Exploring the role of waste management practices in promoting sustainable economic growth in urban communities to attain SDG Goal 12

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To cite this article:
Mahbub, R. & Akter, S. (2026). Exploring the role of waste management practices in promoting sustainable economic growth in urban communities to attain SDG Goal 12. Romanian Journal of Economics, 62(1), 234-249.

Abstract. Objective: *By 2020, 55% of the worldwide population resides in urban areas, yet experts have predicted that this number will reach 68% by 2050. The increasing urban population has created immense stress on waste disposal systems, because they must handle extensive waste output. Dhaka, the capital of Bangladesh, produces more than 5500 tons of waste from a population of 20 million but scraps from improper waste recycling or disposal procedures. This study aims to determine how effective waste management affects the ongoing economic growth among metropolitan residents. This study examines the possibilities for environmental sustainability while promoting metropolitan economic development through the assessment of present waste management practices and their resource optimisation capabilities by fulfilling SDG goal 12. The global economy faces a significant financial burden owing to improper waste management, amounting to approximately $370 billion per year.* ***Method:*** *This study combines secondary data sources with first-hand interviews with 20 industry experts using semi-structured questionnaires comprising urban planners, waste management professionals, sustainability consultants, and others. The interviews aimed to obtain expert in-depth knowledge about present waste management strategies, together with insights into the improvement opportunities and financial advantages of sustainable urban practices.* ***Results:*** *The results of this study show how competent waste management strategies drive urban economic growth, and reveal the potential of a sustainable development strategy to achieve the goals of creating employment while reducing pollutants and maximising resource efficiency to endure metropolitan financial stability.* ***Originality:*** *This study clarifies distinct knowledge about waste management strategies and their economic significance for sustainable urban community progress. This study establishes economic potential as its key focus, as most investigations concentrate on environmental analysis of waste management systems.*

Keywords: *Sustainable Economic Growth, Recycling, Environmental Sustainability, Urbanization, Waste Management Practices, SDG Goal 12.*
JEL classification*: F18, F64, Q20.*

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1. Introduction

Waste manufacturing is a significant challenge for contemporary environmental management. The rapid expansion in population with industrialisation and economic development has led to a rise in multiple types of waste generation. In 2012, global garbage production was 1.3 billion tons annually, projected to increase to 2.2 billion tons by 2025 and 3.4 billion tons by 2050. The management issue worsens in developing nations, as waste production exceeds both population growth and economic advancement. Entities in low- and middle-income nations allocate 3–15% of municipal finances, with over 90% of this budget dedicated exclusively to waste collection (Kumari & Raghubanshi, 2023). Increasing global population and rapid urbanisation have led to increased garbage production, posing significant environmental challenges. Sustainable waste management and circular economy principles have been implemented to mitigate these issues (Aiguobarueghian et al., 2024). The waste management procedures of most developing nations do not adequately align with the best practices of industrialised countries to achieve socioeconomic objectives. Consequently, the significance of waste management in emerging nations has recently increased (Jagun et al., 2022). As a preventive measure, an effective C&D waste recycling process conserves resources from decline, which can be ensured by the systematic allocation of construction projects to C&D waste recycling facilities (Yazdani et al., 2021). Unregulated dumps, open-air burning, and landfilling cause pollution, land degradation, methane emissions, toxic leachate, and climate change, disproportionately affecting underprivileged social groups and imposing significant environmental and public health costs (Abubakar et al., 2022).

This study is crucial for the metropolitan population facing increasing garbage production and its economic consequences. The World Bank reports that metropolitan regions account for over 70% of trash production worldwide, generating more than two billion tons of municipal solid waste (MSW) per year (Maalouf & Mavropoulos, 2022). Efficient waste management can yield substantial economic advantages, with projections indicating that enhanced garbage systems may produce yearly revenues of $7-10 billion for cities globally (Mallette et al., 2021). Recycling contributes 0.4-0.6% to GDP in certain metropolitan areas, employing 1.1 million people and contributing $37 billion. Sustainable waste management practices decrease expenses and enhance fiscal efficiency (CEEW, 2024). This study demonstrates that efficient waste management techniques not only reduce environmental impacts but also enhance economic resilience, job creation, and regional economic growth, thereby benefiting policymakers (Alsabt et al., 2024).

Although many studies have examined the influence of waste management practices on the environment, only a few have examined how they help urban economies grow (Castellar et al., 2021; Hysa et al., 2020). While some studies have examined engineering and tourism, they have not discussed what city planners and residents believe economic perks are in waste initiatives (Rossit & Nesmachnow, 2022; Martayadi et al., 2024). A few qualitative studies have explored the financial impact of circular waste systems on urban residents, highlighting the importance of all participants in waste sustainability (Mngomezulu et al., 2024). Research on circular economy principles primarily focuses on high-income communities and neglects the challenges and opportunities faced by urban people in lower-income countries (Nosike & Christopher, 2025; Aiguobarueghian et al., 2024). Despite the importance of regulation, there is a lack of detailed comparisons of laws, budget management, and government structures that promote sustainability in waste and the economy. Paul et al. (2024) and Kasulla et al. (2024) suggest Dhaka for IoT solutions, but their evaluations lack insight into Dhaka's responses and economic outcomes post-adoption (Paul et al., 2024; Kasulla et al., 2024). The purpose of this study was to determine how urban communities experience and assess the impact of sustainable waste management approaches involving technology on their future economic development.

This study is intricately linked with Sustainable Development Goal (SDG) 12: Responsible Consumption and Production, specifically sub-targets 12.3 (reduce food waste), 12.5 (increase recycling and reuse), and 12. a (Improving technological capacity in developing countries). This study demonstrates

the composition of waste and how it is possible to develop a circular economy and implement smart technologies to achieve sustainable urban development across the world.

Research Questions

1. How does waste management affect urban communities' chances of achieving sustainable economic growth?

2. How should circular economic ideas be used for city waste disposal to support economic fashionability?

2. Literature review

Waste handling is a major environmental issue in large cities, particularly in developing countries. The rapid rise in towns, larger populations, and ambitious economic development has given rise to huge amounts of waste, causing significant environmental, economic, and health problems (Kumari & Raghubanshi, 2023). In 2012, the world produced 1.3 billion tonnes of trash, which is predicted to jump to 3.4 billion tonnes in 2050 by Aiguobarueghian et al. (2024). This development proves that we need to use sustainable approaches and rethink our usual waste-handling methods.

2.1 Global trends and challenges in solid waste management

One study shows that 3-15% of public funds in countries with low and moderate incomes are reserved for waste management. This research also demonstrates that about 90% of all these resources go towards waste collection (Kumari & Raghubanshi, 2023). In addition, the main methods of waste disposal are open dumps and landfills, which are linked to increasing environmental damage and health problems owing to the release of methane and dangerous leachates. This is further complicated by the improper teaching of environmental education to local people. Students support environmental protection and the lack of education and advice from teachers makes it difficult for them to practice sustainable living. The fact that knowledge of waste management differs between young and older people continues to promote responsible practices.

2.2 Circular economy and economic opportunities

Many studies have shown that it is necessary to move from a linear to circular economic model when dealing with garbage. It is important for the circular economy to recycle and use trash again to help the environment and improve its economy (Aiguobarueghian et al., 2024). Researchers have indicated that by recycling construction and demolition (C&D) waste, one can save natural resources, reduce landfill pressure, and benefit the economy with revenue from resource recovery. Conducting circular practices may offer more employment opportunities (Ciuła et al., 2024). Recycling activities of small firms and groups can improve city stability and offer jobs to neglected populations.

2.3 Role of digitalization in modern waste management

Recent studies have revealed that technology plays a significant role in improving handling, monitoring, and processing of trash and garbage. Using artificial intelligence, robotics, and data systems in Moscow increased the precision of garbage sorting, allowed a 75% reduction in operating expenses, and created thousands of jobs. By using digital tools, the routes for waste collection vehicles are now optimised, which helps reduce fuel use and minimise emissions. The high purity achieved by CNNs and robotic arms in separating trash proves that intelligent sorting can significantly improve the recycling process. They follow a cleaner production approach and lower waste at the start of the process while aiding better recovery of materials from waste over time (Jaghoub et al., 2024).

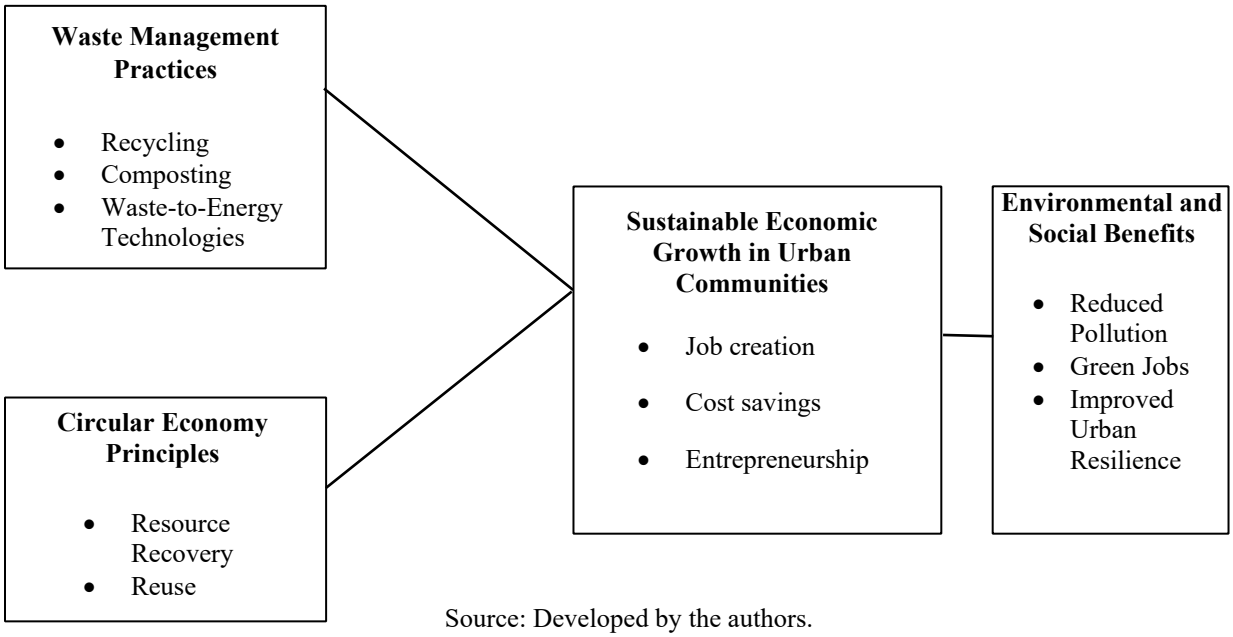
2.4 Urban planning and smart city integration

The right way to manage solid waste is through strategic planning, which relies on technology, money, and teamwork among players. For sustainable solid waste management, it is very important to understand waste, use analytics, and compare services in cities experiencing rapid urbanisation. Unexpected growth in cities and rapid population changes create challenges for these systems; therefore, they must be updated with data (Holder & Kamuhanda, 2024). Policies and government plans should encourage the use of intelligent infrastructure, better teamwork among players, and innovation throughout the waste-to-resources area. In smart cities, SWM refers to caring about the environment by using advanced technologies.

2.5 Conceptual framework

Figure 1 illustrates the conceptual framework, highlighting the role of waste management practices in promoting sustainable economic growth in urban communities.

Figure 1. The role of waste management practices in promoting sustainable economic growth in urban communities



Source: Developed by the authors.

2.6 Sustainable economic dimensions of waste management

2.6.1 Job creation and green employment opportunities

Green jobs in waste management such as recycling, composting, and waste management are gaining popularity in metropolitan areas. These jobs offer employment opportunities for enthusiasts of waste, composting overseers, logistics administrators, and energy plant engineers. Irregular recyclers are now allowed, promoting equal revenue collection, increased access to welfare services, and stable income. Experts in the waste industry argue that joint efforts between communities and waste reuse and recycling have greatly benefited the industry (Vesere et al., 2021).

2.6.2 Resource efficiency and cost reduction for municipal budgets

The regions where waste is consolidated tend to have minimal costs in clearing the environment, releasing dumpsters, and other lifts of garbage. Governments avert dumping recyclable materials and biodegrade them, so that there are very few long-term expenses and charges on the environment. In addition, the city earns revenue from the sale of compost and the graded classification of recyclable wastes. The

graphs show that the application of the concepts of a circular economy leads to better medical practices, water supply, and sanitation in the area, as the redistribution of money saved is left to the development of the sphere in the region (Campos-Alba et al., 2021).

2.6.3 Innovation and local enterprise development

This waste management process promotes the growth of local businesses. People have started to manufacture upcycled products, farm with the help of compost, and create products with recycled materials in cities; many SMEs are now following this trend (Holder & Kamuhanda, 2024). The diversification of the economy is encouraged, and it can stand strong even when the market changes drastically. Sustainability consultants believe that this is a trend, as an increasing number of development organisations and local governments are supporting businesses by placing a pronounced focus on environmental salvation, employing digital waste monitors, and adopting circular business approaches. They not only assist in the urban economy, but also encourage individuals to purchase environmentally friendly goods (Jaghoub et al., 2024).

2.7 Waste management practices with SDG 12 targets

In the case of emerging nations, whose rising urbanisation is exerting heavy environmental and economic pressure on them, the linkage of sustainable waste management with SDG Goal 12 is important. The present study supports some of the SDG 12 sub-targets:

- The goal 12.3 (Halve Per Capita Global Food Waste) complies with diversion programs for organic waste. Over half of Dhaka solid waste is natural, and as a result, it is an opportunity to reduce waste and manufacture new resources by creating biogas production facilities and compost production facilities (Jerin et al., 2022). This promise was also validated through the organic waste composition of Dhaka (54.92%), which indicates the feasibility of both anaerobic breakdown and selective composting for the reduction of disposal and recovery of renewable energy (Rashid, 2019).
- Target 12.5 (Substantially Reduce Waste Generation) strengthens recycling and reduction activities. This study shows how the integration of the informal sector of garbage assortment into formal structures could enhance recycling standards and reduce general discarding. Many individuals work in an informal economy that can have a higher income and contribute to more efficient recycling and fewer totals of trash, assuming that the government fully embraces formal involvement (Snehalatha et al., 2025).
- Target 12.a (strengthening scientific and technological capacity) emphasises the intellectual and technical capacity of developing nations. The proposed research evaluates the possibilities of smart waste practices, which are critical innovations contributing to modernising processing and easing the introduction of transparency into municipal garbage. Examples include AI-based segregation, smart bins, and IoT-based tracking systems (Paul et al., 2024). To implement scalable and technology-driven waste systems, it is essential to constantly monitor, engage in cost reduction, and promote reliability which is eased by the existence of such digital infrastructure, as the examples of Dhaka and the world suggest.

2.8 Economic impact of waste management on urban cities

In addition to reducing costs, sustainable waste management has its own economic benefits in the form of job creation, local business expansion, better health of the people, and substitution of imports. There is a recycling trade in Dhaka, and scrap collectors informally scavenge the city. The formalisation of the waste treatment and energy (WtE) industry can boost workers' income by over 25%, reduce dependency on landfills, and generate $500 annually for municipalities struggling with financial issues through compost sales (Avani, 2024).

In addition, textile waste recycling can help Bangladesh save more than 700 million dollars in importation costs annually, which is a considerable aid in the country with a strong trade deficit. Small-

scale innovations such as plastic waste-based businesses, upcycling workshops, and compost-based urban farming promote inclusive urban entrepreneurship and urban sustainability and resilience, which are crucial for SDGs 8 and 12 (Zami, 2025).

3. Methodology

3.1 Research design

The intention of this study was to gather detailed information regarding the contribution of particular waste management methods to the sustainable development of urban populations by adopting a qualitative methodology. This study examines the initiatives and viewpoints of various stakeholders in the urban waste sector regarding their role in this situation. Twenty semi-structured in-depth interviews provided the primary data for this study. Additionally, to boost confidence in the primary data, secondary data sources, such as peer-reviewed papers, policy reports, and documents of the urban government, were consulted. This method enhances the reliability and importance of the study.

3.2 Data collection methods

Twenty in-depth interviews were conducted to collect primary data. The people involved were authorities located in the municipal field, owners of businesses that deal with recycling, representatives of NGOs, and so forth. The interviews varied depending on the availability of the participants and their preferences and were carried out offline (face-to-face) and online (through Zoom and Google Meet). Each session took a timeframe of 60-90 minutes, which was sufficient to analyse the professional views of the participants, their experiences and comprehension of waste management processes, and their economic impact. The aim of the study was described to the participants before each interview, during which free consent to make an audio recording was obtained. To secure the confidentiality of the respondents, ethical standards were carefully adhered to throughout the process of the procedure. All recorded tapes were transcribed verbatim to maintain no loss of information due to memory or writing. Subsequently, systematic coding of the transcribed data based on thematic analysis was conducted to identify recurrent themes, emerging data, and themes that raise significance to the research questions.

3.3 Sample selection

There was a selection of the 20 responders using a purposeful sampling scheme to ensure that people who had extensive knowledge regarding urban waste management were considered. The professionals who participated included urban developers, private recycling firms, sustainability consultants, city officials, and non-governmental organisation representatives. They are currently working in this field, in addition to being people who have experience working with NGOs. The sample population was selected on the basis of professional expertise and a prominent level of knowledge in the field. The selection of each participant was determined by the fact that they had firsthand experience in the development, implementation, or provision of recommendations through strategies in solid waste management and circular economy strategies in cities, particularly in Dhaka.

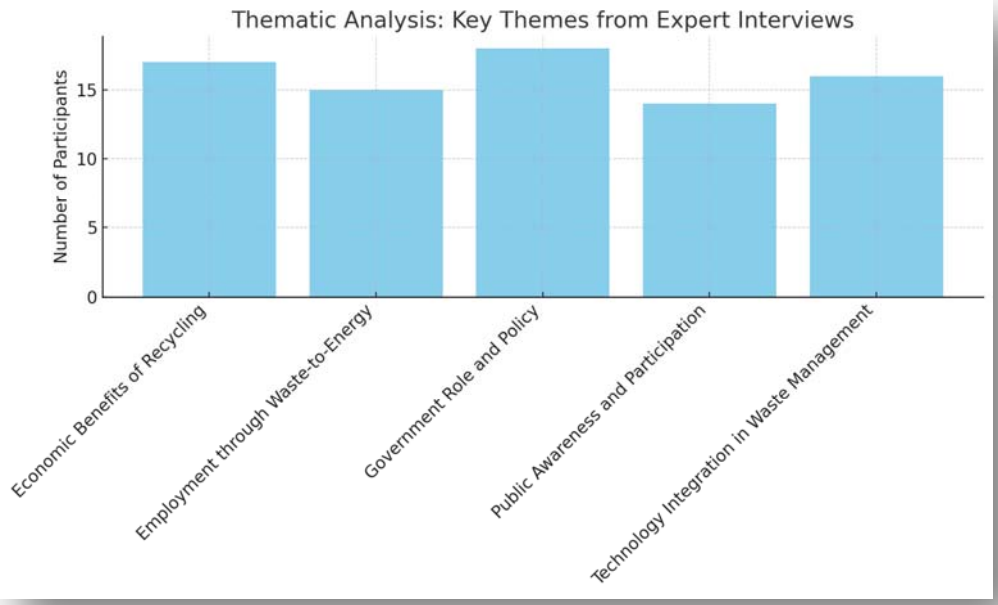
3.4 Data analysis techniques

In this study, thematic analysis was used to reconcile the qualitative contributions of expert interviews with quantitative information on waste management in Dhaka, Bangladesh, provided in several reports and studies. Once the transcriptions were completed, the data were organised with great caution and categorised based on themes that described the most common barriers and relations between waste management and sustaining the economy.

4. Results

The bar diagram shows the frequency of occurrence of each of the most prominent themes, which was determined by the number of participants. Together, these themes can be employed to prove that it is important to show the interdependence between waste management practices and economic sustainability in urban areas. The visualised information presented in Figure 2 illustrates the themes that were the most topical to disclose during the process of leading expert interviews. In the following section, a detailed consideration of each of them will be provided, along with quotations made by participants and academic sources.

Figure 2. Key themes from expert interviews



Source: Based on collected data (developed by the authors).

4.1 Thematic analysis

Thematic analysis was used to compare the materials used in the qualitative interviews, report them, and identify patterns (Ding et al., 2021). Five major themes were identified as relevant in supporting the main issue of being in a position to count waste management as a positive contribution towards the sustainable economic development of an urban society through a well-organised coding procedure.

Theme 1: Economic benefits of recycling

Most respondents stated that recycling played a significant role in the urban economy. According to 17 out of 20 interviewees, recycling initiatives, particularly in the unorganised sector, have lower waste-related expenses and produce revenue. This information is consistent with the studies by Hidalgo-Crespo et al. (2023), which emphasised recycling as a key component of the circular economy in urban low-income communities.

Theme 2: Employment through waste-to-energy

Waste-to-energy (WTE) projects not only reduce trash amounts but also generate skilled and semi-skilled jobs, according to 15 participants. The labour impact and economic feasibility of such initiatives have also been emphasised, particularly in areas with high population densities (CEEW, 2024).

Theme 3: Government role and policy

The lack of integrated municipal policies and uneven enforcement of regulations were cited by 18 respondents as obstacles for sustainable waste management. Effective waste management requires strong governance (Gebrekidan et al., 2024).

Theme 4: Public awareness and participation

Fourteen interviewees expressed that public involvement in trash separation and disposal was still low despite the city's expanding population. One of the primary explanations was the absence of environmental education and awareness. A comparable study by Jerin et al. (2022), which emphasises the connection between awareness and behavioural shifts, reflects this concern.

Theme 5: Technology integration in waste management

According to Atofarati et al. (2025), 16 individuals highlighted digital techniques such as smart bins and GIS-based surveillance as potential ways to improve visibility and expedite waste collection.

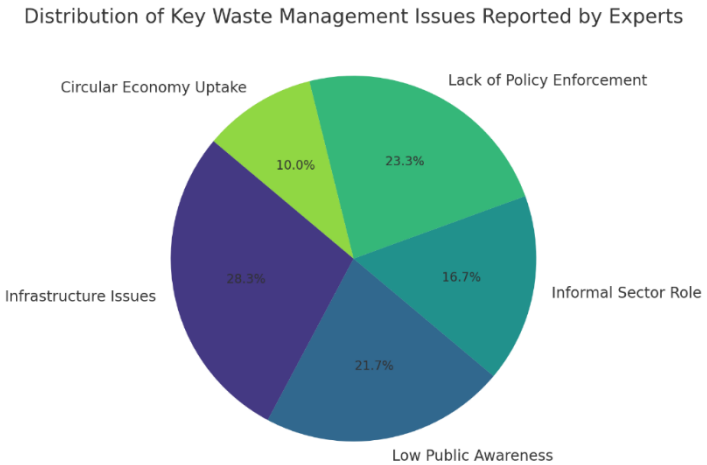
Table 1. Developing themes and thematic coding

Participant Quote	Initial Code	Final Theme
"WTE initiatives are still scarce, but when they do occur, they offer respectable employment."	Few but significant WTE employment	Employment through Waste-to-Energy (WTE)
"Waste is occasionally picked up after four days. No adequate monitoring mechanism is in place."	Inconsistent garbage collection	Government Role and Policy
"Reporting full bins with an app would be beneficial. However, nobody has created it as of yet."	Requirement for digital solutions	Technology Integration in Waste Management
"Bottles are gathered and sold by some boys. This is how they provide for their families."	Unofficial recycling livelihoods	Economic Benefits of Recycling
"Many are unaware of the benefits of composting or what it is. Nobody discusses it."	Insufficient public awareness	Public Awareness and Participation

Source: Developed by the authors.

The significance of participant responses was captured using brief sentences, known as initial codes. The last themes are more general classifications found by comparing and combining codes.

Figure 3. Identified key issues of waste management based on expert opinions.



Source: Developed by the authors.

The frequency with which each key difficulty was raised in the 20 expert interviews is shown in the pie chart. Based on a qualitative study, these topics became prominent motifs and offered significant perspectives on the connection between sustainable economic growth and waste management techniques.

4.2 The unrealized potential of waste composition

Research has indicated that the solid waste composition of Dhaka includes 54.92% organic waste, 14.7% plastics, and 12.6% paper waste. The waste composition demonstrates several important possibilities for waste-to-energy (WtE) and recycling solutions. The waste sample had an average calorific value of 8 MJ/kg which allowed anaerobic digestion and the creation of appropriate methods for extracting energy from this waste (Rashid, 2019).

Table 2. The composition of Dhaka's urban solid waste

Waste category	Percentage of Total Waste (%)
Organic garbage	54.92
Plastic Products	14.7
Paper	12.6
Textile and Wood	4.73
Leather and Rubber	1.54
Metal	1.56
Glass	1.14
Others	8.81

Source: Rashid (2019).

4.3 Essential waste-to-energy project features and effects in Dhaka

Project-specific data, together with expert analyses of waste-to-energy benefits, and environmental and economic impacts, help people better understand these methods. According to 15 participants, trash-to-energy (WtE) projects generate two types of occupational roles, trained and semi-skilled workers, in addition to their waste reduction benefits.

The Amin Bazar Waste-to-Energy Initiative is a significant project for Dhaka which will start operations in 2024 while processing 3,000 tons daily to produce 42.5 a of power. Energy generation from renewable sources was combined with reduced methane emissions to obtain the main benefits of this approach. This initiative handles more than half of the daily garbage produced throughout the city (DNCC, 2023).

Table 3. Key Waste-to-Energy Project Details and Impact in Dhaka

Project name	Location	Capacity (MW)	Waste volume (tons/day)	Anticipated commissioning	Ecological advantage
Amin Bazar WtE Project (DNCC, 2023)	North Dhaka	42.5	>3000	2024	Reduced air/water pollution, methane emissions

Source: DNCC (2023).

4.4 Economic gains from resource conservation and reuse

This subsection explains how recycling produces economic benefits through its connection to informal sector operations and the advantages of formalising these activities. Recycling operations provided direct employment opportunities for more than 700,000 informal workers in Dhaka. The formalisation of this sector would result in a minimum 25% increase in worker income. The plastic sector directly employs 1.5 million people directly, and textile waste recycling could reduce annual import costs by $700 million.

This sector maintains low wages yet possesses substantial economic value, together with its employment capacity (Rahman & Alam, 2020).

Table 4. Economic impact and employment in the recycling sector of Bangladesh

Sector	Number of people employed	Average daily/monthly income	Contribution to GDP (approx.)	Possible economic impacts
Gathering of Informal Waste	>700,000	Tk 300-800/day	Part of 49-64% informal economy GDP	Increased income by 25%+ with formalization
Manufacturing of Plastics (Direct Employment))	~1.5 million	BDT 8,000 - 25,000/month	~1.0% of national GDP (Plastic sector)	50,000+ green jobs by 2030 (plastic recycling subsector)
Regeneration of textiles (Informal)	Tens of thousands (70% women)	US$80/month	Not explicitly stated	Save US$700 million/year in imports

Source: Rahman & Alam (2020).

4.5 Prospective effects of integrated waste management techniques

Moscow demonstrated, through its implementation of smart bins (IoT), AI-driven sorting, and GIS tracking systems that fuel consumption and expenses can decrease by 75%. Through real-time monitoring, these systems improve segregation while supporting informal sector integration, because they provide data transparency (Islam et al., 2025).

Table 5. Prospective effects of integrated waste management techniques

Technology type	Essential features	Measurable effect (proven/potential)
Smart bins (IoT-enabled)	Measure load stages, pound, transpiration, and gas emissions; offer data	Reduce bin overcrowding, cut labor expenses, and conserve time and energy
GIS-based tracking	Enhance the routes used for rubbish collecting	Reduce fuel consumption and emissions
AI/Robotics	Increase the accuracy of waste sorting	Lower operational costs by up to 75% while creating thousands of jobs
Integrated smart systems	Boost recuperation of resources, organizing, and utilization of collection	Convert trash into profitable prospects

Source: Islam et al. (2025).

5. Discussion

Twenty expert interviews produced qualitative findings that established substantial connections between sustainable waste management methods and economic growth in the suburban areas. The research findings show that effective urban waste management systems serve as essential foundations for sustainable economic development in fast-growing cities, such as Dhaka. The high proportion of organic waste (54.92 %) in municipal solid waste indicates unexploited opportunities to develop composting and waste-to-energy systems which could reduce landfill use and advance renewable energy targets. This promise remains unfulfilled because there is no clear policy framework, and people lack knowledge about it. The theme analysis indicates that formalising unorganised recycling through effective public-private partnerships generates more jobs and enhances resource recovery.

The waste management system of Dhaka may be rebuilt owing to AI sorting solutions which are integrated with Internet of Things-enabled bins and smart waste management infrastructure. National cases, for example, demonstrate that these technological advancements are not only dependable and cost-effective

in terms of operation but also help reduce environmental pollution. However, the technology systems themselves do not address structural problems. The advancement of digital infrastructure requires policy frameworks which not only solve the problems of informal garbage workers but also contribute to the development of technology. The use of technology must be consistent with local contexts to bring about both environmental benefits and ensure that economic benefits are distributed fairly among the stakeholders of development.

5.1 Originality

This study is an original contribution to the area of sustainable waste management, which combines empirical qualitative witnesses with verified secondary numeric data to show the intersection between economic, technological, and policy factors in the implementation of sustainable waste management. While the literature mostly focuses on environmental or technical dimensions only, this research is special in that it weaves the story of waste practices in Dhaka with the narration of efforts to achieve inclusive urban economic growth.

Furthermore, the study is quite innovative because it attempts to gather all aspects of the waste-to-energy potential, the effects of smart technologies, and the role of informal labour within the sustainability framework through a single issue. The mixed format results which link thematic analysis with practical datasets provide a fresh and comprehensive point of view to scholars, policymakers, and urban planners who search for waste solutions applicable to other rapidly expanding urban areas of the Global South.

5.2. Waste management sustainable benefits

Efficient waste management helps in sustainable economic growth, especially when garbage is reused and recycled for green energy. Anaerobic digestion, cremation with energy recovery, and biogas generation are among the waste-to-energy (WTE) technologies that allow urban dwellers to convert their organic and non-recyclable waste into heat, power, or fuel for vehicles (Biancini, 2024). There is a decreased dependency on fossil fuels and a lower amount of waste that enters landfills, thereby mitigating the effects of environmental pollution (Freedman, 2024). Energy produced from waste also boosts energy security and creates employment opportunities in the green and renewable energy sectors, in addition to being a source of energy. It also attracts money to green projects, boosts innovation, and increases cities' overall productivity (Ajirotutu et al., 2024).

Waste management processes that focus on the recovery of energy and reuse of resources help the circularity of resource use, which in turn results in the mitigation of greenhouse gas emissions, lower energy prices, and promotion of a sustainable economy (Aiguobarueghian et al., 2024). This not only creates a better environment for the future, but also ensures financial stability in urban areas. Localised anaerobic digestion facilities in Chittagong, Bangladesh, are estimated to yield 536 cubic meters of biogas per day. The biogas was then used to run a 50-kW gas engine and supply electricity to 44 households. The strategy is going to be the source of zero waste, and it is going to offset the release of 500 tons of carbon dioxide into the atmosphere every month while simultaneously saving the urban area from waste. In addition, the strategy will have a two-year return on investment period, which is good for the business (Alam et al., 2024). In accordance with a study from Poland, a waste-burning facility should be given priority, along with a change in design for faster payback, which is in line with circular logical economic ideas (Ciuła et al., 2024). Waste management can be improved by executing various schemes, such as persuading the use of sortable packing, constructing real infrastructure for biowaste processing, and increasing biogas output (Singh et al., 2024). The combination of these feasible waste management techniques not only promotes long-term financial viability and environmental sustainability in urban environments, but also reduces pollution, generates jobs, attracts investments in green projects, and facilitates the growth of a circular economy (Sharma et al., 2021).

6. Practical implications

The findings of this research can be interpreted to assist those involved in the sector, environmentalists, and local governments in getting their acts together for the environment and simultaneously sourcing profitable ventures. Efficient waste disposal networks that are coordinated with recycling and the transformation of waste into energy (WTE) in urban areas are the branches of the green economy that decrease contamination and the effects of global warming, while simultaneously providing income and employment. Because of these actions, SDGs 8 and 12 are implemented by converting waste into a resource that not only provides jobs but also induces new ideas. In particular, when facing rapidly growing cities and limited resources, local governments should prioritise policies that protect the environment and contribute to the economic growth of the region. This study provides practical recommendations for Dhaka to meet SDG Goal 12, including reducing food waste for composting and renewable energy, reducing landfill dependency, and integrating smart technologies such as GIS and AI-assisted garbage sorting. These measures not only improve waste management efficiency but also stimulate job creation and economic growth in cities.

This study identified measurable options that can be adopted by urban policymakers, planners, and waste management authorities in Dhaka and similar cities. These include formalising the informal recycling sector, scaling up waste-to-energy projects, and adopting smart technologies. Cities can create green jobs, reduce environmental pollution, and improve waste-management efficiency. These actions not only promote sustainable urban development, but are also consistent with national and global climate and economic goals; thus, waste management has become a key lever for inclusive growth.

6.1 Policy recommendations

Based on the findings of this study, a list of recommendations is outlined to guide policymakers and urban authorities on how to enforce a strong sustainable waste management system and plan in both local and metropolitan areas.

Formalising informal waste industries: Cities need to institutionalise recyclers by legalising them and educating and rewarding informal waste industries. This will increase efficiency, tracking of data, and tax collection.

Scale-up of WtE and composting undertakings: The government and private sector are encouraged to collaborate on waste-to-energy and composting initiatives, particularly to utilise the high organic waste in Dhaka.

Invest in digital waste: Invest in an infrastructure; GIS-based tracking may connect to the smart bin system and be powered by AI sorting to update waste logistics and monitoring at the agency level.

Make SDG targets local: The urban development policies must specifically align with the SDG 12 indicators, specifically 12.3 and 12.5, and develop local, specific recycling, waste reduction targets, and education goals.

Facilitate education and behaviour change: Awareness campaigns on garbage separation and recycling can encourage public participation and reduce landfill waste by raising awareness of the economic value of recycling.

6.2 Limitations

This study has some limitations. First, the qualitative data that were collected might not represent the entire array of opinions existing in the waste management industry because it is grounded in a relatively limited sample of expert interviews (n = 20). Second, the study can only put forward its findings within the area of Dhaka; therefore, the findings may not be applicable to rural areas and other urban areas in Bangladesh or any other part of the world. Third, this study does not benchmark the use of possible technological options, such as artificial intelligence (AI) and smart bins, in Dhaka. Moreover, since the opinions of experts depend on, some of the insights may be inclined towards either the business or the

individual. To complement these exploratory findings, additional studies may involve direct observations, experimental case studies, and household levels.

7. Conclusion

In line with these findings, it is essential for cities to focus on green waste disposal methods to achieve sustainable economic growth. In this way, communities can not only reduce the harm inflicted on nature, but also increase their economies by embracing the circular economy concept, which includes recycling, composting, and using leftover energy. This study draws attention to the fact that proper waste management in urban areas, such as Dhaka, might become the major driving force for sustainable economic growth. The process of thematic analysis, together with the collation of empirical data, highlighted the possibilities of the exploitation of waste resources, particularly organic and recyclable materials, for economic benefit if policy, infrastructure, and public engagement are supported. From this study, it can be inferred that the large informal sector plays a significant role in the recovery of waste that is going to be used as a resource, although this happens without gaining recognition or support from institutions. The activities of such a sector may be regulated at the same time as one invests in waste-to-energy (WtE) projects, such as the Amin Bazar plant, which not only enables the reduction of environmental harm but also opens the way for a great number of jobs in the green economy. In summary, this study indicates that it is strategically significant to align SDG Goal 12 with urban waste management practices. This study shows that cities such as Dhaka can take tangible actions towards achieving SDG 12.3, 12.5, and 12.a with a priority focus on resource recuperation, elimination of food waste, and investing in technological innovation. This alignment with the scientific basis of local garbage projects makes them powerful alternatives that are particularly relevant globally to serve as examples of sustainable economic development in other metropolitan societies across the Global South.

***Authors' contribution*:** *Introduction, M.R.; Literature review, A.S.; Methodology and data, M. R.; Research results and comments, M. R., and A.S.; Conclusion, M.R.*

References

Abubakar, I. R., Maniruzzaman, K. M., Dano, U. L., AlShihri, F. S., AlShammari, M. S., Ahmed, S. M. S., Al-Gehlani, W. A. G., & Alrawaf, T. I. (2022). Environmental Sustainability Impacts of Solid Waste Management Practices in the Global South. *International Journal of Environmental Research and Public Health*, *19*(19), 12717. https://doi.org/10.3390/ijerph191912717

Aiguobarueghian, I., Adanma, U. M., Ogunbiyi, E. O., & Solomon, N. O. (2024). Waste management and circular economy: A review of sustainable practices and economic benefits. *World Journal of Advanced Research and Reviews*, *22*(2), 1708–1719. https://doi.org/10.30574/wjarr.2024.22.2.1517

Ajirotutu, R.O., Adeyemi, A.B., Ifechukwu, G.O., Iwuanyanwu, O., Ohakawa, T.C., & Garba, B.M.P. (2024). Future cities and sustainable development: Integrating renewable energy, advanced materials, and civil engineering for urban resilience. *Magna Scientia Advanced Research and Reviews*, *12*(2), 235–250. https://doi.org/10.30574/msarr.2024.12.2.0204

Alam, S., Md Rokonuzzaman, Rahman, K. S., Haque, A., Chowdhury, M. S., & Prasetya, T.A.E. (2024). Techno-Economic and Environmental Analysis of Organic Municipal Solid Waste for Energy Production. *Heliyon*, *10*(11), e31670–e31670. https://doi.org/10.1016/j.heliyon.2024.e31670

Alsabt, R., Alkhaldi, W., Adenle, Y. A., & Alshuwaikhat, H. M. (2024). Optimizing Waste Management Strategies Through Artificial Intelligence and Machine Learning - An Economic and

Environmental Impact Study. *Cleaner Waste Systems*, *8*, 100158–100158. https://doi.org/10.1016/j.clwas.2024.100158

Atofarati, E. O., Adogbeji, V. O., & Enweremadu, C. C. (2025). Sustainable smart waste management solutions for rapidly urbanizing African Cities. *Utilities Policy*, 95, 101961. https://doi.org/10.1016/j.jup.2025.101961

Avani, A. (2024). *The environmental impact of waste-to-energy facilities*. *Environmental Watch*. https://www.environmentalwatch.org/wte2024

Biancini, G. (2024). Improvement of Environmental and Energetic Performance of Waste Treatment Facilities. *Uniecampus.it*. https://hdl.handle.net/11389/51981

Campos-Alba, C. M., Garrido-Rodríguez, J. C., Plata-Díaz, A. M., & Pérez-López, G. (2021). The selective collection of municipal solid waste and other factors determining cost efficiency. An analysis of service provision by spanish municipalities. *Waste Management*, 134, 11–20. https://doi.org/10.1016/j.wasman.2021.07.039

Castellar, J. A. C., Popartan, L. A., Pueyo-Ros, J., Atanasova, N., Langergraber, G., Säumel, I., Corominas, L., Comas, J., & Acuña, V. (2021). Nature-based solutions in the urban context: terminology, classification and scoring for urban challenges and ecosystem services. *Science of the Total Environment*, *779*, 146237. https://doi.org/10.1016/j.scitotenv.2021.146237

CEEW (2024). *India's Circular Waste Economy Potential for Sustainability. Council on Energy, Environment and Water.* https://www.ceew.in/sites/default/files/india-circular-economy-potentialwebceew16dec.pdf

Ciuła, J. Sobiecka, E., Zacłona, T., Rydwańska, P., Oleksy-Gębczyk, A., Olejnik, T. P., & Jurkowski, S. (2024). Management of the Municipal Waste Stream: Waste into Energy in the Context of a Circular Economy—Economic and Technological Aspects for a Selected Region in Poland. *Sustainability*, *16*(15), 6493–6493. https://doi.org/10.3390/su16156493

Dhaka North City Corporation (DNCC) (2023). *Progress Report on Amin Bazar Waste-to-Energy Project*. Retrieved from https://dncc.gov.bd

Ding, Z., Liu, R., & Yuan, H. (2021). A text mining-based thematic model for analyzing construction and demolition waste management studies. *Environmental Science and Pollution Research International*, *28*(24), 30499–30527. https://doi.org/10.1007/s11356-021-13989-1

Freedman, B. (2024). Chapter 4 ~Renewable and Non-renewable Energy Sources. *Louis.pressbooks.pub*. https://louis.pressbooks.pub/environmentalscience/chapter/chapter-4/

Gebrekidan, T. K., Weldemariam, N.G., Hidru, H.D., Gebremedhin, G. G., & Weldemariam, A.K. (2024). Impact of improper municipal solid waste management on fostering One Health approach in Ethiopia — challenges and opportunities: a systematic review. *Science in One Health*, 3, 100081–100081. https://doi.org/10.1016/j.soh.2024.100081

Green.org. (2024, January 30). Job creation through WtE facilities. Green.org. https://green.org/2024/01/30/job-creation-through-wte-facilities/

Holder, M.P., & Kamuhanda, J.K. (2024). Effect of Solid Waste Management on Socio-Economic Development of Urban Area: A Case of Kicukiro District. *International Journal of Innovative Science and Research Technology (IJISRT)*, 9(4). https://doi.org/10.38124/ijisrt/IJISRT24APR2077

Hidalgo-Crespo, J. Amaya-Rivas, Ribeiro, I., Soto, M., Riel, A., & Zwolinski, P. (2023). Informal waste pickers in guayaquil: Recycling rates, environmental benefits, main barriers, and troubles. *Heliyon*, 9(9), e19775–e19775. https://doi.org/10.1016/j.heliyon.2023.e19775

Hysa, E., Kruja, A., Rehman, N. U., & Laurenti, R. (2020). Circular Economy Innovation and Environmental Sustainability Impact on Economic Growth: An Integrated Model for Sustainable Development. *Sustainability*, *12*(12), 4831. https://www.mdpi.com/2071-1050/12/12/4831

Islam, M. S., Hasan, M. R., Mostakim, K., Joarder, M. S. A., Hasan, M. H., & Ahmed, M. R. (2025). E-Waste Management in Bangladesh: Environmental Impacts, Health Risks, and Sustainable Policy Strategies. *Cleaner Waste Systems*, 100297. https://doi.org/10.1016/j.clwas.2025.100297

Jaghoub, J.A., Suleiman, A., Takshe, A. A., Moussa, S., Majid, A., Sheikh, S., & Tantry, A. (2024). The Role of Innovation in Waste Management for Enterprises: A Critical Review of the Worldwide Literature. Studies in Systems, *Decision and Control*, 453–464. https://doi.org/10.1007/978-3-031-51997-0_38

Jagun, Z. T., Daud, D., Ajayi, O. M., Samsudin, S., Jubril, A. J., & Rahman, M. S. A. (2022). Waste management practices in developing countries: a socio-economic perspective. *Environmental Science and Pollution Research*, *30*, 116644–116655. https://doi.org/10.1007/s11356-022-21990-5

Jerin, D. T., Sara, H. H., Radia, M. A., Hema, P. S., Hasan, S., Urme, S. A., Audia, C., Hasan, M. T., & Quayyum, Z. (2022). An overview of progress towards implementation of solid waste management policies in Dhaka, Bangladesh. *Heliyon*, 8(2), e08918. https://doi.org/10.1016/j.heliyon.2022.e08918

Kasulla, S., Malik, S. J., Baxla, S.P., & Zafar, S. (2024). The Role of IoT in Waste Management and Sustainability. *Zenodo*. https://doi.org/10.5281/zenodo.11854522

Kumari, T., & Raghubanshi, A. S. (2023). Waste management practices in the developing nations: challenges and opportunities. *Waste Management and Resource Recycling in the Developing World*, 773–797. https://doi.org/10.1016/b978-0-323-90463-6.00017-8

Maalouf, A., & Mavropoulos, A. (2022). Re-assessing global municipal solid waste generation. *Waste Management & Research: The Journal for a Sustainable Circular Economy*, *41*(4), 0734242X2210741. https://doi.org/10.1177/0734242x221074116

Mallette, A. J., Datta, A., & Krishnamoorti, R. (2021). Consolidated nuclear waste storage in Andrews, Texas: An integrated technical and policy risk analysis. *Energy & Environment*, 0958305X2110513. https://doi.org/10.1177/0958305x211051328

Martayadi, U., Bagiastra, I. K. & Damayanti, S.P. (2024). Sustainable Waste Management and Economic Impact at Loang Baloq Park, Mataram City: A Focus on Tourism Economics. *Journal of Economics Research and Social Sciences*, *8*(1), 1–12. https://doi.org/10.18196/jerss.v8i1.17612

Mngomezulu, S., Mbanga, S., & Adeniran, A. (2024). The factors influencing waste management for economic development—the perspective of Nelson Mandela bay municipality residents. *Frontiers in Sustainability*, *5*. https://doi.org/10.3389/frsus.2024.1469207

Nosike, R. D. C. J., & Christopher, I. H. (2025). Integrating Circular Economy Principles Into Waste Management Practices. *Journal of Arts, Religion, Philosophy and Cultural Studies,* 1(1), 17–25.

Paul, L., Mohalder, R.D., Alam, K.M. (2024). *An IoT Based Smart Waste Management System for the Municipality or City Corporations*. ArXiv.org. 1-6. https://arxiv.org/abs/2411.09710

Rahman, M. S., & Alam, J. (2020). Solid Waste Management and Incineration Practice: A Study of Bangladesh. *International Journal of Nonferrous Metallurgy*, 9(1), 1–25. https://doi.org/10.4236/ijnm.2020.91001

Rashid, M. H. O. (2019). Sustainable Municipal Solid Waste Management in Dhaka City: Challenges and Issues. *Journal of Bangladesh Institute of Planners*, 97–107. https://doi.org/10.3329/jbip.v12i1.76796

Rossit, D. G., & Nesmachnow, S. (2022). Waste bins location problem: A review of recent advances in the storage stage of the Municipal Solid Waste reverse logistic chain. *Journal of Cleaner Production*, 130793. https://doi.org/10.1016/j.jclepro.2022.130793

Sharma, H. B., Vanapalli, K. R., Samal, B., Cheela, V. R. S., Dubey, B. K., & Bhattacharya, J. (2021). Circular economy approach in solid waste management system to achieve UN-SDGs: Solutions for post-COVID recovery. *Science of the Total Environment*, *800*(3), 149605. https://www.sciencedirect.com/science/article/pii/S0048969721046805

Singh, K., Kumar, N., Bharti, A., Thakur, P., & Kumar, V. (2024). Waste to Energy Conversion: Key Elements for Sustainable Waste Management. In: Gupta, A., Kumar, R., Kumar, V. (eds)

Integrated Waste Management. 91–117. Springer, Singapore. https://doi.org/10.1007/978-981-97-0823-9_5

Snehalatha, B., Jamuna Bai, A., Anil Kumar, K.M., Sachan, D., Patil, S.J. (2025). Municipal Solid Waste Recycling and Management: Formal and Informal Sectors. In: Pandey, A., Suthar, S.S., T.T. Amesho, K. (eds) Solid Waste Management. Springer, Cham. https://doi.org/10.1007/978-3-031-78420-0_14

Vesere, R., Kalnins, S. N., & Blumberga, D. (2021). Role of Green Jobs in the Reduction of Waste and Waste Management. *Environmental and Climate Technologies*, 25(1), 1128–1141. https://doi.org/10.2478/rtuect-2021-0085

Yazdani, M., Kabirifar, K., Frimpong, B. E., Shariati, M., Mirmozaffari, M., & Boskabadi, A. (2021). Improving construction and demolition waste collection service in an urban area using a simheuristic approach: A case study in Sydney, Australia. *Journal of Cleaner Production*, *280*, 124138. https://doi.org/10.1016/j.jclepro.2020.124138

Zami, M. T. (2025, April 23). Textile giant Bangladesh pushed to recycle more waste. Context. https://www.context.news/just-transition/textile-giant-bangladesh-pushed-to-recycle-more-waste