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The Efficacy of Solid Waste Management Methods in Mto Wa Mbu, Tanzania

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Abstract

Solid Waste significantly contributes to the degradation of both public and environmental health, making effective waste management a critical issue for countries worldwide. By 2050, global waste production is projected to increase by up to 70%, with sub-Saharan Africa expected to more than triple its current waste levels [7]. Although Tanzania has made notable developmental strides, evident in rising GDP and declining poverty rates [17], the country continues to face challenges in waste management due to limited financial resources for public policy in this sector. This study uses a standardized observational checklist, along with an interview, and literature reviews, to gather data and assess the current solid waste management practices in Mto Wa Mbu, a town and administrative ward in Tanzania's Arusha Region. By analyzing the waste management system in Mto Wa Mbu, this research aims to highlight policy shortcomings, both governmental and community-based, and offer insight into potential improvements. While Mto Wa Mbu has seen progress, largely driven by community-based organizations (CBOs) and private businesses, issues such as littering, open burning, and insufficient public waste disposal infrastructure persist. The paper concludes by proposing strategies for promoting a more circular economy within the village.

Keywords: Circular economy, Community Based Organizations (CBOs), Local municipalities, Open burning, Solid Waste Management (SWM)

Introduction

Solid Waste Management (SWM) in developing countries is a critical factor in safeguarding and improving public and environmental health. The urgency of effective SWM becomes evident when considering global projections: according to the United Nations Environment Programme (UNEP), annual solid waste generation is expected to rise from 2.1 billion tons in 2023 to 3.8 billion tons by 2050. UNEP also estimates the global direct cost of waste management at approximately USD 640.3 billion—this figure includes the hidden costs of pollution, poor health, and climate change resulting from inadequate waste disposal practices [12]. The scale and expense of the SWM crisis continue to grow, posing a considerable challenge for developing nations, many of which have only minimal or underdeveloped waste management systems [4]. When solid waste is neglected or improperly disposed of, public health and environmental quality deteriorate.

Poor SWM can have far-reaching consequences for health and the environment. For example, open burning releases harmful pollutants such as CO, CO₂, SO₂, NO₂, and PM₁₀ into the atmosphere [16]. The release of solid waste into bodies of water contributes to global marine litter and environmental contamination [14]. Uncontrolled disposal also generates serious heavy metal pollution in water, soil, and plants [15].

In Arusha, Tanzania, projections indicate that solid waste generation will increase significantly by 2030 [11], raising concerns about the sustainability of current waste management practices. Due to limited budget allocations for SWM from the central government [1], waste management responsibilities are decentralized—each region is divided into districts, and districts into wards—leaving each jurisdiction to address its own challenges. The United Republic of Tanzania acknowledges its difficulties in providing adequate SWM support across all regions. As a result, local municipalities often rely on CBOs and private companies for waste management services, a framework envisioned by the Environmental Management Act (EMA) Part IX Sections 114-119 [2].

Mto Wa Mbu, an administrative ward in Arusha located near Lake Manyara, depends primarily on private businesses and Community-Based Organizations (CBOs) for its waste management. This small yet popular tourist destination serves as a gateway to several national parks. Consequently, beyond protecting public health and the environment, local stakeholders emphasize cleanliness to maintain the town's appeal to visitors. Although Mto Wa Mbu has made notable improvements in SWM over the years, this study found that the town continues to face persistent challenges, including littering, open burning, and limited adoption of circular economy practices.

This study gathered observations collected over a one-week period using a standardized survey checklist to assess the effectiveness of Mto Wa Mbu's waste management strategies. Supplemented by literature reviews of SWM in Arusha and beyond, the research aims to identify shortcomings and propose strategies for Mto Wa Mbu and other local municipalities to strengthen their SWM systems and expand opportunities. Ultimately, the discussion considers how local initiatives can play a

pivotal role in improving SWM while recognizing that sustained government support may be essential for achieving a long-term, sustainable circular economy [18]

Methods

Study Area

The observational data was collected within Mto Wa Mbu, beginning along the town's main road, T17, and extending into connecting streets. Four primary streets—Muungano Street, Vanga Street, Pangani Street, and Nyerere Avenue—were included in the survey. Data was also gathered from numerous unnamed residential paths branching off from T17.

To supplement the observations on solid waste management, the study incorporated an interview with a local stakeholder. The interview provided insights into Mto Wa Mbu's solid waste collection and waste transportation systems, as well as local initiatives aimed at promoting a more sustainable SWM framework.

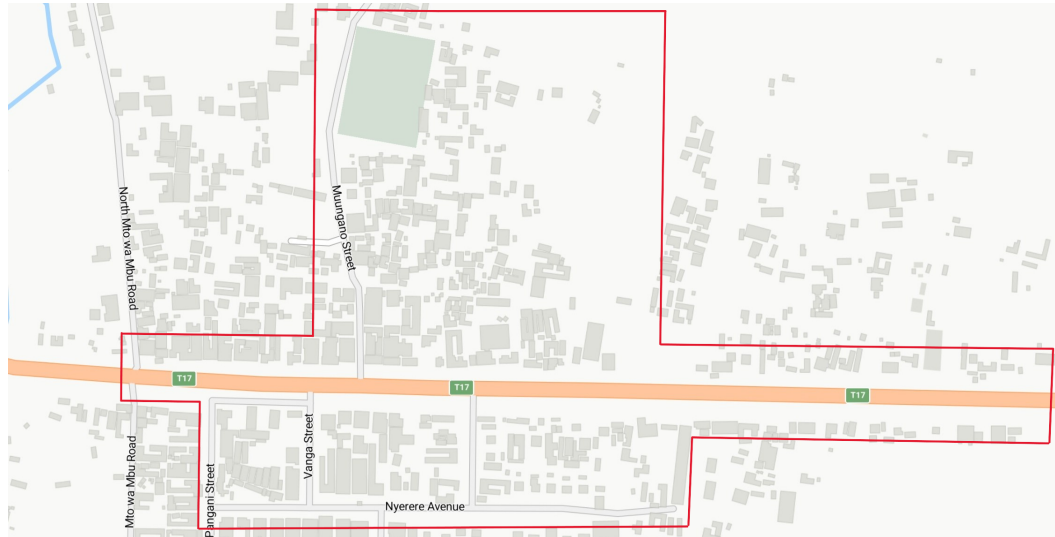


Figure 1. Map of the conducted study area in Mto Wa Mbu.

Observational Data Collection

Observational data was gathered over a one-week period in June 2025 to evaluate community behaviors related to solid waste management and mismanagement. The study area, shown in Fig. 1, included local food, electronics, general, and utility stores along T17, Mto Wa Mbu's main street, where both locals and tourists frequently shop. Observations also extended into the surrounding residential streets branching from T17. This area was selected because it serves as the town's central hub of activity and lies directly along T17, a highway connecting multiple national parks in the Arusha region and serving as a major route for tourists and Tanzanians.

Littering Practices, littering behaviors were recorded through field notes, documenting the amount and types of solid waste present. Common litter included plastic bottles, bottle caps, paper wrappings, and food scraps.

Open Burning, Instances of open burning were documented through field notes, noting both active burning sites and remnants of previous burning. Indicators included piles of ash, scorched vegetation, and partially burnt solid waste, often plastic.

Community Engagement, Community participation in SWM was assessed by observing public trash bins, composting, signage promoting waste cleanup, and other recycling initiatives. These indicators were used to evaluate local involvement in maintaining the town's cleanliness.

Literature Review

A literature review was conducted using several peer-reviewed publications to gain an understanding of effective SWM practices in developing countries worldwide. These publications also included studies on integrated waste management in sub-Saharan countries, with specific data from Tanzania. Additionally, studies focusing on waste management in the Arusha Region were reviewed to identify regional factors that may influence SWM in Mto Wa Mbu.

Results & Discussion

The data tables presented in this section represent the finalized version of the standardized observational checklist, which was completed for each street location within the Mto Wa Mbu study site. Data was recorded in qualitative amounts.

*Amount is defined as follows: *handful* (can fill one hand), *bagful* (can fill a standard plastic bag), *cartload* (can fill a cart measuring approximately 0.5 m²), or *truckload* (amounts larger than a cartload) [8]. See Table 1.

The results of this study were derived by integrating qualitative data from the stakeholder interviews, the literature review, and the standardized observational checklist. These results assess the current methods of Mto Wa Mbu's SWM system and evaluate their effectiveness in relation to best practices for waste management in developing countries, as identified in the literature review.

Table 1. Observational Data by Location

Location	Data Collected	Description
T17	Public Waste Bins	1 waste bin, fair condition.
	Littering	Type & Amount: cartloads of plastic, bagsful of paper wrappings and food scraps. Items: plastic bottles, glass bottles, bottle caps, paper wrappings, food scraps.
	Waste Disposal Methods	Local Businesses piled filled trash bags in front. cartload of solid waste piled in front of few buildings.
	Waste Segregation	Plastic was separated from general waste (food scraps, glass, paper wrappings.)
	Local Recycling Initiatives	Old bags used as flowerpots. Glass bottles reused for new beverages. Scrap-business for reusing scrap metals.
	Evidence of Open Burning	None.
	Waterways Pollution	Littering accumulated in masses at drainage intersections. Visible bagsful of littering throughout open drainage system.
Muungano Street	Public Waste Bins	No waste bins on street.
	Littering	Type & Amount: bagsful of plastic, handfuls of paper wrappings. Items: plastic bottles, bottle caps, glass bottles.
	Waste Disposal Methods	cartloads of solid waste piled outside some homes, active open burning.
	Waste segregation	Not apparent.
	Local Recycling Initiatives	None.
	Evidence of Open Burning	3 separate piles of burnt SW and ashes
	Waterways Pollution	N/A
	Public Waste Bins	1 waste bin, fair condition

Location	Data Collected	Description
Vanga & Pangani Street	Littering	Type & Amount: bagsful of plastic, handfuls of paper wrappings and food scraps. Items: plastic bottles, plastic caps, paper wrappings
	Waste Disposal Methods	Piled trash bags in front of buildings.
	Waste Segregation	Plastic was separated from general waste.
	Local Recycling Initiatives	Reused old boxes and glass bottles. Vendors had waste bins in some stores.
	Evidence of Open Burning	None.
	Waterways Pollution	Handfuls of littering in open drainage system.
Residential Areas	Public Waste Bins	None.
	Littering	Type & Amount: cartloads of plastic, handfuls of paper and food scraps. Items: plastic bottles, paper wrappings, food scraps.
	Waste Disposal Methods	Piled waste outside homes, significant open burning practices, some filled trash bags.
	Waste Segregation	Not Apparent.
	Local Recycling Initiatives	None.
	Evidence of Open Burning	5 separate piles of burnt SW and ashes.
	Waterways Pollution	N/A
Nyerere Avenue	Public Waste Bins	None.
	Littering	Type & Amount: bagsful of plastic, handfuls of paper wrappings and food scraps. Items: plastic bottles, bottle caps, paper wrappings, food scraps.
	Waste Disposal Methods	Not Apparent.
	Waste Segregation	Not Apparent.
	Local Recycling Initiatives	Truckload of banana peels for composting.
	Evidence of Open Burning	None.
	Waterways Pollution	Handfuls of littering in open drainage system.

Analysis of Results

The steps taken for SWM in Mto Wa Mbu are primarily driven by local stakeholders and a CBO in collaboration with private business efforts. The town has implemented positive initiatives in waste collection, as evidenced by the many local businesses along T17 that pile their trash bags for pickup. Waste is separated into distinct bags: those containing general waste (paper wrappings, glass, food scraps, etc.) and those containing plastics. The plastic-filled bags are purchased and collected by a private company for recycling and repurposing within their business operations. According to the local organizer and the literature review, the remaining waste bags are transported to the Muriet Landfill in Arusha [11], with trash collection occurring twice per month. Additionally, local stakeholders have organized town cleanups—though their frequency is unclear—to promote cleanliness and raise awareness of waste management. These activities indicate the presence of an *operational*, though still developing, *SWM system*.

An *operational SWM system* can be evaluated using the waste management strategy outlined in the study on Integrated Waste Management Policy and Legislation for African Countries. This five-step framework ensures the development of a feasible waste management system for developing nations [19]. Figure 2 illustrates the program.

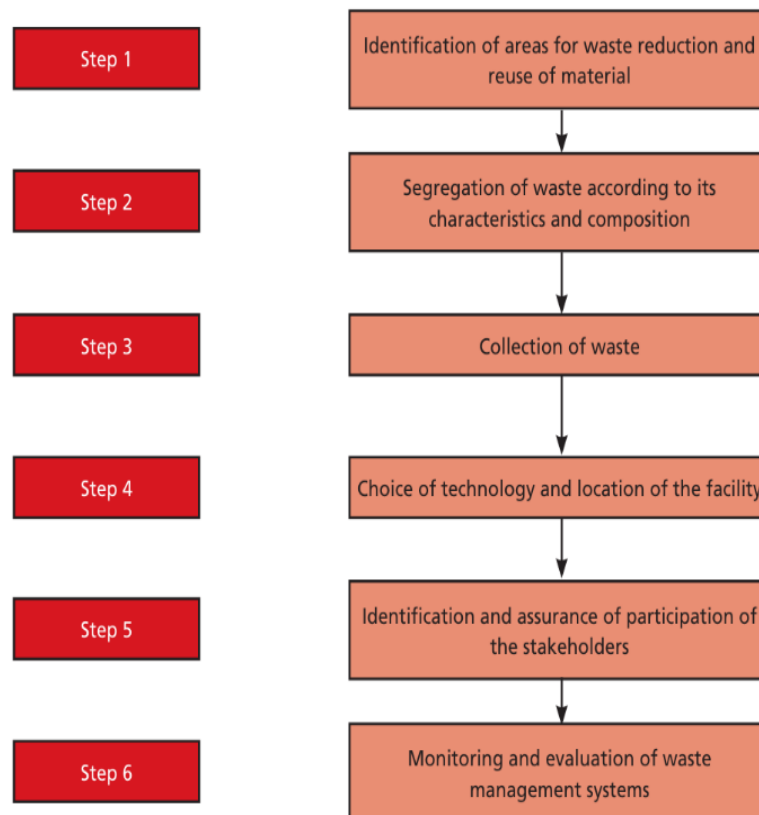


Figure 2. Steps of Waste Management Strategy (Source: D.D Basu, 2001, CSE).

Step 1, The *Environmental Management (Prohibition of Plastic Carrier Bags and Plastic Bottle Cap Seals) Regulations, 2022* is a nationwide legislation passed by the Tanzanian government that imposes a total ban on plastic bags and plastic packaging [3]. This law has contributed to fulfilling the first step of the Waste Management Strategy in Mto Wa Mbu. Additionally, the town has made some effort to reuse metal scraps and compost biodegradable materials.

Step 2, Separating plastic from non-plastic waste prior to collection, along with composting banana peels and other biodegradable waste, contributes to the segregation of waste according to its characteristics and composition.

Step 3, An initiative by local stakeholders, in collaboration with a private recycling business, established a necessary waste collection system. While waste collection currently occurs twice a month in Mto Wa Mbu, the recommended frequency is once or twice per week for household waste and daily for market waste [10].

Step 4, The private recycling business fulfills Step 4 by using conventional recycling methods to process and reuse the plastic waste collected from Mto Wa Mbu.

Step 5, Participation of local stakeholders is vital for implementing a successful waste management plan [10]. In Mto Wa Mbu, stakeholders include households, small business owners, recyclers, and the informal sector. Participation is evident in various forms: the CBO that organizes trash pickup, the business owners who set out their waste, and the recycling company that collects it. However, many households in residential areas do not participate in formal collection, opting instead for open burning to dispose of their solid waste.

Step 6, Due to the decentralized nature of Mto Wa Mbu's solid waste management (SWM) system and the limited resources of the local government, monitoring and evaluation remain insufficient. This component is critical, as it enables authorities to gather data and improve overall management. Without data on waste generation, segregation rates, or collection efficiency, the system risks becoming ineffective.

Suggestions

In residential areas, open burning of waste remains common. This suggests that trash collection services may not be adequately reaching these parts of town, or that residents in these areas may lack awareness of the environmental and health consequences of open burning. Installing public waste bins throughout Mto Wa Mbu—paired with regular monitoring and collection—could significantly reduce littering and open burning. However, before implementing such infrastructure, it is crucial for a CBO or similar initiative to continue promoting waste management education across the town. Ensuring that residents understand the impacts of poor waste practices will help maximize the effectiveness of any new waste collection measures.

Additionally, Mto Wa Mbu's waste collection is closely interconnected with the Arusha region, as the town's trash is disposed of at the Muriel landfill site, located in Arusha city. This landfill receives solid waste from 24 of the 25 Arusha wards [11], with Mto Wa Mbu being one of the contributors. With the continuing development of Arusha region, the current daily waste generation of more than 550 tons is expected to increase significantly [1]. This should be a concern for local municipalities in Arusha City, because the current conventional landfill dumping is not a sustainable long-term practice and available space will run out [5]. This situation raises important questions about the need for more centralized and coordinated government assistance in waste management, including policies that promote and finance a circular economy.

Conclusion

Though Mto Wa Mbu has made significant progress toward developing an operational SWM system, challenges related to community awareness, open burning, littering, and dependence on a linear economy persist. The community has shown recognition of the importance of waste management, as demonstrated by proactive trash collection along T17, Vanga Street, Pangani Street, and Nyerere Avenue; however, there remains substantial room to improve sustainable SWM practices. As outlined in the recommendations, implementing public waste bins and strengthening community waste education could greatly enhance the town's SWM system if properly implemented.

Due to the time constraints and limited resources of this study, future research should focus on quantifying waste generation across all Mto Wa Mbu and conducting surveys on public awareness. These statistics could assist local CBOs and private businesses in shaping future SWM initiatives that foster job creation, economic growth, and improved waste infrastructure. Additionally, such data could strengthen transparency between CBOs and local municipalities, facilitating the development of more robust regional SWM policies.

Ultimately, SWM is not solely a local concern but a nationwide challenge that must be addressed to safeguard public health and protect the environment. Collecting and analyzing localized SWM data can help overcome current administrative and institutional barriers in Tanzania—particularly the lack of coordination between stakeholders and the local government, which limits the accessibility of necessary funding [1].

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