

# Municipal Material Management

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## Abstract

*The increase in global prosperity and population has led to a significant rise in the generation of Municipal Solid Waste (MSW), posing serious threats to public health and the environment. This study explores the global state of MSW generation, composition, and management strategies, comparing the effectiveness of various technologies across 59 developed and developing countries. A total of 19 criteria for the selection of MSW management technologies are discussed, highlighting challenges such as inadequate infrastructure, insufficient policies, and informal waste practices, especially in low-income regions. In the context of Southern Ethiopia's Dilla town, for example, waste generation is predominantly organic (68.4% by weight), with severe limitations in waste collection systems, public awareness, and resources. Recommendations for integrated urban agriculture, public policy changes, and financial incentives are provided as possible solutions to these problems. Globally, the future projections indicate a significant increase in MSW, which could reach 3.4 billion tons by 2050, requiring urgent re-evaluation of existing waste management practices to meet sustainability goals. This study aims to provide valuable insights for countries struggling with MSW issues and help policymakers adopt more sustainable waste management practices.*

**Keywords:** Municipal solid waste, solid waste management, waste-to-energy, waste composition, organic waste, global waste trends, environmental health, dilla town, ethiopia, circular economy

## INTRODUCTION

### SOLID WASTE: Control of Generation

Municipal Solid Waste (MSW) generation has increased 4. 4. as a result of rising prosperity and population, endangering public health and the environment. The problem of Municipal Solid Waste Management (MSWM) affects everyone on the planet. Nearly everywhere in the world, MSWM is at a critical point, and strategies for managing MSW are being developed to ensure a sustainable environment. The purpose of this paper is to outline the current state of MSW generation, composition, management, and associated issues on a global scale. The status of various MSWM technologies has been compared among 59 developed and developing countries, grouped according to their gross national income. In order to choose the best MSWM technology or technologies for a city or town, a total of 19 selection criteria that impact the technologies' performance, operational suitability, and applicability have been discussed. Every risk and difficulty that could arise over the Waste to Energy (WtE) project's lifetime has also been covered. Additionally, this paper provides a comparative overview of various globally recognized MSWM technologies as well as the current growth of the WtE

technology market. It was discovered that the majority of industrialized nations have successfully adopted the Solid Waste Management (SWM) hierarchy and are currently placing a strong emphasis on MSW reduction, reuse, and recycling. However, since most of the MSW is dumped in an open manner and most of these nations rely on an inadequate waste infrastructure as well as the informal sector, solid waste management (SWM) has become a major issue in low-income and low-middle-income countries. Effective waste

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management policies, financial resources, technology selection, and the availability of sufficient trained personnel are some of the other significant obstacles. [1] This study provides a clear picture of MSW composition, generation, management strategies, and policies in a global setting. All countries in the world where effective MSWM has not yet been implemented may find this manuscript to be beneficial. This study provides a clear picture of the composition, generation, and management strategies and policies of solid waste in a global context. All countries in the world where effective MSWM has not yet been implemented may find this manuscript to be beneficial. There was no data generated for this study. The results of international conferences, papers that have already been published in journals, and reports that have been released by government agencies provided all of the supporting information.

### ***Measurand***

As a step toward efficient management in Dilla town, Southern Ethiopia, descriptive issued the status of solid waste management (SWM) practice as well as to characterize and quantify the municipal solid waste. To collect information on the residents' current waste management practices, formal surveys with a structured questionnaire were given to SWM operators and household residents. On-site waste segregation, characterizations, and quantification were carried out along with numerous field investigations. It was discovered that residential households generated waste at an average rate of 0.475 kg per capita per day. By weight, organic waste made up 68.40% of the waste. By weight, the recyclable waste is composed of 1.50% paper and 1.90% plastics. By weight, however, other wastes consist of 0.90 percent miscellaneous, 19.6% inert, 0.96% textiles, 0.30% metals, 0.30% glass, and 0.50% leather and rubber. The primary issues with solid waste management are being exposed by the general lack of knowledge among residents, inadequate household waste segregation practices, and the disposal of waste in an unhygienic landfill. Other obstacles to SWM include an inefficient system for charging for solid waste, a shortage of skilled labor, improper routes for collection, a lack of collection vehicles, improper placement of community containers, and illegal disposal of solid waste. Based on the study's findings, it can be said that the majority of the solid waste produced in the town was organic waste. Therefore, the city can recover this waste by implementing integrated urban agriculture, which could compost the waste and turn it into organic fertilizer. In order to improve SWM, it is necessary to provide equipment, incentives, other financial policies, public awareness campaigns, and other supplies that are now insufficient or inappropriate. [2] The town's municipal authorities might use this work as a reference point and encourage environmental protection agencies to reevaluate how their strategies and policies are being implemented in relation to the town's environmental and public health. In developing nations, the number of people living in cities is growing, which has resulted in a massive amount of municipal waste being generated there. This has complicated the management of the waste and put public health and the environment at risk. Therefore, the results of this study will be crucial for town municipalities and other policymakers in addressing these issues. This study can force environmental protection authorities to reevaluate the implementation of their policies and strategies with regard to the larger issues of human and environmental health conditions of town inhabitants. It can also act as a benchmark for the municipal authorities of Dilla town, for whom the problem is still invisible and insignificant.

Globally, there is a significant increase in the quantity and composition of municipal solid waste generated, especially in developing nations due to factors like population growth, fast urbanization, industrialization, a thriving economy, and rising living standards. A report by the United Nations Environmental Programme (UNEP) estimates that between 1.7 and 1.9 billion metric tons of municipal solid waste (MSW) were produced globally in 2010 (UNEP Citation2010a). According to future projections, the current rate of waste generation could rise sharply and reach 3.4 billion tons by 2050. For example, rising urbanization and shifting lifestyles have resulted in eight times as much MSW generation in Indian cities in 2008 as in 1947. Municipal services were thus under tremendous strain as a result of the rise in the rate of solid waste generation.

In developing nations, solid waste management techniques and systems for collecting and disposing of waste are not working. For example, according to a 2002 UNIDO report, only 70%, 40%, 41%, and

37% of solid waste were collected in Abidjan, Ibadan, Bujumbura, and Lome, respectively. Approximately 15% of the collected waste is processed through unsafe and informal recycling, and over 50% of the waste is typically disposed of in unsanitary landfills. Solid waste collection systems are typically installed from house to house, especially in developed countries. Due to a number of issues, such as the growing urban population and other financial and economic problems, this phenomenon is extremely rare in developing countries. In low-income nations, 80–90% of the entire waste management budget is consumed by collection alone. Open dumping and open burning thus remain the main methods of disposing of MSW in most developing nations, including Ethiopia.

The most common form of waste collection systems in many Sub-Saharan African countries seems to be communal container collection methods. Under this type of arrangement, households can dispose of their solid waste in common containers that are available at designated locations throughout their neighborhood. Subsequently, the garbage collection trucks pick up these containers, empty the contents at the assigned disposal location, and put the containers back where they were before. Unfortunately, there are a number of issues with this waste pickup method that leave waste uncollected. As a result, waste ground dumping at collection sites is overflowing. As a result, the location of communal containers may be hazardous to the locals' health and environment. Waste management is inadequate in many Ethiopian towns, where it is disposed of along roadsides and in open spaces, potentially endangering public health and the welfare of the populace. Ethiopia's Dilla Town is experiencing a similar phenomenon. One of Ethiopia's biggest environmental problems in urban areas is improper waste management. Ethiopia is seeing a lot of initiatives aimed at enhancing the town's environmental health. As a result, Dilla Town began solid waste management roughly ten years ago, but the program is unable to adapt to changing needs. Because of this, the municipality's estimate reveals that the waste produced in the town is not properly collected and is disposed of. Every now and then, the town's citizens are somewhat organized to clean up their immediate neighborhoods. All of these initiatives, however, were only partially successful. The majority of Dilla town is accustomed to having sporadic solid waste. Waste heaps are unlawfully deposited in public areas, alongside roads, in drainage channels, sewerage courses, and open spaces, ultimately draining into the adjacent river. Living spaces become unattractive and smelly due to the uncollected solid waste that is left all over the place. This attracts insects and rodents, endangering the environment and spreading disease that could have a negative impact on public health.

Beyond the current inefficiencies in SWM, the most difficult problem in Dilla town that seriously burdens the town's municipal services is the increase in the generation of solid waste and changes in its composition. Because of the inadequate management of this waste, there is a serious threat to the environment and public health, especially in slum areas where residents are frequently disregarded by government agencies and have limited access to better services. As far as we are aware, there is no report available regarding the solid waste management practices, solid waste characterization, and solid waste quantification status of the residents of Dilla town, Ethiopia. Therefore, immediate attention is required to address the aforementioned issues and their negative consequences. As a step toward efficient solid waste management, the following goals of this study were set forth in order to evaluate the state of municipal solid waste management practices: characterizing and quantifying solid waste in the instance of Southern Ethiopia's Dilla Town.

### ***Contemporary***

The production of municipal waste worldwide has a number of negative effects on the environment, such as nitrogen pollution, greenhouse gas emissions, and the buildup of plastic in the ocean. Estimates of waste and pollution development, both past and future, are, however, hard to come by. In order to generate the first estimates of waste generation in the past and future (1965–2100) broken down by composition and treatment, as well as the ensuing environmental impacts, descriptive issued compositional Bayesian regression was used for each country. It is suggested that as economic development progresses, the total amount of waste produced worldwide will increase, rising from 635

million tons in 1965 to 1999 million tons in 2015 and finally reaching 3539 million tons by 2050 (median values, middle-of-the-road scenario). The global share of organic waste falls from 47% to 39% between 2015 and 2050, while the shares of all other waste types—especially paper—increase. Recycled materials are being processed more sustainably, and energy recovery, composting, and recycling now account for 18% of treated waste, down from 28% in the past. Although the annual input of plastic waste into the oceans has peaked, we still predict that environmental loads will rise in the future. The environmental Kuznets curve does not seem to be followed by waste production, and current estimates do not meet UN SDGs for waste reduction. Our analysis demonstrates that in order to lessen the strain on natural systems and establish a circular economy, the current trends and advancements are insufficient. The majority of processes inevitably result in the production of waste, or unwanted or superfluous byproducts. 7–9 billion tons of waste are produced annually worldwide. Municipal Solid Waste (MSW) is a distinct type of household waste that, depending on the reporting standard, may also include commercial and industrial wastes. Two billion tons of the waste produced in 2016 came from MSW. But given its effects on the environment at the local, regional, and global levels; its close proximity to people and possible health effects; and its potential for recovery through circular economy supply chains, it merits special attention. Depending on how they are disposed of, different types of MSW may have different effects on the environment and human health. Plastic wastes are becoming a greater global concern because they linger for a long time and are consumed by organisms, which can have negative effects on human health as they move up the food chain. In 2006, 3%–4% of the world's Greenhouse Gas (GHG) emissions came from fugitive emissions from waste treatments. Another major long-term local impact is nitrogen pollution from waste leachate, which can lead to nutrient imbalances and disease in surrounding water bodies. Moreover, it has been demonstrated that burning wastes outdoors releases a considerable quantity of dangerous air pollutants, which have a negative impact on people's health, particularly in developing nations. As we transition to a circular economy, waste products ought to be recycled, composted, or burned to generate energy, allowing them to be reincorporated into production processes as materials or embedded energy. [3]

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