International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Municipal Solid Waste Management Policies, Practices, and Challenges in Uganda: A Systematic Review

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ABSTRACT

Environmental, social, and economic activities are among the areas that are impacted by municipal solid waste management, or MSWM. Massive trash production and uneven management have made the problem worse in Uganda. Therefore, the purpose of this systematic review is to examine the legal and policy frameworks, practices, and difficulties related to MSWM in Uganda. A website search was performed to locate studies from 1995 to 2021. The Scopus and Web of Science databases, as well as Google Scholar, were utilized to look for published and unpublished studies from 2005 to 2021. Only the English language was included in the search. The parameters of the produced study were used to extract the study. The AMSTAR 2 was used to evaluate the listed studies' risk of bias. Seventy two (72) studies were determined to be qualified out of the 1135 records that were identified. Several legal frameworks that improve MSWM implementation in Uganda, which is primarily concerned with garbage collection, transportation, and disposal, were found by this systematic review. The primary obstacles were a lack of capability, public awareness, policy enforcement, and stakeholder cooperation. In Uganda, MSWM issues have become more prevalent in recent times and are having an impact on the day-to-day lives. Thus, these results could contribute to the enhancement of MSWM in Uganda.

Keywords: solid waste management, policies and practices, challenges, Uganda.

INTRODUCTION

The multidisciplinary field of municipal solid waste management (MSWM) encompasses administrative tasks as well as solid waste management techniques like trash generation control, storage, collection, transportation, processing, and disposal (Onungwe et al., 2023). Its overarching objective is to enhance economic growth and quality of life while minimizing and eliminating the negative effects of waste on the environment and human health (Dlamini & Zikhali, 2024). Effective MSWM is therefore crucial to enhancing human health, the environment, and local communities' socioeconomic activities. Nonetheless, MSWM is a significant environmental issue and a public health risk, according to the United Nations Environment Programme (UNEP) (Grangxabe et al., 2023). Solid waste has more detrimental effects on the environment, society, and economy in emerging nations than in rich ones (Ezeudu & Ugochukwu, 2024). In a similar vein, the problem of municipal solid waste is more severe in urban areas due to the prevalence of massive industrial and other activity. Concurrently, public sectors in developing nations carry out a variety of MSWM tasks, and due to the lax enforcement of MSWM regulations, these sectors cannot adequately provide solid waste management services on their own (Apio et al., 2024). Therefore,

in many developing nations, unlawful open burning and dumping of solid waste are widespread activities (Omona & Maderu, 2023).

Furthermore, the industry's growth and the population's rapid increase are creating massive amounts of trash, whose management necessitates increased institutional setup, infrastructure, and community involvement (Awino & Apitz, 2024). One of the biggest problems facing developing nations, especially those in sub-Saharan Africa, is the enormous amount of waste generated and the uneven handling of that waste. The nations of sub-Saharan Africa have the lowest gross domestic output, and a sizable section of their inhabitants are impoverished.

Nonetheless, a recent World Bank study indicates that although population growth and urbanization in sub-Saharan African nations are occasionally increasing, the economic development of the bulk of these nations is expanding quickly (Mor & Ravindra, 2023). In addition, Uganda is among the nations in sub-Saharan Africa with the quickest rates of growth. As a result, there are concerning high rates of municipal solid waste management issues in sub-Saharan African nations, including rising solid waste creation rates and open burning and dumping (Meena et al., 2023). Uganda was chosen as the case study for this systematic analysis because the author thought the nation may serve as a representative example for sub-Saharan Africa and even other emerging nations.

However, in order to lessen and eventually eliminate the negative effects that inappropriate waste management methods have on the environment and human health, the Ugandan government has already enacted MSWM laws and rules (Ambaye et al., 2023). Due to Uganda's rapidly expanding economy, increasing urbanization, and industrialization in its largest cities, MSWM is a significant problem there (Fidelis et al., 2023). As a result, the MSWM issue in Uganda is a serious concern that has an impact on human health, the environment, and economic activity (Naveenkumar et al., 2023), particularly on the local residents' quality of life. Furthermore, recent research has shown that the poor MSWM performance in Ugandan cities, together with the environmental and public health issues brought on by the large percentage of uncollected solid waste, are continuing to worsen rapidly.

As a result, the MSWM issue is becoming worse and is one of Uganda's major cross-cutting problems. Despite Uganda's decentralization policy, which assigns towns MSWM duty, the majority of them struggle to address their waste issue (Osman et al., 2023). Therefore, the primary goals of MSWM in Uganda have been garbage collection at the source and transportation to disposal locations. Inadequate institutional capacity, funding, expertise, and awareness, a lack of baseline data on solid waste, a lack of stakeholder cooperation, a lack of political commitment and prioritizing, and ineffective planning and execution are the main causes of this issue (Yusuf et al., 2019).

Therefore, based on the available research on the policy and legislative frameworks, practices, and difficulties in Uganda, this systematic review attempts to offer helpful information that will aid in the development of the country's municipal solid waste management strategy. Consequently, it seeks to respond to the following important queries;

1. What MSWM legal and policy frameworks are in place in Uganda?
2. How is Uganda currently managing its municipal solid waste?
3. What are Uganda's primary municipal solid waste management challenges?

MATERIALS AND METHODS

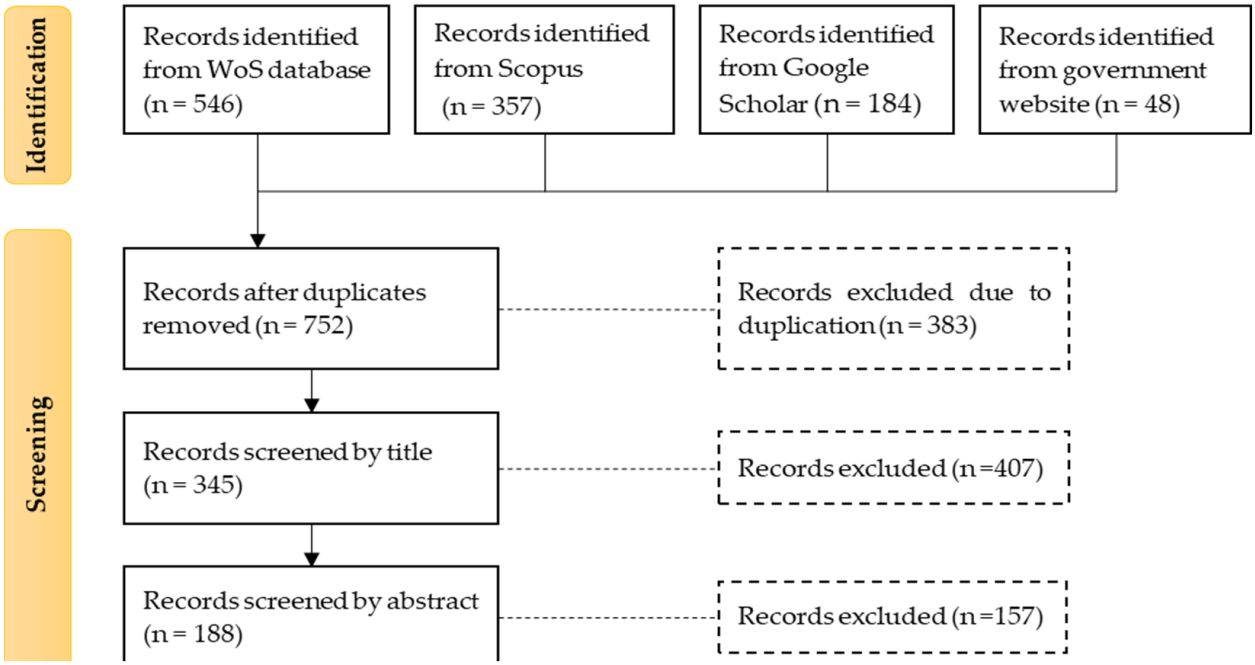
The body of existing literature from the several included studies was systematically reviewed. Systematic literature review aids in the identification, assessment, analysis, and interpretation of pertinent research

literature in light of a particular research issue (Maphosa, V., & Maphosa, 2023). Additionally, it maps published research on particular subjects (Ritterbusch & Teichmann, 2023). The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 statement, which superseded PRISMA 2009 as the current recommendations for reporting systematic reviews, adheres to this approach (Hou et al., 2023).

This systematic assessment of Uganda's municipal solid waste management policies, procedures, and issues was conducted using the PRISMA 2020 checklists. Study eligibility requirements: Only English-language publications from January 2005 to July 2021 were considered, both published and unpublished. Government laws, rules, and policies pertaining to municipal solid trash in Uganda was also covered. Since the solid waste management policy and regulatory frameworks developed between 1995 and July 2021 are long-term instruments that the government continues to employ, they are included.

Information Sources and Search Strategy: From November 20, 2024, to December 5, 2024, electronic searches were carried out on the Scopus and Web of Science databases as well as Google Scholar, in accordance with the review's qualifying requirements. Titles and abstracts were part of each search engine's search strategy. Along with policies and legal frameworks pertaining to the Ugandan Environment, Forest, and Climate Change department, searches were conducted for each of the review's objectives, such as MSWM policy and legal frameworks, practices, and difficulties in Uganda.

The timeline covered published and unpublished studies to 2005, as well as policy and legal framework to 1995. The online search approach was limited to the English language. Selection of the Study: The reviewer independently examined the papers by titles and abstracts after first removing duplicates, and then discussed the resulting records. The reviewer then looked over the entire content of the chosen papers to make sure they met the qualifying requirements. After examining the independently screened papers according to their titles, abstracts, and eligibility requirements, a final conclusion was reached. The 72 studies that met the criteria for this systematic review are displayed in Figure 1.



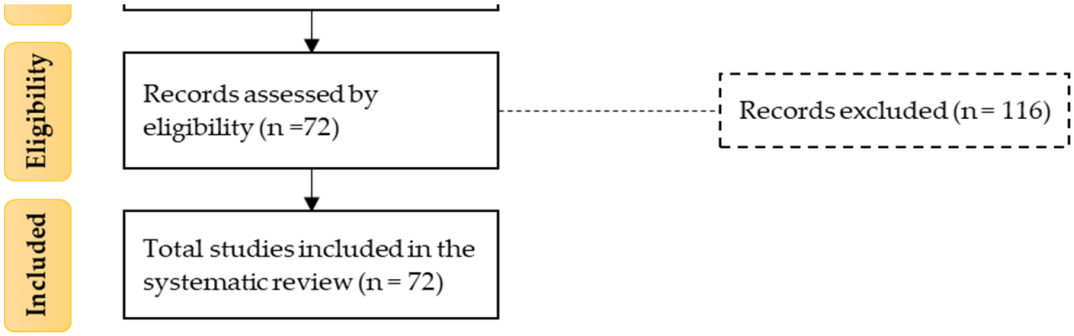


Figure 1 shows the PRISMA flow diagram for the research selection summary.

Data collection Process: Five randomly chosen articles were used to test the plot, and standardized data extraction was created to gather study information including study year, sample size, and content details. Following data extraction for each article, the process was reviewed for the final result. **Examine the Risk of Bias Evaluation:** The measurement method to analyze systematic reviews (AMSTAR 2) was used to evaluate the risk of bias while concentrating on the included articles' substance. The following section then discusses the systematic review's specific findings.

RESULTS

The following discusses Uganda's municipal solid waste management policy and legislative frameworks, practices, and the main obstacles to these practices:

Ugandan Municipal Solid Waste Management Policy and Legal Frameworks: The implementation of the MSWM system in Uganda is supported by a number of laws and rules (Muheirwe et al., 2023). Additionally, Uganda has developed legislative frameworks and policies for the management of municipal solid waste, and the following section discusses international waste conventions:

The Republic of Uganda's 1995 Constitution has brought attention to some environmental issues in the nation and serves as the foundation for all national policies, particularly those pertaining to the environment. Environmental rights are covered under Article 50. While Article 39 guarantees that the government would work to ensure that all Ugandans live in a clean and healthy environment, and that "government and citizens shall have the duty to protect the environment," "all persons have the right to a clean and healthy environment" (Awino et al., 2024). These guarantee the right to a healthy and clean environment for all Ugandans, as well as the obligation placed on the government and populace to preserve the environment.

The goal of Uganda's 2014 environmental policy is to safeguard the environment and natural resources while promoting sustainable development. In the following three sub-articles, this policy discussed the idea of waste management. Waste collection services, solid waste recycling, safe disposal, and the importance of scientific research to discover appropriate sanitary landfills were all mentioned in Article 3(7) Human Settlement, Urban Environment, and Environmental Health.

Furthermore, safe sanitary landfill sites, the creation of rules and regulations to regulate waste from various sectors, waste minimization, recycling, handling, and storage of hazardous and dangerous materials, and the oversight of waste management implementation were all covered in Article 3(8) Hazardous Materials and Pollution from Industrial Waste. Furthermore, Article 3(9) air Pollution and Climate Change discussed the importance of taking proper action against factors that contribute to climate change and air pollution,

like methane gas, which can be released from poorly managed landfills.

Protection of Public Health. "Any person shall collect waste at an especially designated place and in a manner, which does not affect the health of the society," according to Article 12 of this proclamation (Kumar et al., 2023). It forbids disposing of any kind of solid waste, liquid, or otherwise-in a way that endangers the environment or public health. Furthermore, this declaration stipulates that hospital waste must be disposed of using methods that adhere to environmental and public health regulations.

Evaluation of the environmental impact. Project proponents are required under the EIA proclamation to conduct an EIA for projects deemed to have substantial social and environmental implications (Adedara et al., 2023). Before being implemented, waste disposal facilities like landfills and waste incineration must undergo an EIA. EIA is crucial to the municipal solid waste management system as a result, Control of Environmental Pollution. In particular, Article 5 of the proclamation addressed the management of both hazardous and non-hazardous wastes. Through the establishment of an integrated municipal waste management system, "all urban administrations shall ensure the collection, transportation, recycling, treatment, or safe disposal of municipal waste," according to Article 5 Sub article 1 (Maalouf & Mavropoulos, 2023).

The proclamation emphasized the necessity of collaboration between municipal solid waste management and pertinent environmental authorities to oversee and assess municipal solid waste management systems, ensuring the efficacy of their execution.

Ratified International Waste agreements: Uganda has ratified two international agreements, the Rotterdam Convention and the Basel Convention, which are crucial for enhancing the solid waste management systems in the country. The Rotterdam Convention promotes shared responsibility and cooperation among parties in the international trade of hazardous chemicals to protect the environment and human health (Kumari & Raghubanshi, 2023).

The Basel Convention is an international treaty governing the trans-boundary transfer and disposal of hazardous waste. The main goal of the latter convention is to protect human health and the environment from the adverse effects of hazardous and other kinds of waste and to control its movement between countries (Hirpe & Yeom, 2021).

This commitment not only aligns Uganda with global best practices but also fosters collaboration with other nations facing similar challenges. As a result, it enhances the potential for knowledge sharing and resource mobilization to effectively tackle waste management issues.

Control of Hazardous Waste Management and Disposal: In addition to preventing harm to biodiversity, the environment, human or animal health, and/or property from improper handling of hazardous waste, this seeks to provide a framework for the environmentally responsible management and disposal of such material (Onungwe et al., 2023). It is the main national hazardous waste management and disposal control proclamation that lists the types of waste that need to be controlled, their chemical components, and their attributes. Clean production principles, the obligations of hazardous waste generators, hazardous waste labeling, storage, reuse, treatment, and recycling, as well as the handling and disposal of hazardous waste, are all covered in the proclamation's articles. It also covered unlawful transactions, cross-border travel, including the transportation of hazardous material between states.

Ugandan Municipal Solid Waste Management Procedures: Numerous studies on MSWM have been carried out in Ugandan towns and cities during the past few decades. The detrimental effects of inadequate solid waste management on the environment, public health, and municipal services have been recognized by the majority of municipalities nationwide since 2001 (Osman et al., 2023). As a result, several towns

and cities in Uganda have adopted MSWM methods.

Nonetheless, some research has revealed that MSWM practices differ among Uganda's metropolitan centers, contingent on the municipalities' level of awareness and solid waste management capability. Similarly, despite the fact that MSWM systems are intended to safeguard the environment and enhance circumstances in every city, a study carried out in Malaysia revealed that the fundamental hierarchical components of MSWM practices varied significantly among towns and cities (Muheirwe et al., 2023).

Furthermore, a Zimbabwean study (Takunda & Steven, 2023) found that MSWM practices may vary between residential and industrial producers, urban and rural areas, and developed and developing countries. Poor solid waste management is a common feature of many developing countries because of unbalanced systems. Solid waste management systems are inadequate and variable in sub-Saharan African nations like Uganda; in particular, waste avoidance, reduction, reuse, recycling, and energy recovery are at very low levels.

The primary goals of Uganda's current MSWM are solid waste collection, transportation, and disposal. The functional element's implementation is still lacking. According to studies carried out in Bangladesh (Noman et al., 2023), Mozambique (Florencio da Silva et al., 2023), and Nigeria (Onungwe et al., 2023), garbage is gathered from generation sources and transported to final disposal locations, just like in the majority of developing nations.

Given that Uganda's solid waste handling, recycling, and disposal system performance are still very low, this suggests that the government should focus on sustainable solid waste management strategies, such as prevention, reduction, reuse, recycling, and final disposal in many Ugandan towns and cities (Muheirwe et al., 2023). In summary, Uganda lacks a solid waste management system's fundamental functional components (Awino & Apitz, 2024). Therefore, the entire MSWM system in Uganda should be upgraded and replaced with sustainable MSWM; still, the government must give open burning and dumping, waste collecting, and final disposal serious consideration.

The movement of MSWM practices in numerous Ugandan cities is seen in Figure 2.

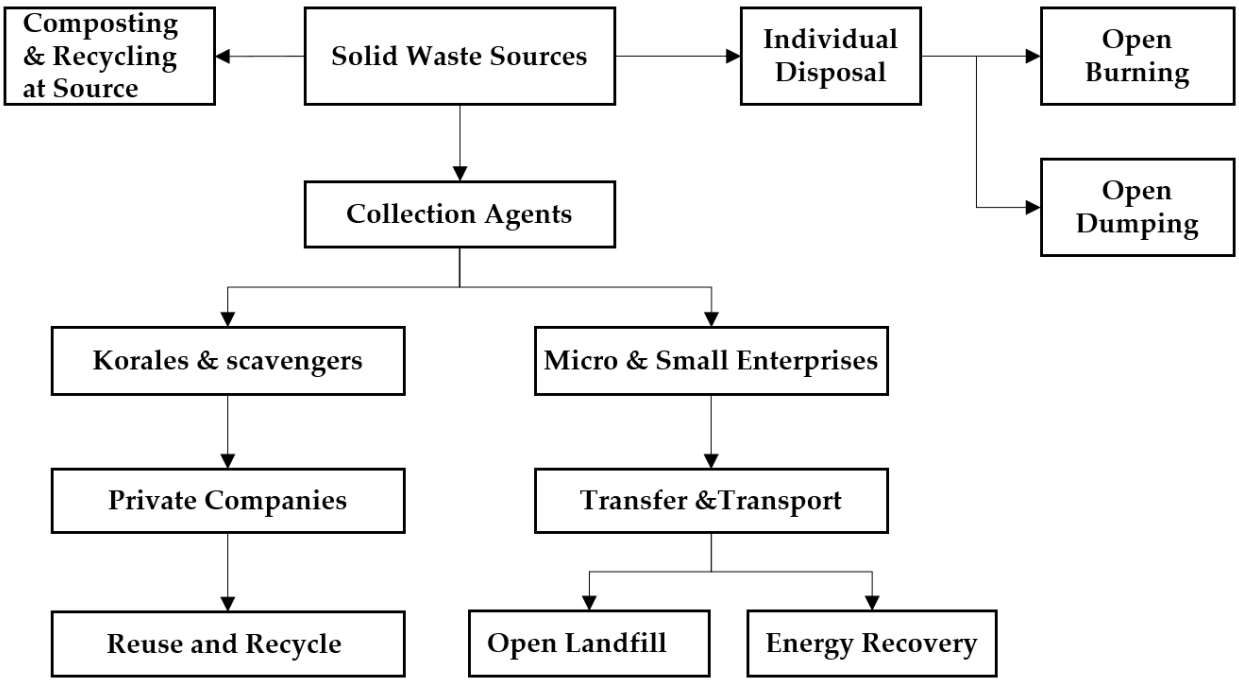


Figure 2: Uganda's municipal solid waste management process flow.

Production of Waste

The total amount of waste from various sources at a given time and location is known as waste generation. Sub-Saharan African nations produced roughly at a rate of 0.46 kg per person per day, 174 million tons of solid garbage were produced in 2016; by 2050, this amount is predicted to triple (Kumari & Raghubanshi, 2023). However, societal prosperity may have a direct impact on the quantity of solid trash produced.

On the other hand, the World Bank (2023) estimated that Uganda's municipal solid waste generation rate was 6 million tons annually in 2015 and is expected to increase to 10 million tons annually by 2030 and 18 million tons annually by 2050. According to a prior study (Osman et al., 2023), Uganda's total municipal solid waste generation rate is expected to reach approximately 0.65 kg/capita/day by 2025 (19,690 tons/day, or roughly 7.18 million tons/year).

The average amount of solid trash produced by households in Ugandan towns and cities, according to surveys, varied between 0.23 and 2.03 kg/capita/day (Baguma et al., 2023).

The Composition of Waste

Solid garbage in Africa has increased recently, but the content of waste has also changed (Neto et al., 2024). The percentage of organic waste declines with increased industrialization and economic development, especially in industrialized nations. The waste composition of these cities is characterized by food and green waste at 43%, plastics at 8.6%, paper and cardboard at 10%, metal at 5%, glass at 3%, wood at less than 1%, and other waste at 30% since sub-Saharan African countries generate a large amount of organic waste because of the preparation of fresh food and the use of less packaging on goods that are sold in the markets (He et al., 2024). Similarly, the bulk of Uganda's solid waste content is organic, according to a comprehensive analysis of the literature that included investigations from different towns and cities.

Collection of Waste

One of the key elements of municipal solid waste management is solid trash collection (Muheirwe et al., 2023). The majority of formal solid trash collection in Ugandan cities is carried out by micro and small businesses, who pick up waste from door to door and deliver it to facilities and disposal sites (Osman et al., 2023). In many Ugandan cities, solid garbage is also collected by unofficial organizations known as street boys and scavengers (Grangxabe et al., 2023).

Additionally, they visit open dump sites, temporary garbage containers, and homes to collect recyclable solid waste. 88% of households use bags to collect solid garbage, according to a prior study evaluating solid waste management in Ugandan towns (Apio et al., 2024). Most homeowners keep solid trash in containers that don't adhere to municipal regulations. Furthermore, maintaining solid waste collection services, eradicating open burning and uncontrolled solid waste disposal, and transitioning to sustainable management for all solid waste remain significant issues for low-income nations like Uganda (Yusuf et al., 2019).

Given the probability of population growth over the coming years, which also forces these towns to prioritize trash issues, this might become even more challenging in the future in big cities in low-income nations. Furthermore, in three towns-Kampala, Masaka, and Jinja-solid trash collection rates were 70%, 80%, and 55%, respectively. This shows that in 2018, solid garbage in these cities was not collected in proportions of 30%, 20%, and 43%, respectively. At the same time, between 30 and 60 percent of the was-

te produced in developing countries' cities goes uncollected, according to Muheirwe et al., (2023). Furthermore, whereas Accra (Ghana), Kampala (Uganda), and Moshi (Tanzania) had solid waste collection coverage rates of 80%, 65.2%, and 61%, respectively, Sousse, Tunisia, and Lagos, Nigeria have solid trash collection coverage rates of over 90% (Mor & Ravindra, 2023). The authors anticipated that more than 90% of municipal solid waste collection coverage may lessen the current environmental problems, public health issues, and economic burdens due to uncollected solid waste problems in Uganda, despite the fact that it is difficult to make a decision solely based on the waste collection rate.

However, between 20% and 50% of the solid trash produced in many urban areas in underdeveloped nations like Uganda is thought to go uncollected. Especially during the rainy seasons, runoff water carries this uncollected garbage, which might be kept on the land's surface. These result in the buildup of solid waste in water bodies and the drainage system, which clogs drains and harms communities and the environment.

Furthermore, a recent study conducted in Kampala revealed that uncollected solid trash is dumped into ditches, rivers, and open places (Fidelis et al., 2023). In Uganda, major cities have a far greater coverage of solid waste collection than rural settlements, where collection systems are occasionally nonexistent. Uncollected garbage can lead to public health issues like respiratory, growth, and skin disorders as well as water diarrhea and environmental issues like groundwater, land, and air pollution. Only around 2% of Ugandans have access to solid waste management services, despite the fact that it has grown to be a significant environmental and public health burden in urban areas (Adedara et al., 2023).

Uganda's metropolitan areas must thus adopt efficient solid waste collection policies and procedures, and this literature analysis found that the nation's solid waste collection system was deficient in several cities.

Energy from Waste, Reduction, Reuse, Recycling, and Waste Prevention

Reuse, recycling, and waste-to-energy conversion initiatives, as well as the avoidance and reduction of solid waste generation, are not effectively implemented in developing nations. Only 4% of the municipal solid waste produced in Africa is recycled by the private sector, despite the fact that 70–80% of it is recyclable, according to the UNEP (Kumar et al., 2023). Furthermore, the primary goal of the African Union Commission was to recycle at least half of the urban waste generated in African cities by 2023 (Florencio da Silva et al., 2023). Therefore, in certain cities, private companies have already started recycling waste materials such plastics, paper, glass, metals, and organic garbage. Scaling up such solutions, however, requires expanding end product markets and bringing in new recycling businesses. At the same time, Uganda's urban solid waste recycling efforts were insufficient; for instance, only roughly 5% of Kampala's solid trash is recycled (Nickson et al., 2024).

This demonstrates that Uganda will need a number of years to fulfill the African Union Commission's objective of recycling its urban garbage. Separating the debris into many categories is another step in the solid waste recycling process's initial stage (Apio et al., 2024). One of the most important benefits of solid waste separation at the source is that it promotes reuse and recycling practices in cities. Reusable bottles, jars, and recyclable materials are purchased from homes and sold to intermediaries and merchants in major towns by the informal private sector, which has encouraged the reuse and recycling of solid waste (Oates et al., 2023). Additionally, they occasionally gather recyclable and reusable solid trash from landfills and sell it to private businesses.

Additionally, using an advanced incinerator plant to recover energy from waste on a large scale is a common waste management system in developed countries, but it is expensive, requires highly skilled

labor, and requires highly sophisticated technology, according to the USEPA Best Practices for Solid Waste Management (Kiguli et al., 2023). If waste-to-energy facilities are not properly managed, they also have an impact on the environment. Waste avoidance, reduction, reuse, recycling, and waste-to-energy techniques are examples of sustainable MSWM initiatives that are generally lacking in Uganda. In a similar vein, low-income nations' sustainable municipal solid waste strategy systems were inadequate because of budgetary constraints (Aryampa et al., 2023).

Transportation and Transfer of Waste

Prior to being transported to the processing and final disposal locations, solid waste is deposited and kept in intermediate locations known as waste transfer stations (Fidelis et al., 2023). Therefore, moving waste from collection locations to temporary storage facilities and moving it to processing facilities and final disposal locations are included in the transfer and transport activities for municipal solid waste. Cities and municipalities are in charge of transporting municipal solid waste to waste-to-energy facilities and final disposal locations, according to a prior study on MSWM in Uganda. Micro and small businesses have a limited role in this process (Somorin et al., 2023). However, there are not enough transfer and transportation facilities for solid waste in the towns and cities of emerging nations. Similar to this, a lot of towns and cities store their collected rubbish outdoors, on the side of the road, where it is exposed to the elements and attracts bugs (Edodi, 2023). The ecology and public health in the vicinity of the solid waste transfer stations are immediately impacted by this

Disposal of Waste

The last stage of municipal solid waste management is waste disposal, which shields the environment and public from the negative effects of solid waste (Kumari & Raghubanshi, 2023). The availability of technology, skilled labor, and each nation's financial resources may all have an impact on the waste disposal facility's quality. In Africa, the most popular way to dispose of waste is open dumping, which is the unplanned dumping of rubbish without regard for public health and environmental protection. Open burning is another often employed waste removal technique (Maalouf & Mavropoulos, 2023).

The ecology and public health surrounding disposal sites are thus seriously harmed by unplanned and poorly managed solid waste disposal practices, which also have an impact on future generations by raising greenhouse gas emissions that fuel climate change (Ambaye et al., 2023).The Open WASH study Tandlich et al., (2024) states that thermal processing, which involves burning and incinerating solid waste, and landfills, which comprise waste burial pits and communal open dumping, are Uganda's two primary waste disposal techniques.

However, the majority of Ugandan towns and cities lack standardized locations for disposing of waste. Furthermore, Naveenkumar et al., (2023) claimed that the majority of Ugandan cities dispose of their garbage by open dumping, which contaminates the soil, groundwater, surface water, and overall natural environment. Garbage minimization techniques that convey garbage to dumpsites for ultimate disposal have received less attention in developing nations (Fidelis et al., 2023).

In Uganda, incineration is primarily used to treat medical waste, but open burning of solid refuse is another prevalent practice. Because more than half of the urban population engages in open burning, the ultimate solid waste disposal systems in African cities are not ecologically friendly, according to the 2019 African Development Bank Report (Muheirwe et al., 2023). This suggests that a number of limitations impact the adoption of solid waste management systems in Uganda.

The difficulties in Ugandan municipal solid waste management

In Uganda, managing municipal solid waste is a significant environmental issue that has an impact on people's daily lives, especially in metropolitan areas. The primary obstacles in the field were determined by this methodical examination of the body of research on MSWM in Uganda. Solid waste management is a multifaceted problem that affects the nation's economic as well as numerous social and environmental facets (Takunda & Steven, 2023).

Global issues including public health, climate change, environmental degradation, and sustainable production and consumption are closely related to it. The study by Noman et al., (2023) found that the problems with MSWM in a number of developing nations were growing waste creation, budgetary constraints, a lack of cross-sectoral connections, and waste management infrastructures.

Similar to this, the EFCCC State and Outlook of the Environment (Onungwe et al., 2023) found that the primary obstacles to MSWM in Uganda are limited access to waste collection services, inadequate public and private investment in solid waste management, unplanned historical patterns in a number of towns and cities, inappropriate waste disposal practices that negatively impact the environment and human health, and limited knowledge of and use of formal waste recycling.

Other significant issues that MSWM in Ugandan towns and cities faced include a lack of managerial commitments, a lack of competent staff, a lack of infrastructure, a lack of financial resources, and ineffective implementation of laws and policies (Nickson et al., 2024). Furthermore, the nation lacked adequate knowledge and instruction on waste prevention, reduction, reuse, and recycling at the community level. Additionally, there is a dearth of information on energy recovery from solid waste and composting (Apio et al., 2024). However, a number of Ugandan cities still struggle with municipal solid waste management in spite of certain regulatory frameworks in place (Onungwe et al., 2023). These difficulties could include anything from producing a lot of waste to having an ineffective strategy for disposing of it. According to a recent study by Gebrekidan et al., (2024) in Addis Ababa, the difficulties include the government placing less emphasis on MSWM, the lack of land for various solid waste management activities, especially for temporary storage and disposal sites, financial constraints, a lack of infrastructure for solid waste collection and transportation, and a shortage of qualified human resources.

Furthermore, according to Omona & Maderu (2023), Uganda's MSWM systems are erratic in terms of collection and transportation, insufficient in terms of waste prevention and collection coverage, ineffective from a technical standpoint, weak in terms of the enforcement of solid waste management laws and policies, and occasionally influenced by political factors. Other issues with solid waste management in Ugandan cities include poor public participation, ineffective planning and execution, a lack of regular monitoring and evaluation, and a lack of cooperation among stakeholders, especially the government and private sector (Awino & Apitz, 2024).

DISCUSSION

In order to examine the policies, practices, and difficulties of MSWM in Uganda, a systematic literature analysis was carried out on both published and unpublished research from 2005 to 2021 as well as working policy and legislative frameworks from 1995 to 2021. Based on a search of the government website, the Scopus and Google Scholar databases, and a total of 72 studies that satisfied the eligibility requirements, the review was conducted. Other published studies on MSWM, especially in Uganda, corroborate the findings in this systematic review.Solid waste management techniques in Uganda are supported by a number of MSWM laws and policies, according to Somorin et al., (2023).

These results are in line with our findings that the foundation for putting MSWM into practice and enforcing it at all levels is a legal and policy framework. Similar to this, the Open WASH report (2021) said that the primary goals of such practices in Uganda were the collecting, transportation, and ultimate disposal of solid waste.

These data also support our conclusions that open burning and open dumping were Uganda's primary municipal solid waste disposal methods, and that micro and small businesses and local scavengers handle solid trash collection.

Furthermore, Edodi (2023) discovered a weak solid waste management system in Uganda as a result of insufficient regulations, lax enforcement, insufficient garbage collection coverage, a lack of funding, and no formal solid waste recycling systems-aside from certain private company operations.

According to our findings, the primary obstacles to MSWM in Uganda were related to the following: policy and legal (with little focus on solid waste prevention, lack of technical guidelines), institutional (weak cooperation among sectors and other stakeholders, weak human and material capacity), social (low community awareness and attitudes), financial (lack of finance and low priority given for solid waste management), and political (low priority for solid waste management due to political interference).

However, for this systematic study, abstracts and titles were independently examined. Nevertheless, a recent analysis by Oates et al., (2023) revealed that up to 13% of the pertinent papers were overlooked by abstract and single title screening. Furthermore, only English-language publications were included in this review. To make sure that these restrictions wouldn't alter the review's overall findings and conclusions, data extraction and bias assessment were carried out.

Moreover, the contributions and consequences of this systematic review were discussed in light of Uganda's municipal solid waste management policies, practices, and difficulties.

First, the existing state of Uganda's municipal solid waste management was examined in this systematic review. By offering substantial proof of Uganda's national municipal solid waste management policies and practices, it will advance knowledge and close gaps in the body of existing literature.

Second, this analysis gave researchers, stakeholders, and policymakers a concise overview of Uganda's municipal solid waste management laws, procedures, and issues. This review is unique in that it covers every practical aspect of national municipal solid waste management procedures.

Third, this evaluation assists policymakers and other interested parties in adjusting plans and policies based on the research's conclusions and recommendations to enhance Uganda's municipal solid waste management.

Fourth, aside from the importance of the paper's findings to the field of study, the evidence presented here has a significant impact on the management of municipal solid waste in other developing nations, especially in sub-Saharan Africa, where comparable issues may arise.

Fifth, it could broaden the focus of upcoming research on municipal solid waste management topics and be used as a reference for academic purposes.

Sixth, it indicates the areas that require more research, particularly the gaps in knowledge on sustainable municipal solid waste management techniques such energy recovery from trash, waste avoidance, reduction, reuse, and recycling.

In order to address the present issues with solid waste management practices in the nation, Uganda's municipal solid waste management systems should concentrate on sustainable solid waste management techniques in the future. These include waste generation prevention, reduction, reuse, recycling, composting, and waste to energy on a large scale.

Thus, this systematic review's contributions and the implications for future research could result in sustainable municipal solid waste management in Uganda, improving the country's social, economic, and environmental sustainability.

Conclusion

Based on the primary qualitative questions of this review, a summary of Uganda's municipal solid waste management laws, policies, practices, and difficulties was provided in this systematic review. The following conclusions were then reached in light of the results of this comprehensive literature review. Although Uganda has enacted environmental policies, proclamations for the management of municipal solid waste, and other relevant laws, the nation does not generally follow through on their implementation or enforcement. In order to accomplish sustainable solid waste management, Uganda's MSWM policies and laws must be implemented with integrated enforcement.

To implement sustainable MSWM at all governmental levels, there were no specific technical guideline frameworks (separation at the source, waste prevention, reduction, reuse, and recycling; converting waste to energy).

In Uganda, MSWM is linked to a number of economic, social, and environmental problems that demand the government's urgent attention.

The amount of rubbish generated in many Ugandan cities and towns has increased recently as a result of industrialization and rural-to-urban migration. Degradation of the environment and increased harm to public health are the results of an uneven waste management system and a growth in the volume of solid waste. Furthermore, this review discovered that MSWM practices varied by city and area in Uganda. Solid garbage collection in the nation's capital, however, proved to be more difficult than in many of the nation's smaller towns.

In Uganda's municipal solid waste collection system, especially the door-to-door solid garbage collection system, micro and small businesses played an important role. Furthermore, because MSWM in Uganda is primarily concerned with the collection, transportation, and disposal of trash, sustainable solid waste management practices-such as the prevention and reduction of waste creation, reuse, recycling, composting, and energy recovery from waste-were found to be ineffective. Furthermore, in many Ugandan towns and cities, open burning and dumping are the most often used methods for disposing of solid garbage.

Briefly put, there are many obstacles to the adoption of MSWM methods in Uganda, such as the absence of enforcement of the legal and legislative framework, financial limitations, a shortage of qualified human resources, infrastructure limitations, and poor public knowledge of solid waste management. The problem has also been exacerbated by poor planning and execution of solid waste management, particularly the low priority assigned to solid waste management in many Ugandan cities, and a lack of cooperation among MSWM stakeholders. These review findings indicate that Uganda's MSWM issues are made worse by a number of obstacles, which has an immediate impact on the environment and public health. Therefore, strengthening institutional ability and enforcing legal frameworks effectively are essential to enhancing Uganda's MSWM system.

In order to limit the formation of solid waste, the authors also proposed several technical laws, such as a waste tax on manufacturers of hard-to-recycle products and a volume-based waste fee scheme. Additionally, it is crucial to separate solid waste into categories such as food waste, plastics, paper and cardboard, glass and metals, and non-recyclable waste at the household and community bin level. This

helps to lower the quantity of solid waste and promotes recycling, composting, and reusing practices. Additionally, raising community awareness of the methods that help reduce solid waste, like separating waste at the source, purchasing products with less packaging, buying in bulk to reduce packaging, using reusable instead of disposable materials, using their own shopping bags, like those made of cloth and recyclable materials, minimizing and composting food waste, and, if feasible, feeding animals. In order to convert solid waste management opportunities into a circular economy practice in Uganda, future research should focus on integrated sustainable solid waste management, which aims to protect and enhance public health, the environment, and material and energy recovery through the promotion of environmental quality, sustainable consumption, and production.

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