Review Article

Problems and Possible Solutions to Municipal Solid Waste Management in Malawi Urban Areas – An Overview

ABSTRACT

Municipal solid waste (MSW) management poses significant challenges in urban areas of Malawi, with rapid population growth, poor sanitary conditions, and inadequate waste disposal infrastructure exacerbating the situation. This overview synthesizes existing literature to examine the complexities of MSW management in key Malawian cities, including Mzuzu, Blantyre, Zomba, and Lilongwe. Drawing from diverse sources such as peer-reviewed papers, governmental reports, and policy documents, the study investigates the root causes of MSW problems and explores potential remedies. Key issues identified include poor waste disposal habits, lack of waste classification, insufficient waste removal services, and community perceptions towards waste disposal. Furthermore, the paper analyzes the legal frameworks and environmental regulations governing MSW management in Malawi, highlighting the roles of various stakeholders and policy instruments. To address these challenges, the paper proposes a multi-faceted approach involving enforcement of legal laws, civic education and awareness campaigns, community engagement, involvement of private operators, conversion of waste to energy, promotion of recycling activities, composting, and provision of public bins/trash containers. By implementing these strategies, Malawi can move towards sustainable MSW management, mitigate environmental risks, and improve public health outcomes in urban areas.

Keywords: Municipal Solid Waste, Malawi Urban Areas, Waste Disposal, Environmental Regulations, Waste Management Strategies

1. INTRODUCTION

Globally, about 7-10 billion tonnes of wastes are generated every year while 3 billion people lack controlled disposal facilities (UNEP, 2015). Furthermore, solid waste produced by about 2 billion people worldwide, is also not collected leading to indiscriminate disposal of wastes. Uncollected waste is of great concern because it presents serious risks to public health by blocking drains, creating stagnant ponds, and providing a conducive environment for mosquitos and other flies to multiply (Baig, 2013). The quantity and characteristics of MSW are influenced not only by living standards and lifestyle but also the type and availability of natural resources in that particular region or country (UNEP, 2005). Bhada-Tata and Hoornweg (2012) observed that, MSW includesall types of solid waste generated by households and

commercial establishments, which are usually collected by government authorities.Poor solid waste management not only has health and environmental implications, but it also has social and economic implications (Owusu, 2010), most especially in developing nations such as Malawi. Malawi is a landlocked country located in the southern part of Africa, sharing its borders with Mozambique, Zambia, and Tanzania (KPMG, 2012). The country's estimated population in 2019 was 18.6 million. With the population growth rate of 2.7 percent, Malawi's population is expected to double by 2038 (Lino and Ismail, 2017). Like many other developing African countries, Malawi has undergone rapid population but little economic growth in recent years, a situation that has resulted in an increased solid and liquid waste generation (Ding et al., 2021; Vazquez et al., 2020).

In Malawi, there is an increase in unplanned settlements and rapid population growth in urban areas resulting in poor sanitary conditions and inadequate domestic waste disposal (Spong &Walmesly, 2003). In most of the developing countries, waste generation is estimated at an average of 0.7 kg per capita per day. Whereas Malawi reports a generation of 250 tonnes per day or 3.5 kg per capita per day. All the wastes are situated in periphery of the cities. By 2011, there was no policy to start a waste recovery process in the cities (Malawi) of any kind (Karagiannids& Kontogianni, 2012).It should be noted that most waste management problems in Malawian cities emanate from inadequate financial muscle, technical expertise and necessary equipment such as waste collection vehicles from mandated institutions (Zeleza-Manda, 2009).The current waste management system in Malawi, particularly in urban areas faces significant challenges despite the involvement of both public and private entities. These challenges include limited capacity in waste collection and disposal, unequal distribution of waste management responsibilities between public and private sectors, and the inability of existing services to effectively handle the increasing volume of waste generated. Consequently, this results in rapid solid waste accumulation, posing environmental and public health risks in cities and other areas. Hence, this paper seeks to identify the current problems and provide possible solutions to municipal solid waste management in Malawiurban areas.

2. METHODOLOGY

This study employs a comprehensive literature review to investigate the challenges and potential remedies regarding municipal solid waste (MSW) management in Malawi's key cities: Mzuzu, Blantyre, Zomba, and Lilongwe and others. Drawing from a diverse array of sources, including peer-reviewed papers from esteemed databases such as Scopus, Web of Science, Google Scholar, Semantic Scholar, and ResearchGate, alongside reports from governmental and non-governmental entities, this overview seeks to offer a nuanced understanding of the MSW management landscape in Malawi. Utilizing targeted keywords like "MSW in Malawi in Zomba," "MSW Problems in Malawi Cities," and "Waste Disposal in Malawi," the study aims to gather insights into the prevailing challenges and potential solutions associated with MSW management in urban Malawi. By synthesizing findings from scholarly articles, reports, and other pertinent publications, this research endeavors to propose effective strategies for addressing the MSW management complexities within Malawi's urban environments. Figure 1 illustrates

the geographical distribution of four prominent Malawian cities: Mzuzu to the north, Blantyre to the south, Zomba to the southeast, and Lilongwe, serving as the capital.

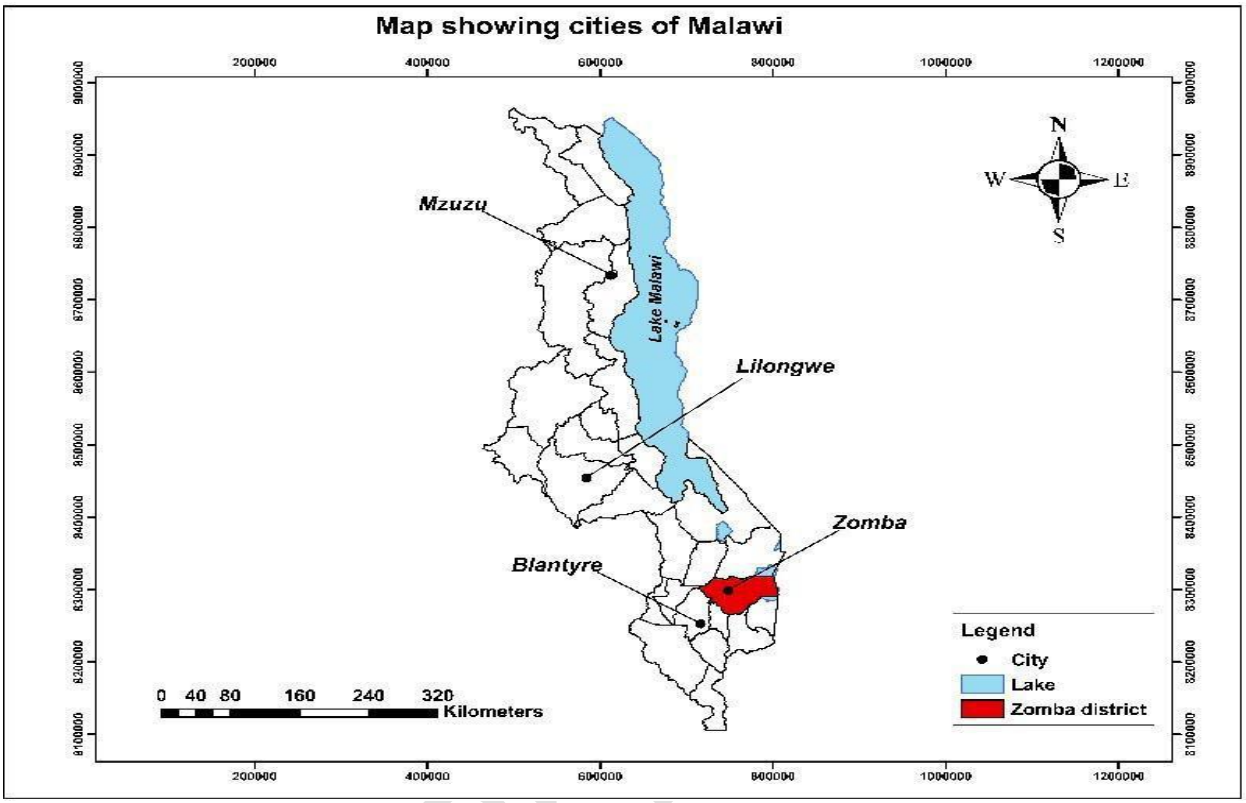

Figure 1: Map of Four Malawi Cities

Source: Njewa et al. (2022)

3. RESULT AND DISCUSSION

Municipal Solid Waste Generation in Malawi Major Urban Areas

In most developing countries such as Malawi, city councils or municipalities are mandated to be the overseer of solid waste management. The solid waste generated in municipalities or cities is referred to as 'municipal solid waste' (MSW). Factors which influence generation of solid wastes in municipalities include economic conditions, living standards, urbanization, and population (Liu & Wu, 2011). Solid Waste Management (SWM) is a major challenge, especially for urban areas in most developing countries like Malawi (Raab et al., 2021). In Malawi, city assemblies and district town councils are solely responsible for waste collection, which is overseen by the Ministry of Local Government. However, in Blantyre and Lilongwe Cities, a few other private companies are involved in rubbish collection in residential areas under private arrangement (UNDP, 2015). For example, it is documented that 74.1 percent of the waste generated in Blantyre City is collected by the Blantyre City Council and 5.9 percent is collected by private-owned companies. In Lilongwe, 68.7 percent of the waste is collected and

transported to dumping sites by private operators whereas 7.2 percent is managed by the Lilongwe City Council (UNDP, 2015).

This implies that large volumes of the generated wastes in Lilongwe are transported to the dumping sites by private-owned companies unlike in Blantyre City where large quantities of the wastes are handled by the Blantyre City Council (Halle and Burgess, 2006). However, current waste collection services can only effectively handle about 30 percent of total waste generated. This therefore results in rapid solid waste accumulation in cities and other locations (Barré, 2014). Total MSW production for all cities in Malawi roughly stands at 1000 tonnes per day, resulting in significant pollution (Kasinja and Tilley, 2018). The current annual waste generation is at 553 tonnes per day for Lilongwe and 435 tonnes per day for Blantyre (UNDP, 2015). Waste generation is expected to increase to 642 tonnes per day by the year 2025 and 803 tonnes per day in 2031 for Lilongwe, whereas annual waste generation for Blantyre is expected to increase to 485 tonnes per day and 673 tonnes per day in 2025 and 2031 respectively. It is therefore recommended that suitable investments be made in solid waste management to meet the increased waste generation (Halle and Burgess, 2006).

Furthermore, Zomba the former capital city of Malawiis not exceptional from the challenges of MSW. It has a population of 105,013 (2018 population and housing report) who are estimated to produce 52.507 tons of wastes per day. Zomba as a city produces more solid wastes due to increase in population and limited supply of resources for the city council to perform its duties. In regard to the large amount of solid waste generated in the city, only small percentage of these waste is processed or treated. As a result of reduced waste collection coverage, many city residents and companies illegally dump wastes in inappropriate places or burn them anyhow thus potentially creating harmful smokes, these later increases land and air pollution in the city (Malawi Government, 1988).

Similarly, Mzuzu City is number three in size among cities in Malawi and has a population of 221,272 (NSO, 2018). An environmental impact assessment for the waste management facility revealed that about 22000 metric tonnes of wastes are generated per year showing an approximate average of 171 Kilograms per inhabitant (Mzuzu City Council, 2013). The National Sanitation Policy (2008) acknowledges that solid wastes management is a problem in Malawian cities. Domestic solid waste is being poorly managed in Mzuzu City. This is evidenced by sights of wastes disposed indiscriminately as one moves around roads, drains, streams, bushy areas and in households. The situation is even worse in the informal settlements. A study by Red Cross (2015) revealed that 41% of the studied households dispose wastes on bare grounds in low- income areas of Mzuzu City. Disposal of solid wastes on bare grounds is detrimental to the environment and public health. Population in Mzuzu City is growing at an annual growth rate of 4.4 % with an expected projection of 522, 000 dwellers in 2030 (Mzuzu City Council, 2013). National Statistical Office (2018) indicated that Mzuzu City experienced the highest inter-censual growth rate between 2008 and 2018 at 5.4 %. There is thus an increase in urbanization and growth of informal settlements in Mzuzu leading to generation of more solid wastes.

Municipal Solid Waste Problem in Malawi Urban Areas

Research by Omokaro et al. (2024a) reveals that 16 unregulated dumpsites in Sub-Sahara Africa are close to natural resources (most especially water resources) and human settlements which results in environmental and health implications. In Malawi, 22% of the country's surface area is covered by lakes, rivers, and wetlands. While ground water quality is generally acceptable throughout the country, many surface water sources are polluted or under pressure from deforestation, unsustainable agriculture, settlements, mining, industry, commerce, tourism, and climate change that is causing flooding and droughts (Kandodo, 2017). Effluents and solid waste from small and large companies are often dumped into the water bodies in Malawi due to insufficient waste disposal mechanisms. For example, the chemical values in the Lilongwe and Mudi rivers – the main water sources supporting Malawi's two largest cities – have been measured with contaminants above safe limits. Large populations in informal urban settlements with low access to sanitation facilities also pose a great health risk to the local residents (Kandodo, 2017). Research by Omokaro et al. (2024b) noted that, pollution of the water in the coastal areas should be viewed as crime against humanity, therefore a violation of human rights; this is because people living in the coastal areas depend on the waters for drinking, bathing, and fishing which is their major source of livelihood. The authors further stressed that, water resources law and environmental management strategy must be backed by effective regulation, enforcement, and implementation in the field. More so, problem of solid waste management is a global issue; every city of the world is facing challenges of solid waste. In support to that, reports reveal that in 2006 the total amount of municipal solid generated globally reached 2.02 billion tons representing a 7% annual increase since 2003, (Global Waste Management report 2007).

Poor Waste Disposal Habit

There have been several reports from researchers from Malawi, that most of the people avoid paying fees at waste management sites. Busa (2009) supports this claim more especially in cases of residents. In various parts of communities, disposing wastes illegally is on the rise. This habit is associated with the avoidance of paying disposal fees at waste management sites. The people who engage in such acts are of the opinion that the prevailing waste collection fees are excessive. Therefore, instead of following the rightful channels for disposing waste or paying third party waste pick up services, they illegally dispose the waste in remote locations. Some third-party waste pick-up services have also gotten into the habit of dumping waste on illegal dumpsites to avoid paying the disposal fees.Busa (2009) suggested that poor waste disposal is caused by ignorance, where most people do not understand and are not very much aware of the consequences of poor dumping.

A study done by the National Statistic Office of Republic of Malawi (2008), proved that since the overall level of waste production is positively correlated with the population of country, an increase in population automatically implies an increase in the amount of overall waste. There are official waste disposal sites that people may use to get rid of the large amounts of waste. However, there is a small but still significant

amount of people who just dump their trash illegally in the woods and water sources. This problem is increasing with an increase in population since more waste is produced, and thus the probability for more waste dumping is likely to increase. Busa (2009) argued that regardless, some individuals simply do not see the need for recycling waste or follow the proper waste disposal channel and therefore go to highly unusual lengths to dispose waste illegally. Some people are simply too lazy to bring their trash to official dumping sites. A fraction of the society also does not care about the poor dumping problem and its consequences. They do so by completely avoiding prosecution and detection, which means that they do know the act, is unlawful. As a matter of fact, most of the items illegally disposed of, such as old appliances, white goods and furniture can be easily recycled or even reused. So, it can be suggested that most of the people engaging in acts of poor waste disposal simply do not understand the importance of reuse or the concept of recycling wastes.

Lack of Waste Classification or Characterization

Classification of wastes as toxic and hazardous, recyclable or non-recyclable, kitchen, and combustible waste is the best first step in waste management (Nie et al., 2018). Most of the wastes collected in Blantyre and Lilongwe cities are organic. Thus, the wastes can be categorized into household, market, commercial, and industrial (Barré, 2014). The wastes such as food residues, plastic bottles, plastic papers, and metals such as aluminum and copper are common (Turpie et al., 2019). In both cities, the largest proportion of wastes disposed of at dumping sites is household wastes at 40.3 and 68.3 percent for Blantyre and Lilongwe respectively. This is followed by market wastes at 27.0 and 18.8 percent for Blantyre and Lilongwe correspondingly (Turpie et al., 2019). The quantity of commercial and industrial wastes disposed of at Blantyre dumping site is higher as compared to that of Lilongwe. Lilongwe showed that large household wastes are transported and deposited at its dumping sites, which could be attributed to lifestyle patterns (UNDP, 2015).

Another problem area in Malawi is the Mulanje Mountain, which is affected by the dumping of plastics, such as plastic bags and bottles. These waste items attract pests such as rats and other smaller creatures, which have made the area extremely unhygienic and prone to disease. Additionally, when left in the open, the rain causes the plastics to leach chemicals into the soil, which further infiltrates and contaminates the streams and rivers. Water from Mulanje Mountain, for instance, is utilized by many Malawians; so the pollutants are directly affecting the health of the surrounding populations (Progression, 2018).

Lack of Waste Removal Services

Lilongwe City Council (2015) is of the view that people believe that, it is the government's duty to take care of the disposed wastes. They dispose wastes poorly hoping that the government will one day appear to clean up the large piles of wastes. For instance, this is the case with most Malawian urban markets where the market users dump large piles of wastes on land or on the dumping site, hoping that the government through the city council will come and clean up the mess.Furthermore, solid waste removal

services in Zomba city are very poor. Zomba city council and private companies at a fee. This explains the argument that only high-income areas have their waste collected at regular intervals for example Mangasanja, Matawale& old Naisi and the informal settlements residents are forced to find ways to dispose their waste anyhow due to lack of support from the city council. (Wowers& Grady, 2018).

Chirwa et al. (2016) also found that surface water disposal of wastes was common in Mzuzu's informal settlements especially in Masasa and seconded by Ching'ambo. A study by Kapanda (2020) in Mzuzu reveals that that indiscriminate solid waste disposal is being practiced in the study areas including rivers, stream banks and roadside drains. The study respondents agreed with the existence of indiscriminate solid waste cited lack of awareness on proper disposal methods and lack of space as the major causes for indiscriminate solid wastes disposal. Other causes included convenience, lack of door-to-door waste collection services, lack of secondary disposal sites provided by the council and lack of enforcement of laws by the city council. One of the respondents had this to say, '*most people are just lazy to dig rubbish pits and they find it easier simply to throw away wastes anyhow*'.

A study done by the Monitoring and Evaluation Office of Community Servings (2010) indicates that the city generates 109 tons of solid wastes per day; a total of 15% is derived from industries, 25% from commercial areas, 20% from hospitals and 40% from residential areas. The study indicates that the city has been hit by a sanitation problem in both solid and liquid waste management. Waste disposal has also affected many Malawian urban communities around Lilongwe City. People of the communities also have their own ways of dumping wastes, for instance some use pit latrines and others dispose the wastes in water sources found in the communities like, streams, dams and roadsides.

Community's Perception Towards Poor Waste Disposal

A study by Nazombe et al. (2019) found out that there are a number of challenges faced by the Zomba city council concerning solid waste management, the challenges are as follows; the number of times scheduled for waste collection in various hotspots is not enough, this is due to inadequate service cars for waste collection.Inadequate skips for waste disposal in the unplanned areas like Chikanda. Lack of willingnessfrom the local citizens to use the provided Skips properly; for example, people in Chikanda have been calling for the removal of skipper in their area, the misconception that people have on democracy have given them the liberty to throw waste anyhow. Poor law enforcement on waste disposal. Shortage human resource (work force) to collect wastes. Poor road networks especially in unplanned areas for example Chikanda, Mpunga and Chinamwali. Citizens not taking responsibility in waste management due to the belief that, by paying city rents the city should take full responsibility in waste management using the funds collected. Due to the geographical position of the city, there is mass movement of solid waste from Zomba plateau during rainy season. Inadequate awareness campaigns and encroachment of land at the 4 miles disposal site.

According to Kapanda (2020) study in Mzuzu, findings reveals that none of the respondents in the study carried out by the author were paying for solid waste collection and solid waste collection was not being done at their households, while some were not willing to pay. The respondents who were not willing to pay for solid waste collection gave various explanations namely, '*we donot generate huge amount of waste'*, '*we are poor and therefore we cannot afford waste collection services'*, '*it is expensive'*, *we use our own bin and make manure for sale and that it is the work of the city council and therefore there is no need for us to pay."*

Ndala and Ndala (2022) study further established that most people in the communities are not willing to pay for waste management services in Lilongwe City. The research finding reveals that demonstrates that, 40% of participants agreed, 25% of participants strongly agreed, 25% of participants were not sure about the statement, 5% disagreed and also 5% of the participants strongly disagreed. Based on the response from the participants it has shown that most of them were in favor of the statement. This arguably means that indeed most people avoid paying fees at waste management sites. The study further reveals that most of the community members' belief that it is the duty of government including local government to take care of waste management.

4. MALAWI LEGAL FRAMEWORKS ANDENVIRONMENTAL REGULATIONS ON MUNICIPAL WASTE MANAGEMENT

In Malawi, issues allied to waste management have been recorded in 3 frameworks namely the National Environmental Action Plan (1994), National Environmental Act (1996), and the National Environmental Policy (NEP), initially approved in 1996 and was amended in 2004 (Barre, 2014). Other frameworks include sanitation bills and public health act. All these documents tackle solid waste management. The National Sanitation Policy (2006) acknowledges that solid wastes management is a problem in cities and that there is no separation of wastes either at the source or disposal site hence making efforts of recycling and/composting difficult. The Constitution of Malawi values proper management of the environment to provide a good healthy living and working environments for all inhabitants of Malawi as echoed by the Government of Malawi (2006) in the National Sanitation Policy.

Section 2 of Environmental protection of the Laws of Malawi (2010) mandates City Councils "*to establish, maintain and manage services for the collection and removal and treatment of solid and liquid waste, and the disposal thereof whether within or without its area and may compel the use of its services by anybody of persons to whom the services are available" (page 3144)*. This shows government interest to deal with solid wastes. The National Sanitation Policy (2006) was later amended in 2008. Its mission is "*to ensure that all people in Malawi own and have access to improved sanitation facilities, practice safe hygiene, and practice safe recycling of liquid and solid waste for sustainable environmental management and socio-economic development"*. Theme number 3.3 of the NSP (2008) focuses on sanitation and hygiene promotion and delivery of services in Cities, Municipalities, Towns, Market centres and Peri-Urban areas.

Some of the strategies in relation to solid waste management employed in the theme 3.3 are “to promote recycling and safe disposal of domestic solid waste and “to extend solid waste refuse collection services to all residential areas and markets with active participation of communities and market committees”. National Sanitation Policy (2008) also calls for Non-Governmental Organizations (NGO) and Civil Society Organizations (CSO) “to promote recycling of organic, liquid and solid wastes for production of organic fertilizers and biogas wherever applicable”. Furthermore, the Government of Malawi (GOM) strategized “to train informal recyclers in solid waste management and employ them at recycling centres and landfill sites” as recorded in the National Sanitation Policy under theme 3.3. This paper focusses more on solid waste management and not liquid waste. The inclusion of solid waste management and involvement of stakeholders in the National Sanitation Policy and the other legislatures and polices above reveals the magnitude of solid waste management challenges in Malawian cities.

5. POSSIBLE SOLUTIONS TO IMPROVE MSW MANAGEMENT IN MALAWI

1. Enforcement of Legal Law: The problem of poor waste disposal basically is the process which involves people committing the act, so to stop the act the community members also have responsibility in reporting of illegal dumping. Wilson (2007) argued that it is possible for people in all communities and societies to stand up against poor waste dumping. The people that engage in poor waste dumping activities do so knowingly and are always on the lookout for places where the environmental regulatory authorities hardly patrol. Hence, if people can take the responsibility of reporting any witnessed act of illegal dumping, it can impressively help in curbing the activity. This strategy should also work towards establishing a special task force that includes the environmental, health, police, and public works departments to work in cooperation with the local people. Study by Anjum (2013), towards the mitigation of poor waste disposal, stated that wastes can be managed if the environmental authorities, together with the local community chiefs, set lower disposal fees to encourage people to use the lawfully stipulated waste disposal systems. At the same time, the relevant regulatory bodies against poor dumping must set higher fines to discourage the habit. This can be done by re-defining the fines and punishments for poor dumping as well as the licensing and charge rates for dumping services. For instance, it has been cited that in some areas, it may be less costly to illegally dump and pay a fine than using legitimate waste disposal channels. By employing this strategy, societies can become less vulnerable to poor dumping of wastes.

2. Civic Education and Awareness: Municipalities should educate residents, institutions, and companies to take responsibility for the garbage they generate. This includes employing reliable waste management operators and encouraging composting of solid waste for organic manure. According to Blantyre City Council (2013), organizing activities based on community clean up days can help to mitigate poor waste disposal. Community leaders can mobilize volunteer groups for each clean-up initiative and organize special clean-up days in which all members of the community participate twice a year or more often if possible. The council also indicated that clean up days have proven to be a tremendous initiative in the sense that people take full responsibility of their community and to dump wastes poorly becomes

difficult, clean up days help to save resources where government financial resources like money is saved, which could be used to employ people to clean up the wastes, but the coming in of community members to clean up their own community stops the burden of losing money by the government through the city councils.

3. Community Engagement and Involvement: According to Blantyre City Council (2013), organizing activities based on community clean up days can help to mitigate poor waste disposal. Community leaders can mobilize volunteer groups for each clean-up initiative and organize special clean-up days in which all members of the community participate twice a year or more often if possible. The council also indicated that clean up days have proven to be a tremendous initiative in the sense that people take full responsibility of their community and to dump wastes poorly becomes difficult, clean up days help to save resources where government financial resources like money is saved, which could be used to employ people to clean up the wastes, but the coming in of community members to clean up their own community stops the burden of losing money by the government through the city councils.

4. Engagement of Private Operators: Governments should engage registered private operators on waste management with appropriate equipment and ensure compliance with existing laws and regulations. More so, producers in the private sector should also be meant to take responsibilities for their production activities in terms of waste generation and distribution.

5. Conversion of Waste to Energy: Malawi could explore converting non-recyclable waste materials into usable heat, electricity, or fuel through processes such as combustion, gasification, pyrolysis, anaerobic digestion, and landfill gas recovery.Considering the impact of climate change on hydropower generation, Malawi could explore alternative energy sources such as converting MSW into electricity or feedstock for chemical production, utilizing pyrolysis and gasification technologies to reduce emissions. Investment in integrated solid waste management is worthwhile investment because it addresses climate change and waste management challenges in particular city. It will create mass awareness of people in Malawi to make the cities of Malawi clean and conducive (Morris 2004).MSW from landfills, including plastics and wood, could be transformed into solid energy fuel, such as briquettes, to address energy fuel issues and reduce dependency on charcoal. More so, incineration can be adopted, and this involves conversion of solid wastes into energy by combustion in a controlled incinerator (Morris, 2004). Incineration is done to reduce the volume of waste. Total waste volume can be reduced by 80% to 90% through incineration, when waste is first processed in an incinerator and then compacted in a disposal.

6. Promotion of Recycling Activities: Encouraging recycling activities can transform waste into useful secondary products, promoting local industries' reuse of MSW and standardization of products. Establishing recycling networks and adopting direct melting recycling methods are also suggested for effective MSW management. Recycling of plastics in the major cities of Malawi will support production of polythene tubes for tree planting and construction works (Morris, 2004).A report produced by UNEP (2015), suggested that members of the community should be in a position to embrace the practice of Reducing, Recycling, Reusing (The 3R). Alexis and Mihelcic (2009) note that poor waste dumping is a

result of a high level of overall waste production. The amount of waste generated can be reduced, then the outcome will be fewer, and there will be fewer scenarios of poor dumping of wastes. All people should always strive to reduce the amount of waste they generate by only purchasing and using essential products. Also, the promotion of recycling initiatives such as the opening up of various designated areas for free collection of used and obsolete appliances, furniture and other home products for recycling can reduce poor dumping. The practice of reusing, such as donating or selling used products that are still in good condition, should as well be encouraged to cut back on poor disposal of appliances, white goods and furniture.

7. Composting: This is defined as the "Controlled aerobic, biological conversion of organic wastes into a complex stable material" (Mtika, 2013). Since agriculture anchors Malawi's economy, directly accounting for about one third of gross domestic product. Agriculture significantly contributes to employment, economic growth, export earnings, poverty reduction, food security, and nutrition. The key player in this form of waste management in Malawi is agriculture where the waste is used to produce manure can be adopted via composting. This will also help make the country's farmers to depend less on chemical fertilizers which also contributes to land degradation and environmental pollution.

8. Provision of Public Bins/Trash Containers: One other way of managing solid wastes, the authorities could provide bins in public places where solid wastes are likely to accumulate, for example close to shopping malls, hospitals, and schools. This will help in easy collection of wastes to be dumped at designated area and well managed area in every city. For instance, Beautify Malawi Trust (Beam) provides such bins in public areas and when full are collected by the city council. The aim is to encourage Malawians to work towards making the country cleaner and healthier.

9. Provision of Dumpsite/Landfills: According to Omokaro et al. (2024a), dumpsites are essentially unregulated areas designated for the disposal of solid waste, often lacking proper management and environmental safeguards. They serve as on-land dumping grounds where waste is haphazardly disposed of without adequate containment or protection measures. Therefore, if the Malawi Government provides regulated dumpsite and/or landfill where waste can be brought to from various cities, it will help with proper environmental sanitation and waste management in the major urban areas.

10. Penalty and Fine for Offenders: The Malawi Government should be ready to implement strict penalty and fine to waste offenders in both urban and local regions. Penalty such as community services or jail terms for month for violating environmental laws or high payments in terms of money. This will be very effective as it will discourage individuals for illegal waste dumping.

11. Natural Resources Marking: Since reports has shown that natural resources such as water bodies are being polluted due to illegal dumping on waste there should be some sort of marking or warning signs prohibiting residents from dumping their waste in water bodies or any natural resources as the case maybe. This should be views as violation of human rights and punishable offence as posited by Omokaro et al. (2024b).

6. CONCLUSION

Municipal solid waste management in Malawi's urban areas faces multifaceted challenges stemming from population growth, inadequate infrastructure, and insufficient regulatory mechanisms. The analysis reveals a complex interplay of factors contributing to poor waste management practices, including illegal dumping, lack of waste classification, and limited waste removal services. However, amidst these challenges, there exists a range of potential solutions that can be pursued to improve the situation. By enforcing existing legal laws, enhancing civic education and awareness, fostering community engagement, leveraging private sector involvement, exploring waste-to-energy initiatives, promoting recycling activities, embracing composting, and providing public bins/trash containers, Malawi can make significant strides towards sustainable MSW management. Collaboration among government agencies, civil society organizations, private sector entities, and local communities is essential to implement these solutions effectively. Ultimately, addressing MSW challenges in Malawi requires a holistic approach that integrates policy interventions, technological innovations, and community participation to create cleaner, healthier, and more sustainable urban environments for all residents.

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