

MUNICIPAL SOLID WASTE MANAGEMENT: AN ASSESSMENT OF THE MANAGEMENT FRAMEWORK IN ZAMBIA

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ABSTRACT

Governance mechanisms for Municipal Solid Waste (MSW) are critical to the sustainable management of waste for effective environmental management and public health. These mechanisms are dependent on management frameworks upon which they are based. This study aimed at assessing current frameworks for managing MSW in Zambia using a descriptive research design with a questionnaire being the data collection tool. Eighty purposively sampled respondents were administered and the tool had a 90 per cent response rate. Data analysis involved the use of frequency tables, percentages, bar, the mean, and standard deviation. The results were as follows; male respondents were 73 per cent as compared to female respondents at 27 per cent, respectively, while source of generation for residential areas was at 88 per cent. Public sector role in the governance of MWS 66.7 per cent, private sector (18.9%), NGOs (7.8%), with academia 2.2 per cent, others 4.4 per cent respectively. Frequency of collection was as follows: daily (45.7%), twice a week (14.9%), weekly (39.4%). Recycling of MSW by the private sector (47.2%), municipality (14.6%), and a combination of both accounted for 38.2 per cent. Management of final disposal sites by private sector (11.7%), municipalities (44.6%) and co-managed sites (43.5%). Lack of technical capacity to develop and implement policies by municipalities was 33 per cent while lack of financial resources for the waste management sector (39%). The results of the study indicate a growing and rooted challenge in the governance of MSW in Zambia. Therefore, governance mechanisms must be based on robust and effective frameworks that will ensure effective service delivery by local authorities with the involvement of all stakeholders, gender and social inclusion and also effective development and application of policies, technology and financial resources. This will result into sustainable waste management service to protect public health and the environment and ultimately implement a circular economy model.

Keywords: Frameworks, governance, management, municipal, solid waste

INTRODUCTION

Waste management systems with a focus on protecting the health of city residents and enhancing the aesthetic appeal of regions have existed since the Roman Empire (World Bank, 2018). Despite receiving relatively low priority, Solid Waste Management (SWM) is one of the most important responsibilities of any local authority or city government (Mwanza, 2017). Although waste management

systems have been in place for decades and despite the importance of waste management to public health and environmental protection, the sector faces several challenges, as evidenced by the presence of uncollected waste in urban and peri-urban areas of cities in most developing countries. Marshall and Farahbaks (2013) note that well-defined engineered systems have been used in industrialised nations since 1960, while collection and removal dominate the SWM sector in developing nations. Mmereki *et al.*, (2016) reaffirm that SWM is a global challenge due to the ineffective implementation of waste policy. The magnitude of the difficulty is determined by the various nations' efforts to contain the problem of solid waste.

In developed countries, solid waste is less of a concern than in developing countries. The disparity can be explained by the fact that in developing nations, the rate of solid waste production exceeds the capacity to manage it effectively (Liyala, 2011). According to Lemaire *et al.*, (2015), waste management is an important issue for most African cities. The population's solid waste appears to be the responsibility of administrative units or authorities. Therefore, mechanisms for managing the implementation of laws and policies should be developed (United Nations Environment Programme [UNEP], 2018). Municipal solid waste management systems should, therefore, be built based on clear and enforceable legislation, policy instruments such as solid waste management plans and solid waste management strategies. Institutional capacity for local authorities in the aspect of finance, technical and social inclusion, especially for the informal sector are critical in governance mechanisms for managing municipal solid waste in developing countries like Zambia.

Municipal Solid Waste Management (MSWM) in Zambia is guided by a series of legal and regulatory frameworks that have evolved over time, shaping the way solid waste is managed within the country. These mechanisms play a crucial role in addressing environmental concerns and ensuring the well-being of urban residents. In this section, we will delve into these governance mechanisms, providing insights into their historical development and specific functions. The evolution of MSWM governance in Zambia can be traced back to the National Conservation Strategy (NCS) of 1985. This marked the initial recognition of MSWM as a significant environmental challenge for the nation. Subsequently, the enactment of the Environmental Pollution and Control Act No. 12 of 1990 was a pivotal moment in shaping the legal framework for environmental management, including waste management regulations. Under this act, specific regulations known as the Waste Management Regulations were introduced in Statutory Instrument No. 71 of 1993. These regulations govern various aspects of waste management, including waste transportation and the establishment of waste disposal sites. The act, along with these regulations, forms the core of the legal framework governing MSWM in Zambia.

A comprehensive legal framework encompasses various acts that contribute to MSWM governance in Zambia. The Environmental Pollution and Control Act provides the overarching legal foundation for environmental management, including

waste management. The Public Health Act safeguards public health by addressing issues related to waste disposal and sanitation. The Mines and Minerals Act may be invoked in cases where waste management intersects with mining activities. The Local Government Act empowers local authorities to manage waste collection and disposal within their jurisdictions. Together, these acts constitute a comprehensive legal framework governing municipal solid waste management. The National Environmental Action Plan (NEAP) emerged from the National Conservation Strategy (NCS) of 1985. It was established in 1994 and outlines specific action steps to address solid waste management as a pressing environmental concern.

The NEAP provides a strategic roadmap for waste management, emphasising sustainable practices, recycling, and community involvement. It serves as a guiding document for government agencies and local authorities in their efforts to improve MSWM in Zambia. Collectively, these governance mechanisms form the foundation for effective municipal solid waste management in Zambia. They address environmental challenges while striving to enhance the quality of life for urban residents. The National Conservation Strategy (NCS) of 1985 served as the policy document for the municipal solid waste governance mechanism in Zambia. The NCS of 1985 was revised and renamed the National Environmental Action Plan (NEAP) later, in 1994. The NEAP provided solid waste management action steps as an environmental concern.

The municipal solid waste governance mechanism encompasses institutions such as Zambia Environmental Management Agency, the Ministry of Mines, the Ministry of Health, and the Ministry of Local Government via the Local Authorities. On a global scale, with a few exceptions, the management of municipal solid waste has been delegated to municipalities or local governments. This practice aligns with the observations of Shelton and Kiss (2005), who correctly note that waste cannot be eliminated, but local governments and responsible ministries and agencies can reduce its environmental impact by implementing source reduction, recycling, treatment, and disposal techniques.

Effective governance is essential for the longevity of a Municipal Solid Waste Management (MSWM) system. In this context, governance encompasses the laws, policies, and strategies implemented by local governments through municipalities to establish and sustain efficient MSWM mechanisms within communities. Chandak (2010) highlights that a significant portion of municipal budgets, ranging from 20 per cent to 50 per cent, is allocated to waste management, yet only half of the urban population is adequately covered by waste collection services. This financial commitment underscores the importance of governance in optimising resource allocation for waste management.

Joseph (2006) emphasises that sustainable waste management requires a comprehensive interdisciplinary framework, where governance plays a pivotal role. It serves as the foundation for aligning policies with practical implementation. Shah (2005) further elucidates that governance involves the political body responsible for making policy decisions. However, despite the recognition of governance's

critical role, a gap persists between waste management policies, legislation, and actual practices, as noted by the Economic and Social Council of the United Nations (2009).

According to Palczynski (2002), administration is one of the major weaknesses of waste management mechanisms in Africa. This entails that governance mechanisms exist, and the weakness in administering them resulting in these challenges. To sustainably address MSWM challenges in developing countries and Zambia in particular, enhancement of the existing mechanisms for managing municipal solid waste must be prioritised. Prakash and Hart (1999) write that in governance, formal organisations are often permitted or required to establish, monitor, and enforce rules, as well as resolve disputes. Therefore, in developing countries, there is need to enhance governance mechanisms for managing municipal solid waste to resolve most of the challenges developing countries face regarding municipal solid waste management.

RESEARCH METHODOLOGY

Research methods applied in this study are discussed below:

Research Objective: The objective of this study was to assess the current frameworks for governance of municipal solid waste in Zambia. The research question was: are the current frameworks adequate to provide governance mechanisms for sustainable and efficient municipal solid waste management in Zambia?

Research Design: the study employed a descriptive research design to describe and document the current situation with regard to frameworks for governance of municipal solid waste within the waste management sector. The study sought to provide a comprehensive and accurate situation or phenomenon through systematic observation, measurement, and analysis of data.

Study Location and Sampling Population: The study was conducted in the Zambian cities (Lusaka, Livingstone, Ndola, Chipata and Kitwe) with a questionnaire administered to 100 respondents. These included town clerks, directors at municipality level, policy-makers, waste collection companies and members of the public who received a waste collection service. Players in the recycling industry were also sampled.

Sampling Strategy: The study employed a purposive sample technique due to the following reasons; target population: municipal solid waste is a complex sector and, therefore, the study sought to collect data from a specific group of respondents who were directly involved in the governance of municipal solid waste in Zambia. These include decision-makers, advocates, service beneficiaries and also players such as contractors, respectively. This approach enabled the researcher to have rich and reliable data. Purposive sampling also helped gather data from manageable and accessible respondents who were relevant to the study.

The purposively selected respondents were considered to have in-depth understanding of the subject matter. Therefore, it contributed to reliability and validation of the data. This approach was supported by the works of Patton (2002), Creswell and Plano Clark (2011) and Palinkas *et al.*, (2015) who emphasised on the value of the respondents being selected. Despite the highlighted benefits, the method employed has limitations in generalisation as it emphasises reliability than representativeness as in the case of random sampling. The study relied on the work of Neuendorf (2017) who advised that a questionnaire can be a valuable tool for collection of data from selected respondents and carry out content analysis on the data. Data analysis involved use of frequency tables, percentages, bar, the mean, and standard deviation to draw meaning, trends and interpretation, respectively

Data Analysis: Data analysis involved processing, interpreting, and making sense of the collected data. The study employed descriptive and inferential statistics to analyse and interpret the data. Descriptive statistics helped summarise and describe the basic features of the data, providing insights into the distribution of survey responses. On the other hand, inferential statistics allowed the researcher to make inferences or predictions about a population based on sample data. Common inferential techniques include hypothesis testing, for example, chi-square tests and analysis of variance (ANOVA) to examine relationships between variables and test hypotheses derived from survey data.

Data Collection Methods: The study employed a survey questionnaire to collect data from purposively sampled population.

Theoretical Foundation of the Study: The study was underpinned by the positivist paradigm, which emphasises empirical observation, measurement, and objective analysis of phenomena. Therefore, this descriptive design relied on the principle of induction reason, which involved generalisations based on observed patterns, trends, and relationships in the data.

Scope and Limitations: The scope of this paper was to assess the current framework for managing municipal solid waste in Zambia. It did not include any other type of waste or any other aspect other than the primary objective of this study.

STUDY RESULTS

The study showed that there were more male respondents representing 73 per cent of the total sample as compared to female respondents representing 27 per cent. The results imply a gender disparity in the sector with the male gender dominating in decision-making leaving the female gender in the lower tier of the system.

Source of Waste Generation

As depicted in Figure 1, most of the waste come from the residential areas, accounting for 88 per cent. The results imply that residential settings generate most of the waste and as such, interventions must focus at residential level notwithstanding other sources such as industrial, commercial, institutional, municipal and heavy; and light industry as indicated in the figure above, respectively.

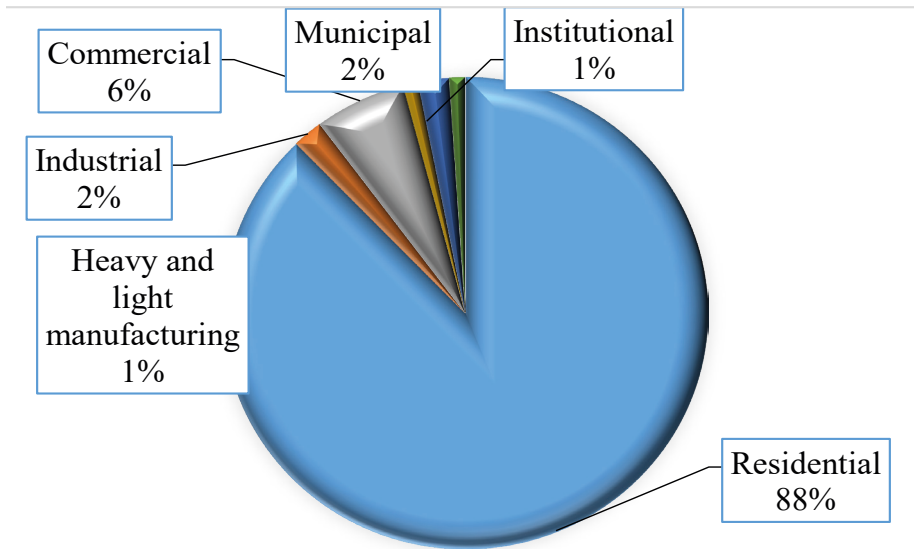


Figure 1: Sources of Municipal Solid Waste in Zambia

Institutional Role in the Governance of Municipal Solid Waste

Table 1 presents the institution’s role in the governance of municipal solid waste. The results indicate that the public sector plays a major role in the governance of municipal solid waste. This accounted for 66.7 per cent, private sector role 18.9 per cent NGOs 7.8 per cent, academia 2.2 per cent and 4.4 per cent others respectively. The results resonate with the role of the public sector for service provision, among them MSWM, as well as protecting public health and the environment.

Table 1: Institutional Role in the Governance of Municipal Solid Waste

Type of Industry / Role	Development of policy	Implementation of policy	Advocacy of policy	Research	Decision making	Stakeholder	Financial Management	Percent
Public	7	35	5	0	2	6	4	60
Private	0	1	4	1	1	1	1	17
Academia	0	0	0	1	0	1	0	2
NGO	0	1	1	0	0	3	0	7
Others	0	0	0	0	0	2	1	4
Total	7	37	10	2	3	13	6	90

According to Table 2 the P-value 0.050 shows that the model of using the kind of solid waste management system to predict the frequency of collection is perfect and that there is a strong relationship between the two variables, and the relationship between types of solid waste and frequency of collection is statistically significant.

Table 2: ANOVA for SWM System and Frequency of Collection

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.627	1	3.627	3.945	.050 ^b
	Residual	84.585	92	.919		
	Total	88.213	93			
a. Dependent Variable: 5. With regards to collection, what is the frequency of collection of waste currently applicable to you?						
b. Predictors: (Constant), 4. What kind of solid waste management system is applicable in your jurisdiction?						

Collection Frequency

Governance mechanisms in place determine the collection frequency for MWSM systems. Table 3 indicates that daily collection accounts for 45.7 per cent, collection twice a week at 14.9 per cent and once a week collection at 39.4 per cent. The results indicate three different collection frequencies. It is, therefore, important to discuss with the generators of solid waste to agree on the most appropriate collection frequency that will ensure optimisation of resources, efficient routes and also, economic viability.

Table 3: Frequency of Waste Collection

With regards to collection, what is the frequency of collection of waste currently	Percent
Every day	45.7
Twice a week	14.9
Once a week	39.4
total	100

Management of Final Disposal Sites

Table 4 presents the results of final disposal practices. The study established that final disposal sites are, on average, managed by both the public and private sectors. The results indicate that the private sector manages only 11.9 per cent, municipalities 44.6 per cent and the sites co-managed by municipalities and the private sector accounting for 43.5 per cent.

The results, therefore, imply that municipalities have engaged the private sector to co-manage final disposal sites to alleviate challenges experienced at these sites due to various reasons, among which are financial constraints. Relatively, the results indicate a low private sector involvement in the exclusive management of final disposal sites.

Table 4: Final Disposal

	Institution Managing the Site	Percent
Management Final Disposal Site	Private	11.9
	Public (Municipal)	44.6
	Combine (Private and Public)	43.5
	Total	100

DISCUSSION OF FINDINGS

This section discusses the results from the study and how they relate or do not relate to existing literature.

Source of Waste

According to the World Bank classification, Zambia is a developing country. The study established that 87.5 per cent of municipal solid waste in Zambia is generated from household or domestic settings, with industrial and commercial generators accounting for two and six per cent, respectively. The results indicate a major quantity of municipal solid waste being generated from households. This presents insights at design stage of governance mechanism to ensure that waste management models used to design the systems incorporate all aspects at household level.

The results presented in the previous paragraph are supported by the results of Dikole and Letshwenyo (2020) who also in their study found that the majority of waste was generated from households with theirs accounting for 55 per cent to 80 per cent of municipal solid waste originated from households in various locations, while commercial areas contribute 10 per cent to 30 per cent. The difference was in industrial and commercial generators of which this study indicated lower generation rates than those of Dikole and Letshwenyo (2020) respectively. The foregoing results are further supported by Mohamad *et al.*, (2020) who came to the same conclusion that households are considered the major source of municipal solid waste, accounting for a significant portion of the total waste generated.

Earlier on, Kaza, Yao, Lisa, Bhada-Tata, Van Woerden (2018) in their report for the World Bank titled *What a Waste*, estimated that 50 per cent of global municipal solid waste is generated from households. These studies have demonstrated the significant contribution of household waste to the overall generated quantities. Therefore, this highlight the need to design governance mechanisms that target reduction and separation of waste at household level. It is also worth noting that

household generation rates vary from one location to another depending on the level of economic growth, presence or absence of industries and also waste collection infrastructure and systems in place. The foregoing going are not the scope of this paper.

Institutional Role in the Governance of Municipal Solid Waste

The governance of municipal solid waste involves the participation of different stakeholders. These are mainly public, private and the academia. A critical understanding of the different roles, contribution and participation levels is key to sustainable municipal solid waste mechanisms. This study established that the main organisational role of the public sector was implementing waste management policy, thus, accounting for 35 per cent of the total 60 per cent of the sample population.

On the contrary, academia, which is supposed to drive the research agenda, only accounted for 2 per cent with regard to its role in the governance of municipal solid waste. The results indicate inadequate research in MSWM in Zambia and thus ultimately affects the anaemia's role in providing recommendations based on empirical evidence.

Despite limited literature on the institutional role in the governance of municipal solid waste, UNEP (2023) in its publication titled, *Harnessing the Role of Private Sector in Waste Management through South-South and Triangular Cooperation for Inclusive Urbanisation*, advocates for the private sector's role in modernising waste management practices and implementing sustainable waste reduction and recovery strategies.

Collection Frequency

The average collection frequency was established at once a week and thus, accounted for 39 per cent. The study did not establish any studies that provided specific recommendation of the collection frequency. Therefore, collection frequencies should be based on the consideration of several factors such as quantities, season, nature of waste, recycling strategies and costs of collection.

Management of Final Disposal Sites

Table 4 presents the final disposal practice. The study established that local authorities manage most final disposal sites (41%), with the private sector accounting for 11 per cent, while combined management of final disposal sites by both public and private accounted for 40 per cent. However, the management of waste at final disposal sites do not include any form of treatment. Therefore, Dlamini *et al.*, (2018) in their study emphasised the need for capacity building and technology transfer to for management of final disposal site using waste to energy technologies. The study reflects the importance of capacity-building for sustainable governance of municipal solid waste.

Technical Capacities and Financial Priorities of Municipalities

Governance of municipal solid waste is largely affected by the technical capacity and financial priorities of the implementing institution; the municipalities. The study revealed that one of the challenges in the governance mechanisms for managing municipal solid waste in Zambia is the lack of technical capacity to develop and implement policies. This accounted for 50 per cent of the sample population. On the other hand, the study further revealed a lack of financial priorities in the governance of municipal solid waste in the country. These results are supported by Michel and Keng (2018) who in their study emphasised the importance of technical expertise and capacity in selecting and implementing appropriate SWM technologies.

Smangele, Mulala and Nzalalemba (2019) later established that staff in municipalities might lack the technical knowledge and skills to implement complex waste management technologies, data analysis techniques, and planning processes. Delufa *et al.*, (2022) later cemented this position by echoing in their study that also identified limited technical capabilities as a major constraint, contributing to inefficient waste collection and inadequate disposal practices. The foregoing institutional challenges in the management of municipal solid waste in Zambia. As noted by Rahman, Myrna and Karlina (2020), there are institutional challenges in municipalities in the management of solid waste and as such, there is need for strategies to address the challenges.

CONCLUSION AND RECOMMENDATIONS

The study established that the current frameworks for managing municipal solid waste are weak, haphazard, and unsustainable. There are no sustainable financial mechanism to support the whole value chain of municipal solid waste management in Zambia. The current framework in Zambia presents a linear flow of waste management systems as opposed to the circular economy model, which is based on sustainability and resource optimisation. Linear flow systems are wasteful of resources and present environmental liabilities as opposed to circular models. To ensure a sustainable and effective municipal solid waste system, municipalities and other stakeholders should consider household generation of waste, frequency of collection, institutional role of key stakeholders, technical capacities and financial priorities and management of final disposal sites to ensure a more sustainable governance mechanism.

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