



A STUDY ON SOLID WASTE MANAGEMENT AND COMPOSITION IN JAMMU CITY

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ABSTRACT

Sustainable solid waste management is a pressing concern for rapidly urbanizing areas like Jammu City. The current state of solid waste management and composition in Jammu City, shedding light on the challenges and potential solutions. The northern region of India has witnessed significant population growth and urban development in recent years. This expansion has led to a surge in solid waste generation. The composition of solid waste in Jammu City primarily comprises organic waste, plastics, paper, and glass. Inadequate waste segregation and disposal practices have resulted in environmental pollution and health hazards. Efforts to improve solid waste management in Jammu City include the establishment of waste segregation and recycling centers, along with public awareness campaigns. These initiatives aim to reduce the environmental impact of waste and promote sustainable practices. Jammu City's solid waste management faces considerable challenges due to rapid urbanization. However, ongoing efforts to enhance waste segregation and recycling offer hope for a cleaner and more sustainable future. Sustainable waste management practices are essential for the well-being of both the environment and the city's residents.

Keywords: solid waste management, waste composition, waste segregation, environmental waste, waste segregation

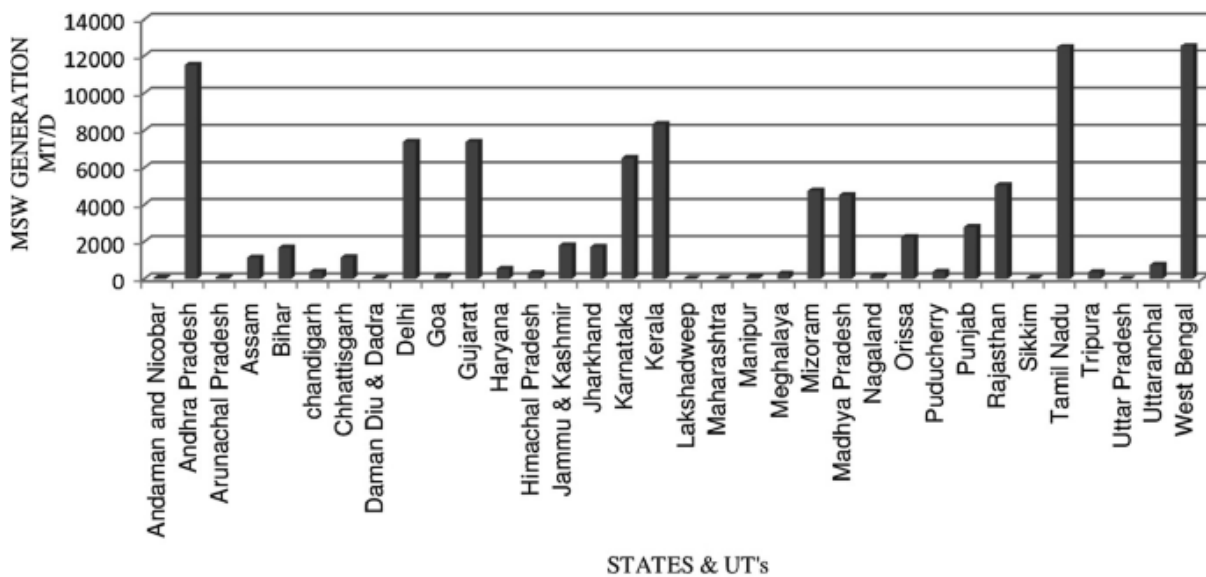
INTRODUCTION

Solid waste management is the systematic process of collecting, transporting, processing, recycling, and disposing of solid materials generated by human activities. Effective management is crucial for environmental sustainability and public health. Solid waste composition varies widely depending on geographic location, lifestyle, and economic factors (Abdel-Shafy & Mansour, 2018). In general, it includes materials like paper, cardboard,



plastics, glass, metals, organic waste, and hazardous substances. Understanding the composition of waste is essential for developing efficient waste management strategies.

Hazardous waste, a critical concern, includes substances like batteries, electronics, chemicals, and pharmaceuticals. These materials require special handling and disposal methods to prevent environmental contamination and health risks. Proper solid waste management involves several stages. Collection is the first step, where waste is gathered from homes, businesses, and institutions. Transportation follows, as waste is transported to processing facilities or landfills. Recycling and composting are essential for diverting materials from landfills, conserving resources, and reducing environmental impacts (Edjabou et al. 2015). Ultimately, landfill disposal is necessary for non-recyclable and non-compostable waste. However, minimizing landfill use through waste reduction, recycling, and responsible disposal practices is a key goal in modern solid waste management.



Solid waste management in Jammu City is a pressing issue that requires attention and sustainable solutions to maintain cleanliness, public health, and environmental well-being. Understanding the composition of solid waste generated in the city is crucial for effective waste management strategies. The composition of solid waste in Jammu City varies, but it typically includes organic waste, paper and cardboard, plastics, glass, metals, and hazardous materials (Kumar & Agrawal, 2020). Organic waste, predominantly consisting of food scraps and yard waste, makes up a significant portion of the waste stream. This organic material can



be composted to reduce the burden on landfills and create valuable compost for agricultural use.

The composition of solid waste in Jammu City is reflective of its urban lifestyle and diverse population. The waste generated here encompasses a mix of materials, including household waste like paper, plastics, glass, and organic matter. Additionally, commercial, and industrial activities contribute to the waste stream with packaging materials, construction debris, and hazardous waste (Sharma & Jain, 2019). Jammu City's waste management system aims to balance the preservation of its natural beauty and cultural heritage with the demands of urbanization and development. The city strives to minimize the environmental impact of waste disposal by promoting recycling and composting, reducing landfill use, and implementing waste-to-energy initiatives where feasible.

Solid waste management in Jammu City is a critical concern as urbanization and population growth have led to an increase in waste generation. The city faces challenges in efficiently collecting, disposing of, and recycling solid waste to maintain a clean and healthy environment. The composition of solid waste in Jammu City varies but typically consists of organic waste, such as food scraps and garden waste, which makes up a significant portion (Kumar & Agrawal, 2020). Additionally, non-biodegradable waste, including plastics, paper, glass, and metals, constitutes a substantial part of the waste stream. Managing this diverse waste composition is essential for sustainable waste management practices. The municipal authorities in Jammu City have initiated various measures to address this issue (Wang et al. 2022). These include door-to-door collection of waste, segregation at source to separate recyclables from non-recyclables, and the establishment of waste processing facilities. Composting and recycling initiatives have also been introduced to reduce the burden on landfills and promote sustainability.

BACKGROUND OF THE STUDY

Solid waste management is a complex process that involves the collection, transportation, and disposal of a wide range of materials. Understanding the composition of solid waste is vital for developing effective waste management strategies that promote sustainability, resource



conservation, and environmental protection (Chen, 2018). Proper waste management practices are crucial to ensure a cleaner and healthier planet for future generations.

Waste category	Gross domestic waste generated (Kg) (25 houses)	Waste generated (kg/c/d)	Waste generated (kg/house/d)	Gross monthly waste generation (kg) (25 houses)	Gross waste generation (Kg/house/month)
<i>Biodegradable</i>					
Vegetable waste	11.00	0.096	0.440	330.00	13.20
Food waste	15.75	0.076	0.630	472.50	18.90
Fruit waste	11.50	0.100	0.460	345.00	14.00
Textile waste	0.324	0.002	0.013	9.74	0.38
Paper waste	7.58	0.064	0.300	227.9	9.10
Total	46.154	0.338	1.843	1385.14	55.58
<i>Non-biodegradable</i>					
Plastic waste	7.10	0.06	0.284	213.00	8.52
Metal waste	1.400	0.012	0.056	42.00	1.70
Glass waste	8.50	0.006	0.34	255.00	10.2
Total	17.00	0.078	0.68	510.00	20.42
<i>Inert waste</i>					
Stone, dust, Hair, wax	0.324	0.002	0.0128	9.72	0.288

Solid waste management in Jammu City involves a multi-pronged approach. Collection of waste from homes, businesses, and public spaces is the initial step. This collected waste is then transported to processing facilities for recycling and composting, reducing the amount sent to landfills. Responsible landfill disposal is necessary for non-recyclable and non-compostable waste, with efforts made to minimize the use of landfills through waste reduction initiatives (Song et al. 2022). To address the challenges associated with solid waste management and composition in Jammu City, it is essential for local authorities to implement comprehensive waste management plans, raise public awareness about waste segregation and recycling, and invest in the necessary infrastructure and technology. Collaborative efforts between the government, communities, and businesses are crucial to achieve sustainable and



efficient solid waste management practices in Jammu City, ensuring a cleaner and healthier environment for its residents (Andeobu et al. 2021).

Solid waste management in Jammu City is a critical aspect of urban governance and environmental sustainability. Located in the northernmost part of India, Jammu City serves as the winter capital of the Union Territory of Jammu and Kashmir. With a growing population and urbanization, the city faces significant challenges in managing its solid waste effectively. The composition of solid waste in Jammu City is reflective of its urban lifestyle, socioeconomic diversity, and commercial activities (Zuhara et al. 2022). The waste generated in the city primarily consists of organic materials, plastics, paper, cardboard, metals, glass, and hazardous waste. Organic waste, originating from households, restaurants, and markets, forms a significant portion of the waste stream. Collaborative efforts between the local government, community, and environmental organizations are crucial for the success of these initiatives and for ensuring the city's future well-being.

Despite these efforts, challenges persist, including the lack of awareness among residents about proper waste disposal and the need for continued infrastructure development. The city needs to invest in modern waste management technologies and educate citizens on waste reduction and recycling to ensure a cleaner and more sustainable future (Andeobu et al. 2021). Solid waste management in Jammu City is a multifaceted issue. Efforts to address waste composition and improve waste management infrastructure are underway, but community participation and awareness are crucial to achieve effective waste management and maintain a cleaner environment for all residents.

AIM AND OBJECTIVES

AIM

The aim of the study is on solid waste management and composition in Jammu city.

OBJECTIVES

- To analyse the composition of solid waste generated in Jammu City, categorizing it into various components such as organic, plastic, paper, metal, glass, and hazardous materials.



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- To determine the environmental implications of current waste management practices, including their effects on air and water quality, soil contamination, and overall ecosystem health.
 - To propose sustainable and environmentally friendly waste management practices, including strategies for waste reduction, recycling promotion, and efficient disposal techniques.
 - To recommend some smart techniques for the solid waste management.

PROBLEM STATEMENT

The problem statement for "solid waste management and composition in Jammu city" addresses the pressing issue of effective waste management and understanding the composition of solid waste in Jammu City. Jammu City, like many urban areas, is grappling with mounting challenges in solid waste management. The rapid urbanization and population growth in the region have led to a significant increase in the generation of solid waste. However, the existing waste management infrastructure and practices have struggled to keep pace with this surge in waste production.

Moreover, improper solid waste management has adverse environmental, public health, and aesthetic consequences. It can lead to pollution of water bodies, soil degradation, air pollution, and the spread of diseases. Therefore, addressing this problem is not only vital for maintaining a clean and healthy environment but also for safeguarding the well-being of the city's residents.

LITERATURE REVIEW

COMPOSITION OF SOLID WASTE

The composition of solid waste generated in Jammu City is a complex mix of various materials that reflects the city's urban lifestyle, consumption patterns, and economic activities. Understanding this composition is crucial for effective waste management strategies. One of the significant components of solid waste in Jammu City is organic waste, which includes food scraps, yard trimmings, and other biodegradable materials (Karak et al. 2012). Organic waste constitutes a substantial portion of the waste stream, and its proper



management through composting or biogas production can significantly reduce the volume of waste sent to landfills.

Plastics represent another major component, ranging from single-use plastics like bags and bottles to durable plastics from packaging materials and consumer goods. The presence of plastics in the waste stream is a global concern due to their non-biodegradable nature and environmental impact, including plastic pollution (Abdel-Shafy& Mansour, 2018). Paper and cardboard waste make up a significant portion of the waste composition, largely originating from packaging, newspapers, and printed materials. These materials can be recycled, making them valuable resources for reducing landfill disposal and conserving energy and natural resources.

Metals, such as aluminium and steel, contribute to solid waste primarily through packaging, beverage cans, and discarded appliances. These metals are highly recyclable, and their recovery helps conserve raw materials and reduce greenhouse gas emissions associated with primary production (Karak et al. 2012). Glass waste consists mainly of glass containers from beverages and food products. Like metals and paper, glass is recyclable and can be reprocessed into new glass products, reducing the demand for virgin raw materials and energy consumption.

Hazardous waste represents a small but critical component of solid waste in Jammu City. This category includes materials like batteries, electronic waste (e-waste), chemicals, and pharmaceuticals. Proper disposal and management of hazardous waste are essential to prevent environmental contamination and health risks (Karak et al. 2012). The composition of solid waste in Jammu City is dynamic and influenced by factors such as population growth, economic activities, cultural practices, and waste management infrastructure. Sustainable waste management practices, including recycling, composting, and responsible disposal of hazardous materials, are crucial for mitigating the environmental impact of this diverse waste composition and moving toward a more environmentally friendly and resource-efficient future (Abdel-Shafy& Mansour, 2018).



ENVIRONMENTAL IMPLICATIONS OF CURRENT WASTE MANAGEMENT PRACTICES

The environmental implications of current waste management practices have significant ramifications for our ecosystems, public health, and the overall well-being of our planet. These implications often vary depending on the methods employed, but some common environmental consequences are evident in many waste management systems. Firstly, landfilling, a prevalent waste disposal method, has numerous environmental drawbacks. When organic waste decomposes in landfills, it produces methane, a potent greenhouse gas that contributes to climate change (Guerrero et al.2013). Landfills can also pose a risk of soil and groundwater contamination if not adequately managed, potentially leading to the spread of harmful chemicals into the environment.

Incineration, another disposal option, can release harmful pollutants into the air. While modern incinerators are equipped with advanced pollution control technologies, there is still a potential for the emission of toxic substances like dioxins and heavy metals, which can have long-lasting negative effects on air quality and human health. Improper disposal practices, such as open dumping or illegal dumping, are highly detrimental (Song et al. 2022). These activities can lead to the leaching of hazardous substances into nearby water bodies, contaminating aquatic ecosystems and posing a threat to wildlife. Furthermore, they contribute to unsightly and polluted landscapes, diminishing the aesthetic and recreational value of natural areas.

One of the most pressing environmental concerns is the excessive use of single-use plastics. These materials are not only a significant contributor to solid waste but also have severe implications for marine ecosystems. Plastic waste often ends up in oceans and waterways, where it poses a severe threat to marine life through ingestion and entanglement. It can take centuries for plastic to break down, persisting in the environment for generations. On a positive note, sustainable waste management practices, such as recycling and composting, can mitigate many of these environmental concerns (Zuhara et al. 2022). Recycling conserves resources, reduces energy consumption, and decreases the demand for virgin materials. Composting organic waste not only diverts it from landfills but also produces valuable compost that enriches soil and reduces the need for chemical fertilizers.



SUSTAINABLE AND ENVIRONMENTALLY FRIENDLY WASTE MANAGEMENT PRACTICES

Sustainable and environmentally friendly waste management practices are essential strategies aimed at minimizing the negative impact of waste on the environment and human health while maximizing resource recovery and conservation. These practices prioritize the reduction, reuse, recycling, and responsible disposal of waste materials. Encouraging the reuse of items is another crucial element of sustainable waste management. Items like containers, electronics, and clothing can often be used multiple times before disposal. Thrift stores, donation centres, and community swap events promote the reuse of goods, extending their lifespan and reducing the need for new production (Andeobu et al. 2021). Recycling is a cornerstone of sustainable waste management. It involves the collection and processing of materials like paper, cardboard, glass, plastics, and metals to create new products. Recycling conserves resources, reduces energy consumption, and lessens the environmental impact associated with raw material extraction and manufacturing. Organic waste, such as food scraps and yard waste, can be composted. Composting is an environmentally friendly practice that turns organic matter into nutrient-rich soil conditioner. This reduces the amount of organic waste sent to landfills, decreases methane emissions, and improves soil quality for agriculture. In some cases, waste materials can be used to generate energy through processes like incineration or anaerobic digestion. While this is a sustainable practice in terms of resource recovery, it should be carried out with proper emissions controls to minimize air pollution.

Building awareness and fostering community involvement are vital components of sustainable waste management. Public education campaigns and programs that encourage responsible waste disposal and recycling behavior help reduce contamination in recycling streams and promote sustainable practices. Emerging waste-to-energy technologies, such as gasification and pyrolysis, have the potential to convert non-recyclable waste into energy and valuable byproducts while reducing landfilling (Tsai et al. 2020). However, careful consideration of environmental impacts is essential in their implementation. Sustainable and environmentally friendly waste management practices are essential for reducing the ecological footprint of waste generation. By prioritizing waste reduction, reuse, recycling, and responsible disposal, communities and industries can contribute to a healthier

environment, conserve resources, and move closer to a more sustainable and circular approach to waste management (Zuhara et al. 2022).

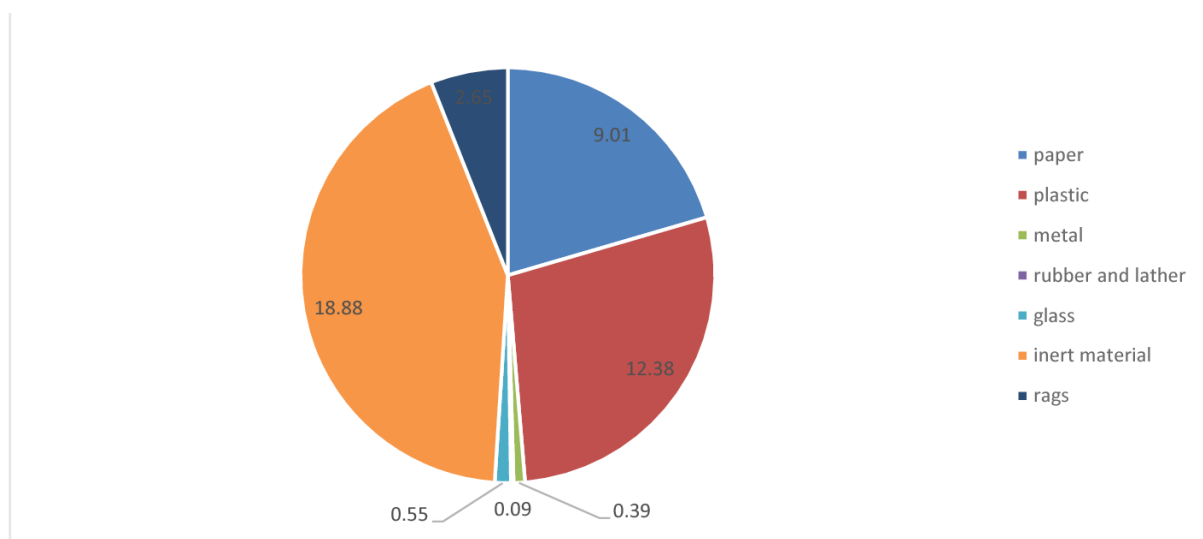
DISCUSSION AND FINDINGS

This discussion delves into the key findings and implications of the study, shedding light on the challenges and opportunities in managing solid waste in this rapidly developing urban center. One of the pivotal aspects of this study was the analysis of the composition of solid waste in Jammu City. The findings revealed a diverse mix of waste materials, with organic waste, plastics, paper, and glass constituting significant portions.

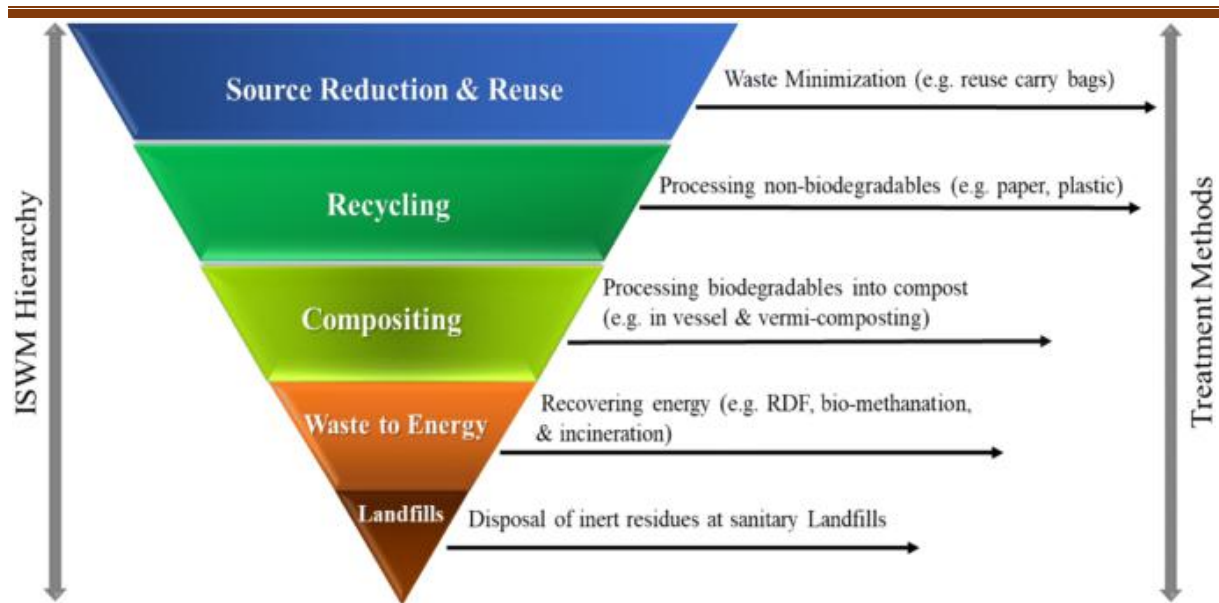


This detailed understanding of composition is invaluable for tailoring waste management strategies, as it provides insights into potential recycling opportunities, resource recovery, and waste reduction initiatives. The study also assessed the existing waste management practices in Jammu City (Abdel-Shafy & Mansour, 2018). It was evident that while there are commendable efforts in place, there are notable challenges. The collection and transportation of waste were found to be reasonably efficient in some areas, but disparities exist. Recycling practices, though gaining traction, require further promotion and infrastructure development. Moreover, the disposal of waste in landfills remains a primary method, necessitating exploration of alternative disposal techniques to minimize environmental impact.

Another crucial aspect of this study was the evaluation of the environmental repercussions of current waste management practices. It was observed that inadequate waste segregation and improper disposal led to soil contamination and negatively affected air and water quality. These findings underscore the urgency of adopting sustainable waste management practices that mitigate these environmental hazards. The study identified several challenges in Jammu City's solid waste management system, including logistical constraints, insufficient infrastructure, and a need for increased public awareness.



However, it also highlighted opportunities for improvement. These include enhanced waste segregation at the source, development of recycling facilities, and the implementation of modern waste-to-energy technologies (Edjabou et al. 2015). Additionally, fostering a culture of responsible waste disposal and recycling among residents can significantly contribute to improved waste management. The solid waste management and composition in Jammu City underscores the urgency of addressing the waste management challenges in this growing urban area. Through a comprehensive analysis of waste composition, current practices, environmental impact, and policy recommendations, it provides a roadmap for sustainable and environmentally responsible waste management (Wang et al. 2022). It is incumbent upon all stakeholders to act on these insights and work collaboratively to ensure a cleaner, healthier, and more sustainable future for Jammu City.



CONCLUSION

In conclusion, the solid waste management situation in Jammu City is emblematic of the challenges many rapidly urbanizing areas face across the globe. The composition of waste, largely dominated by organic matter, plastics, paper, and glass, underscores the need for efficient waste segregation and recycling mechanisms. Jammu City is taking steps in the right direction by establishing waste segregation centers and promoting recycling. However, there is still much work to be done to tackle the waste management crisis comprehensively. Public awareness campaigns and community involvement are crucial in changing attitudes and behaviors toward waste disposal.

The path to sustainable solid waste management in Jammu City is challenging but promising. With continued efforts, improved infrastructure, and a commitment to environmental conservation, Jammu City can pave the way for more efficient and eco-friendly waste management practices. This will not only enhance the city's cleanliness but also contribute to the well-being of its residents and the preservation of its natural surroundings.

RECOMMENDATIONS

- 1. Waste Segregation:** Encourage residents and businesses to separate waste into recyclables, organics, and non-recyclables at the source to facilitate easier recycling and composting.



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2. **Composting:** Promote home and community composting to reduce the volume of organic waste sent to landfills.
 3. **Recycling Programs:** Implement efficient recycling programs for materials like paper, plastic, glass, and metal, with convenient collection points.
 4. **Waste-to-Energy:** Explore waste-to-energy technologies to convert non-recyclable waste into electricity or heat.
 5. **Innovative Technologies:** Explore emerging technologies like robotic sorting and AI-driven waste sorting to improve recycling accuracy.

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