



(RESEARCH ARTICLE)



## Exploring technical challenges that affect sustainable solid waste management practices in Mzuzu City, Malawi

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International Journal of Science and Research Archive, 2023, 10(01), 125–130

Publication history: Received on 11 July 2023; revised on 30 August 2023; accepted on 02 September 2023

Article DOI: <https://doi.org/10.30574/ijrsra.2023.10.1.0687>

### Abstract

Rapid population growth and urbanisation have led to an increase in demand for different products in developing countries and this eventually has resulted into an increase in solid waste such as paper, plastics, bottles, glass and metals. Poor management of solid waste causes air pollution and health problems resulting into respiratory diseases such as asthma and pneumonia. Further, improper organic waste management risks being a breeding ground for disease causing organisms.

This paper explores technical challenges faced by the MCC that affect efforts to achieve sustainable solid waste management practices in Mzuzu city, Malawi. The study employed a qualitative case study design. The study was conducted in Mzuzu city and it targeted people involved in solid waste management. Expert and homogeneous purposive sampling techniques were applied to select participants and the sample size was eighteen. Data was generated through semi structured interviews, focus group discussions and observations, and data was analysed thematically. The study found that sustainable solid waste management practices in Mzuzu city face technical challenges which include; breakdown of transportation vehicles, inadequate waste bins and lack of recycling machinery. It was recommended that, Mzuzu city council should ensure that it deals with technical challenges promptly, in order to achieve sustainable solid waste management in the city, so as to prevent harm to the environment and human beings.

**Keywords:** Solid Waste; Solid Waste Management; Sustainable; Waste Management Theory; Mzuzu City Council (MCC)

### 1. Introduction

Globally, there is an increase in waste production due to an increase in population and urbanisation and this has led to poor waste management in cities and towns in developing countries (UNEP, 2015; Nwosu and Chukwueloka, 2020; US.EPA, 2020; Holm, Chunga, Mallory, Hutchings and Parker, 2021). It is projected that by 2025, 4.3 billion urban residents will generate about 1.42kg of waste per capita per day (Maskey, 2018). Wasteaid and ICCM (2020), predicts that global production of municipal solid waste will grow by an average of 70% by 2025, and this will have a great effect on the ecosystem and human health.

In 2015 the world produced about 2 billion metric tons of solid waste due to the exponential urban growth (US.EPA, 2020). It is estimated that from 2015 to 2040 the bulk of solid waste in urban Africa will increase from 124 million metric tons to 368 million metric tons per year, representing 200% increase (Holm *et al.*, 2021). To this effect, in order to prevent health risks, urban planning authorities need to develop proper infrastructure that would enable safe collection, processing and disposal of solid waste, particularly in developing countries (Nwosu and Chukwueloka, 2020; Cetrulo *et al.*, 2020).

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Solid waste management poses a great challenge to the environment and human health due to an increase in waste generation worldwide. The problem of solid waste is much more complicated in urban areas than in the rural (Debra, Vidal and Dinis, 2021). In Africa, rapid population growth has increased the generation of solid waste and this poses environmental and health risks (Dri, Canfora, Antonopoulos and Gaudillat, 2018; Nwosu and Chukwueloka, 2020). A study by Chireshe (2020) in Zimbabwe found that some of the problems associated with poor solid waste management in Harare included diseases such as diarrhea, malaria, typhoid, dysentery, bad odours, distortion of aesthetic value of suburbs and floods.

Most cities and towns in sub-Saharan Africa, face severe environmental deterioration and health implications due to poor municipal SWM systems (Kubanza and Simatele, 2019). As a result, solid waste is found everywhere, and it is visible along the roads, rivers, open and public places. Such waste has the potential to generate bad smell, pollution, as well as to increase the proliferation of diseases and contamination of vectors in humans (Centrulo, Centrulo, Dias and Ramos, 2020). Some of the improper approaches of managing waste might include poor policies, lack of finance and poor infrastructure (Kubanza and Simatele, 2019). As such, the issue of solid waste management requires a multifaceted approach involving political, socioeconomic, institutional, governmental, non-governmental and environmental aspects. (Centrulo, Centrulo, Dias and Ramos, 2020).

Municipal solid waste management is a challenge in that it is a multidimensional concern which involves a number of processes, which include; generation, separation, storage, collection, transportation, processing, recovery and disposal. As a result, there is need for different stakeholders such as local authorities and residents, governmental and non-governmental organisations to work together in order to achieve sustainable ways of managing solid waste (Gonçalves, Moraes, Marques, Lima and Lima, 2018; Tausova, Mihalikova, Culkova, Stehlikova and Taus, 2020).

One way of promoting solid waste management services in Mzuzu city, is by undertaking SWM processes on a daily basis. To that effect, the MCC collects, transports and dumps municipal solid waste daily, despite not undertaking any recycling, and re-using initiatives. Such being the case, the MCC could do much better if it could be carrying out, recycling processes, in order to enhance sustainable solid waste management practices.

Although Mzuzu city council is trying hard to achieve sustainable solid waste management practices the prevailing situation is that the MCC a lot of technical challenges, that are affecting the management of solid waste in the city. This is evidenced from the heaps of solid waste observed in the town awaiting collection and disposal, due to technical problems. This paper explores how technical challenges faced by the MCC affect efforts to achieve sustainable solid waste managing practices in Mzuzu city, Malawi.

### **1.1. Theoretical Framework**

This study is anchored by the Waste Management Theory. The theory was founded in 2004 by three scholars namely Eva Pongrácz, Paul Phillips and Riitta Keiski (Pongrácz, 2006). This theory was founded on the premise that waste management must be aimed at preventing waste from causing harm to human health and the environment by promoting resource use optimisation (Pongrácz, Phillips and Keiski, 2004). The Waste Management Theory was chosen to be applied in this study due to the fact that, the theory provides practical approaches to the problem of solid waste management.

The Waste Management Theory underscores that solid waste needs to be managed in such a way that it prevents harm to both humans and the environment. As such, waste management practices should aim at reducing production of waste by creating useful products (non-wastes) and also turning waste into non-waste (Pongrácz, 2006; Beleya, Xin-Ci, Ling-Wen, 2019). It is also argued that if the waste disposal site is not carefully managed, it results into environmental and socio-economic problems (Asefa and Mindahun, 2019; Akmal and Jamil, 2021). Therefore, sustainable solid waste management practices need to lead to a safe human health and environment.

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## **2. Material and method**

This study applied a qualitative research approach and it employed a case study research design. The case study research design enables and in-depth exploration of a phenomenon in its natural environment (Ndengu, 2012). As such, this design allowed the researcher to get in-depth data from the participants in their setting.

This study was conducted in Mzuzu city. The area was chosen due to its overwhelming availability of solid waste being generated daily. Mzuzu city is in the northern region of Malawi and it has a total population of about 240,000 people,

and it covers an area of 146 square kilometres (NSO, 2020). The study targeted individuals that are involved in solid waste management in Mzuzu city.

The sample size was 18. The number 18 was determined after reaching a saturation point. The participants were selected using expert and homogenous sampling techniques. The two sampling techniques allowed the researcher to select participants who had practical experience and were involved in solid waste management in Mzuzu city (Nikolopoulou, 2020).

Data was generated using semi-structured interviews, focus group discussion and observations, and it was analysed thematically. Thematic analysis involved coding of data, which means breaking down and re-assembling of data into small pieces in order to identify and allocate it into categories and themes in relation to research objectives (Braun and Clarke, 2006; Ndengu, 2012; Sharp, 2012). Trustworthiness of the findings was achieved through multiple data generation procedures.

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### 3. Results and Discussion

Using thematic analysis, three technical challenges emerged that efforts towards sustainable solid waste management practices in Mzuzu city, breakdown of vehicles, inadequate waste bins and lack of recycling machinery.

#### 3.1. Technical Issues

Apart from human resource, MCC faces technical challenges which include; breakdown of vehicles, inadequate waste bins and lack of recycling machinery.

##### 3.1.1. Breakdown of Vehicles

One of the technical challenges facing Mzuzu City Council is the breakdown of vehicles. Below is what the participants stated in their extracts:

*There is a problem when a vehicle breaks down, and the service is not done quickly. For example, now it has taken 9 months, when the compactor broke down with fixing it (Participant 6, 16.02.2023).*

*They do breakdowns frequently every now and then it breaks down. Like now it broke down June last year it was maintained December. It has stayed 6 months without moving. But for the 6 months, waste was being generated daily (Participant 1, 19.01.2023).*



**Figure 1** Broken-down Vehicle

The finding revealed that the vehicle above had stayed for 8 months waiting to be fixed at the time of collecting data. This meant that there was only one vehicle being used out of two vehicles that the MCC uses for transporting solid waste to the dumping site known as Msilo.





**Figure 2** Skip Bin Vehicle

Figure 2, shows the skip vehicle which is the only vehicle which the MCC uses to transport waste to the dumping site. The figure shows the vehicle offloading solid waste at the Msilo dumping site.

### 3.1.2. Lack of Enough Waste Bins

Another technical issue was, inadequate waste bins. As a result, some areas which deserve to have bins do not have. Consequently, people throw away solid waste anywhere. Due to this challenge, one of the participants suggested that:

*Normally bins must be placed at a distance of some metres. The best way initially is to put bins in places that have people. Bins are required within short distances (Participant 2, 19.01.2023).*

### 3.1.3. Lack of Solid Waste Recycling Machinery

The findings also revealed that the MCC does not have machinery for recycling solid waste. As a result, there is a lot of solid waste accumulating at the dumping site. The figure below shows solid waste just dumped openly, at the dumping site.



**Figure 3** Solid Waste at Dumping Site

This waste is a risk to the environment as well as human beings, which is against the tenets of Waste Management Theory. The theory stipulates that, solid waste ought to be handled in such a way that it does not cause harm to both humans and the environment. However, MCC has plans of buying a recycling machine so that they should be recycling of waste. One of the participants expressed that:

*We want machine for recycling the garbage, so that we should not be dumping, but we should manage them by recycling to some other things (Participant 1, 10.01.2023).*

Technical challenges experienced of vehicle breakdowns, inadequate waste bins and lack of recycling machinery affect the day to day management of solid waste in MCC as highlighted above. Nuskiya and Sahana (2021) agree that, costs of buying and maintaining vehicles affects solid waste management practices. Chireshe (2020) also notes that lack of financial resources also affects the purchasing of enough waste bins and recycling machinery. Financial resources are very crucial in sustainable solid waste management, in that they affect the cost of paying for essential services such as fixing vehicles as well as purchasing waste bins and machines for recycling of solid waste (Holm *et al*, 2021; Breukelman, 2022).

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#### 4. Conclusion and Recommendation

The study findings had provided an insight into the challenges faced by the MCC when dealing with solid waste. Proper solid waste management practices are necessary, in order prevent harm to both the human beings and the environment, as stipulated by the Waste Management Theory. The Waste Management Theory advocates that preventing harm from solid waste can be done by recycling solid waste to make non-waste products. The recycled products could be used again. Regarding human resource, it is vital for the MCC to recruit enough staff so as to ensure that solid waste is properly managed. In addition, it is crucial to have adequate waste transportation vehicles and waste bins, in that these facilities enable proper waste management practices to take place.

For proper solid waste management to be achieved, it is essential for the MCC to review its laws regarding waste management practices so that anyone contravening the laws should be fined appropriately. The reviewed laws, would enable individuals to be vigilant and take issues of waste management seriously. Finally, in order to prevent harm to the environment and human health, it is extremely important for the MCC to have a recycling machinery or engage private entrepreneurs to carry out recycling activities. Recycling helps to turn back the used solid waste into other useful products that can be used again. This would help prevent dumping of solid waste thereby preventing harm to the environment. The MCC authorities should ensure that they secure adequate finances that would help to resolve technical challenges that are being experienced currently.

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#### Compliance with ethical standards

##### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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