, D. 1997. *Environmental Problems in Third World Cities*. Earthscan Publications Ltd. London.
- Kalwani, J. D. S. 2009. Community Participation in Municipal Solid Waste Management in Informal Settlements: Morogoro Municipality, Tanzania.
- Kaseva, M. E. and Mbuligwe, S. E. 2005. *Appraisal of solid waste collection following private sector involvement in Dar es Salaam city, Tanzania*. UCLAS Dar es Salaam.
- Kironde, J. 1994. *The Evolution of the Land Use Structure of Dar es Salaam*. 1980-1990, Unpublished PhD Thesis, University of Nairobi.
- Kironde, J. M. L. 2000. Rapid Urbanisation in Tanzania: The Government's Coping Strategies in *Urbanising Tanzania: Issues, Initiatives and Priorities*. DUP (1996) Ltd. Dar es Salaam, Tanzania.
- Majani, B. B. K. 2002. *Urban Solid Waste Management in Dar es Salaam, Tanzania*. Conyers, D.
- Makalle, A. M. P. and Victor, M. A. M. 2003. *Poverty and Environment: Impact analysis of Sustainable Dar es Salaam Project on "Sustainable Livelihoods" of Urban Poor*. PEPOA, Research Report No. 03.7. Mkuki na Nyota Publisher LTD. Dar es Salaam.
- Mhache, E. P. 2007. Lesson Learnt on Housing Problems in Unplanned Areas, the Case of Dar es Salaam City in the *Huria Journal*. Volume VII No. 2 December, 2007. ISSN 0856 6739. Pg 161-171
- Mwanthi, M. A. and Nyabola, L. O. 1997. "Solid Waste Management in Nairobi City: Knowledge and Attitudes", *Environmental Health Dec.* 1997 (December, 1997). Pg 23-29.

- Rakodi, C. 1997. *Global Forces, Urban Change and Urban Management in Africa. The Urban Challenge in Africa: Growth and management of its large Cities.* C. Rakodi, Tokyo, The United Nations University Press.
- Theodora, M. and Theodora, L. 1996. *Major Environmental Issues Facing 21st Century.* Prentice Hall, Upper Saddle River, New Jersey.
- Yhdego, M. 1999. *Urban Solid Waste Management in Tanzania Issues, Concepts and Challenges.* Environment Resources Consultancy. Dar es Salaam, Tanzania.