



AMERICAN JOURNAL OF
ENVIRONMENTAL ECONOMICS (AJEE)

ISSN: 2833-7905 (Online)

VOLUME 3 ISSUE 1 (2024)



PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

How Development Sectors are Contributing to Waste Management in Bangladesh

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Article Information

Received: June 10, 2024

Accepted: July 08, 2024

Published: July 12, 2024

Keywords

Bangladesh, Government, Waste, Management

ABSTRACT

This article investigates the role of development sectors like non-government agencies in waste management in Bangladesh, particularly in semi-urban area. Through qualitative methods, key informant interviews and focus group discussions, the study reveals that NGOs are working to establish efficient waste management protocols in the most polluted and contaminated area. They have funded various activities, including awareness campaigns, agricultural practices, bin installation, information distribution, green club development, treatment plans, and transportation and disposal support. It is crucial for local government officials and women to be well-informed about waste management. To strengthen waste management activities, measures such as permanent disposal facilities, fixed garbage collection schedules, recycling markets, whistle systems, and bin erecting are needed. The article emphasizes the importance of well-informed local government officials and women in waste management.

INTRODUCTION

In Bangladesh, the management of solid waste is an urgent matter that requires immediate attention. Research in urban areas such as Chittagong and Dhaka indicate that the nation is currently facing difficulties in efficiently managing domestic solid waste (Sujauddin *et al.*, 2008; Afroz *et al.*, 2011). To address this issue, it is crucial to prioritize the reduction of solid waste and the implementation of sustainable waste management programs (Afroz *et al.*, 2011). Furthermore, Habib *et al.* (2021) have recognized the investigation of waste-to-energy conversion as a technique to enhance solid waste management in places like Rajshahi. Efficiently managing municipal solid trash in Bangladesh, especially in densely populated urban areas like Barishal, poses a substantial and complex problem (Abir *et al.*, 2023). Studies emphasize the crucial need for establishing effective waste management systems to reduce environmental and public health hazards linked to insufficient waste disposal methods (Hamid & Faruquee, 2022). The significant production of solid waste in metropolitan regions, including sewage and greywater, underscores the imperative of establishing efficient waste management systems (Sharior *et al.*, 2023). Efforts to enhance solid waste management in Bangladesh encompass multiple stakeholders, such as households and local governments. Research has proposed models for sustainable waste management strategies, such as community-based methods, to aid policymakers in developing efficient waste management protocols (Banik *et al.*, 2016). The existence of an informal sector Kabir *et al.* (2015) highlight the possibility of incorporating informal practices into formal waste management systems, given the existence of an informal sector actively engaged in waste collection and recycling. Concerning particular waste sources, including medical and industrial trash. Poor management of medical waste presents substantial

risks to public health, highlighting the necessity for improved waste management methods in healthcare facilities (Hassan *et al.*, 2008). Studies on industrial waste management highlight the significance of recycling and implementing safe disposal methods to reduce environmental consequences (Aker & Muniruzzaman, 2020). To effectively handle solid waste management in Bangladesh, it is crucial to adopt a comprehensive approach that combines sustainable practices, community engagement, and efficient policy execution. By utilizing findings from research studies that examine waste classification, socio-economic aspects, waste-to-energy potential, and stakeholder attitudes, Bangladesh can advance in developing a strong and sustainable framework for managing solid waste.

Similar to many other impoverished countries, Bangladesh has mostly neglected and understudied solid waste management. Stakeholders have recently recognized this industry as vital for safeguarding both the environment and human well-being. Bangladesh's urban population has experienced significant and rapid growth, with an annual rate of about 6%. Six main cities primarily concentrate this population: Dhaka, Chittagong, Khulna, Rajshahi, Barisal, and Sylhet. Based on current estimates, these cities house around 13% of the total population, with 55–60% of the population living in urban areas (Alamgir *et al.*, 2005). The efficient administration of the MSW system in these cities requires a cooperative endeavor that includes the municipal authorities, business entities, community-based organizations, and non-governmental organizations (NGOs). The overall status quo remains unchanged. Considering the relevant socioeconomic conditions and technological aspects of the country, it is evident that an integrated solid waste management system (ISWM) is required. In order to assess the feasibility of adopting an integrated solid waste management (ISWM)

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system, it is necessary to thoroughly analyze the existing management system's constraints, limits, and relevant experiences. To accomplish this, a feasibility study called Waste Safe (Alamgir *et al.*, 2005) was conducted to assess the present condition of municipal solid waste (MSW) management in the least developed Asian countries (LDACs), including the problems and limitations it faces. Ahsan *et al.* (2013) and Samah *et al.* (2013a and 2013b) present comprehensive studies on the content, generation, management, and recycling practices of municipal solid waste (MSW) in Malaysia.

Bangladesh is one of the South Asian countries experiencing rapid urbanization, with 63 million people, or 38% of the total population, living in urban areas (The World Bank, 2020). The process of urbanization has led to a significant rise in waste production and made waste management more challenging, particularly in densely populated areas such as Dhaka. These developments have adverse effects on the environment, public health, and urban livability. The eleventh Sustainable Development Goal, Sustainable Cities and Communities, calls for a reduction in the negative environmental impact per person in cities by 2030. This includes a particular focus on improving air quality and managing municipal and other types of trash. Furthermore, this specific aim intricately connects to the attainment of other Sustainable Development Goals (SDGs). Recycling garbage is a method that can help achieve the goal of SDG 7, which is to ensure affordable, reliable, sustainable, and modern energy access for everyone. This will facilitate the pursuit of sustainable energy (Islam, 2021). Bangladesh's rugged topography, abundant vegetation, and breathtaking beauty have occasionally earned it the title of "Greenest Nation" on the planet. Nevertheless, the city's pristine appearance has significantly declined as a result of the widespread accumulation of garbage and insufficient waste management practices (Shamsuddoha, 2009).

Waste refers to any item, product, or object that is discarded, planned to be discarded, or required to be discarded due to its unsuitability for its original purpose. We commonly classify it into two distinct categories: hazardous and non-hazardous materials. Hazardous wastes encompass substances such as pharmaceutical, industrial, and electronic (or "e-waste") wastes. Non-toxic waste includes materials generated by local governments, such as construction waste and residential refuse. Alternatively, waste can exist in either liquid or solid form, and each form necessitates a distinct method for handling and disposing of it. Regardless of its hazardous nature, improper collection and treatment of garbage can pose substantial threats to human health and the environment. As stated by the United Nations, managing solid waste refers to the regulated handling of waste material from its generation at the source, through the various recovery procedures, to its final disposal. Municipal solid waste in urban areas is a significant challenge due to its large volume and difficulties in managing it. Every

day, Bangladeshi cities generate more than twenty-five thousand metric tons of rubbish, with each person producing 170 kg of solid waste per year (Ahmed, 2019). The volume of waste increased by over 100%, from 6,500 metric tons in 1991 to 13,300 metric tons in 2005, within a span of 15 years (Dhaka Tribune, 2020a). The increase in trash will occur due to the country's shift towards a middle-class economy, alterations in the living conditions of urban people, and the country's expanding urbanization. We anticipate an increase in urban solid trash generation per person from 0.49 kg in 1995 to 0.60 kg by 2025. Ahmed, 2019. Inefficient garbage collection, costly removal and disposal procedures, insufficient land for final disposal, the absence of recycling legislation, and a lack of environmental consciousness characterize the present waste management methods (Abedin & Jahiruddin, 2015).

Historical Development of Waste Management

The history of trash reflects the histories of the societies that generated it, their interactions with the environment, and the resources they utilized. Before the industrial revolution, the Parisian motta papillardorum and the Roman cloaca maximum exemplified the close connection between urban sustainability and garbage management. Urban areas generated minimal waste, but the methods for collecting and disposing of it frequently proved ineffective, leading to complaints about unpleasant odors. The deployment of new management tactics and legislation to clean up towns throughout Europe was a result of Neo-Hippocratic medicine, which connected excess mortality in cities to environmental and air pollution. The majority of urban garbage used for agricultural or industrial purposes also saw an increase in value. Therefore, from the 1770s to the 1860s, there was a strong correlation between the state of being well and the retrieval of bodily waste.

The recycling industry experienced a detrimental effect beginning in the 1870s due to the fertilizer revolution, the significant expansion of the coal and later petroleum industries, and the demand for more easily obtainable resources. Although several cities first tried to mitigate the decrease in value of urban by-products, many of them ultimately abandoned these efforts during the interwar period. Before the 1960s, the goal of waste management was to reduce costs. What was once a source of wealth has now become costly for society. The environment functioned as a waste disposal facility. Crises of the industrial city, growing concerns about the planet's resources, and an environmental crisis characterized the 1960s and 1970s. In this context, people perceived waste as a manifestation of the indulgences of a consumerist society. Garbage production continued to rise, resulting in persistent sanitary incidents. The results of waste policy implementation are diverse. The negative consequences of this "curse of the developed world" also affected impoverished countries (Barles, 2014).

Perspective and Prospects

During most of human history, the environment was commonly known as the “global commons” (Hardin, 1968). This implied that activities like resource extraction, agriculture, manufacturing, material production, and distribution, along with human waste, could freely release emissions and waste into the air, water, or land. Wilson (2023) asserts that the 19th century initially enacted regulations for the disposal of solid waste in urban areas and the control of human waste discharge to safeguard public health. Nevertheless, the disposal of hazardous, industrial, and municipal solid waste was unregulated and largely ignored until the later years of the 20th century (Wilson, 2007). Due to the increasing visibility of unregulated emissions, the UK implemented the Clean Air Act in 1956 in response to the London haze. This legislation restricted the use of solid fuels in residential residences and served as a blueprint for such laws in other affluent nations (Wilson, 2023). In addition, resource utilization has experienced a substantial rise since around 1950, resulting in increased emissions and waste generation (Steffen *et al.*, 2015). From 1950 to 1970, the global population experienced 50% growth, reaching a total of 3.8 billion individuals, with 57% of them living in urban areas. Consumerism arose as a result of the improvement in living standards. The environmental demands were on the rise. Rachel Carson’s 1982 book *Silent Spring* ignited the environmental movement by bringing attention to the pervasive issue of pollution caused by persistent pesticides. The expansion of cities has exacerbated the negative impact of unregulated landfill sites, especially those containing hazardous materials, on the population’s well-being. In the 1970s, industrialized nations started implementing extensive environmental rules to tackle the issue of waste causing contamination in land, water, and air (Wilson, 2023).

However, with the establishment of solid waste management, the subsequent evaluation phases have gained recognition. During this phase, researchers categorized various issues, including the composition of municipal solid waste (Strasser, 1999; UK DoE, 1971), the responsibilities associated with waste management (UK DoE, 1971; ERL, 1992b), waste collection, treatment, and disposal (Kleis and Dalager, 2004; UK DoE, 1971), and recycling (Guo *et al.*, 2005; Scheinberg *et al.*, 2010b). At this juncture, the worries about solid waste were a matter of great apprehension for governments, citizens, and other stakeholders. The participating nations’ governments played a pivotal role in spearheading the management of solid waste. Moreover, various researchers proposed a “technical fix” during this phase, and ERL highlighted the institutional context in 1992. During that period, governments and other stakeholders played a crucial role in establishing institutional standards for proper waste management. In addition, there were attempts to increase the technical standards for proper waste management. The major concerns revolved around hazardous waste, municipal solid waste, and the intended and unintended

consequences of waste management. Various researchers and organizations addressed these concerns, including Wilson and Forester (1987), WHO and UNEP (1983), ISWA WGHW (1991, 2002), Kleis and Dalager (2004), Damgaard *et al.* (2010). However, everyone agrees that the persistent issue of waste stems from the consumption of fruits containing inedible components. Every era of human history has witnessed efforts to effectively handle trash. However, the search for flawless management systems or methods is ongoing. We are now endeavoring to resolve these issues using appropriate methods.

Objectives

The main objective of this research was to analyze the condition of garbage and waste management in the municipality. The study aimed to investigate the specific roles of NGOs in raising awareness among municipality residents about waste management. It also sought to understand the current practices of residents in this regard and explore the waste reduction and contamination prevention initiatives implemented by different NGOs.

METHODOLOGY

This study was exclusively planned as a qualitative study, utilizing only qualitative data for interpretation. The research region was chosen to be a municipality in Bangladesh because of the presence of NGO projects being implemented there. Four focus group conversations were done in total. In addition, twelve key informant interviews were done to collect data. The interview schedule was utilized as a research instrument for the collecting of key informant interview data. Furthermore, a questionnaire was employed to guide the focus group conversation and facilitate the collecting of data from the group.

RESULTS AND DISCUSSION

Bangladesh faces pollution from automobile emissions, industrial gases, and dust accumulation. While water contamination has experienced a partial reduction, it has not been completely eradicated. Factors contributing to this reduction include increased awareness, fewer individuals disposing of trash down the drain, and efforts to dispose of waste before it reaches the water. Community engagement in pollution prevention activities, such as recycling and proper waste disposal, is crucial for reducing water contamination caused by rubbish. The incidence of diseases has significantly decreased since the cessation of polythene incineration, which caused significant harm to individuals and led to the proliferation of numerous diseases. Factors contributing to this decrease include a rise in public awareness, changes in waste disposal practices, and the impactful efforts of non-governmental organizations in promoting awareness among the population. The current situation has experienced a moderate reduction in pollution compared to the previous state, with shifts in behavior patterns and heightened consciousness regarding proper

waste disposal. As pollution decreases, the incidence of diseases also decreases. The Cleaners goal is to dispose of garbage before mixing it with water sources and drains, resulting in a reduced amount of waste.

Trash management involves overseeing and regulating waste production, collection, handling, and disposal. It includes measures to prevent waste generation through improved processes, recycling, and reutilization. The implementation of waste management infrastructure has not reached its full potential, but it can mitigate pollution, preserve resources, and prevent environmental damage. The community has seen a shift in waste management practices due to increased awareness and education. Recycling is an effective method for managing and disposing of waste, as it reduces, reuses, and properly handles garbage. Beneficiaries adhere to essential waste management principles, such as using kitchen waste for organic fertilizers and manufacturing door mats, backpacks, and laptop covers. The project aims to address the lack of an established waste management framework by engaging the municipality and partnering with the local government to establish a framework. The former mayor of the municipality believes that the primary hindrance to effective waste management is the lack of personnel and a well-structured strategy. Collaborating with local government and community leaders is crucial for establishing efficient waste management strategies. Community engagement is essential for establishing a mutually agreed-upon framework for trash management. Garbage management involves the systematic handling and disposal of waste, including collection, transportation, processing, and supervision. Education and awareness campaigns have been effective in promoting changes in waste management behavior, including recycling, reducing waste generation, properly disposing of hazardous materials, and endorsing sustainable practices. Awareness of appropriate garbage disposal practices is present in at least 80-90% of homes targeted. Proper waste segregation is crucial for minimizing the environmental impact and preventing health problems caused by improper disposal. Implementing waste division is financially beneficial as it simplifies the recycling process. Participants in the FGD working group emphasized the importance of separating home waste into different bins for each type of waste, including wet and dry waste, and disposing of them separately. Composting home waste is a common practice, and recycling is a common practice. The Green Club (GC) provides three separate categories of waste receptacles for students to use in their schools. However, Bangladesh's dense population presents challenges for garbage management, necessitating a greater allocation of municipal budget for trash management. Despite the NGO initiative's attention, the municipality often does not prioritize waste management. There is a lack of knowledge about the allocation of funds in the waste management sector within the municipal budget, particularly regarding the formulation and specific allocation of funds.

Vocational training focuses on the conversion of waste

materials into profitable business opportunities, which protects the ecology from the detrimental effects of inorganic and biodegradable materials found in refuse. Insufficient waste management can result in soil erosion, water contamination, and air pollution. The training program has provided beneficiaries with other sources of income, such as sewing, composting, and helping women overcome financial challenges. Moreover, effective and sustainable waste management (SWM) conserves resources, mitigates environmental and public health impacts, and enhances urban living quality. However, urbanization, institutional limitations, and unsustainable solid waste management procedures negatively affect public health and environmental sustainability. The project aims to collaborate with the municipality to construct a rubbish management facility to improve the situation and promote a cleaner and healthier community. Along with, the project is collaborating with the municipality to construct a rubbish management facility to enhance the situation and promote a cleaner and healthier community. It is crucial to involve both the municipality and the community in the decision-making process, as the waste management system will have the greatest effect on community members. The majority of KII respondents concurred that the municipality should have prioritized trash control over garbage management in the budget. Surprisingly, municipal dwellers have reduced their use of plastic in their homes by 90% for various purposes, and they expressed their intention to promote the adoption of environmentally friendly products as alternatives to polythene or plastic products. However, feedback from previous KII participants indicates that households only use environmentally friendly products to a limited extent for various household needs, relying on conventional, environmentally harmful materials like plastic and polythene bags. This could indicate a lack of understanding or availability of eco-friendly alternatives, as well as a lack of motivation to make the necessary changes. However, to promote the use of environmentally friendly products in family consumption, it can be beneficial to provide education and raise knowledge about the benefits associated with their usage. The KII respondents revealed that, despite the challenges they face, the homes under study expressed a strong desire to switch to environmentally friendly products if they were readily available and affordable.

The Bangladeshi government has a crucial role in waste management because of the environmental and public health difficulties faced by the country. Bangladesh faces challenges related to air and water pollution, land degradation, and inadequate waste management (Masud *et al.*, 2017). The inadequate waste management planning and infrastructure for municipal wastes, which include human waste, pose substantial environmental and public health risks (Sharior *et al.*, 2023). The government ministries and departments in Bangladesh are actively engaged in devising waste management policies to address these difficulties (Mahmud *et al.*, 2020). Recently, the

government of Bangladesh, in partnership with private NGOs, has undertaken initiatives to transform garbage into electricity, representing a commendable move towards implementing sustainable waste management methods (Mostakim *et al.*, 2021). However, the country continues to face substantial obstacles in waste management, such as insufficient legislation for garbage disposal, a lack of awareness, poor technology selection, and inadequate financial backing (Abedin & Jahiruddin, 2015). The lack of well-defined criteria on the obligations of waste producers and government bodies, coupled with varying laws on waste management, exacerbate the situation (Hamid & Faruquee, 2022). Efficient waste management is especially vital during emergencies like the COVID-19 pandemic, which has put pressure on the healthcare system and worsened problems concerning the handling of biomedical waste in Bangladesh (Shammi *et al.*, 2020). The implementation of mass vaccination programs has exacerbated the already precarious medical waste management system in the country (Rayhan *et al.*, 2022). Developing nations such as Bangladesh continue to have ongoing difficulties in achieving sustainable waste management. This requires the development and execution of comprehensive strategies that are effective in addressing the issue (Hannan & Aigbogun, 2021). Ultimately, the government of Bangladesh assumes a pivotal role in waste management to alleviate environmental contamination, protect public health, and advocate for sustainable practices. To effectively tackle the waste management difficulties encountered by the country, the government can handle them by implementing rules, increasing awareness, investing in suitable infrastructure, and partnering with stakeholders.

Key Concerning Issues in Waste Management in Municipal Area

The study suggests improvements to waste management in Bangladesh's municipality area, including door-to-door collection, a permanent disposal facility, increased participation of women, schedules for cleaners, education on waste management, availability of more containers, increased awareness among public and municipal authorities, and the establishment of environment-friendly clubs. After analyzing the results and reviews of the literature, we suggest proactively addressing certain concerns to have a significant impact on future assessments of waste and resource management. The policy issues that should be given priority are sustainable financing (Whiteman *et al.*, 2001; Brunner and Fellner, 2007; Bundhoo, 2018), reevaluating sustainable recycling in the Global North (Iacovidou *et al.*, 2021; WRAP, 2022; Cahill *et al.*, 2011), and reevaluating sustainable recycling in the Global South (GA Circular, 2020; World Bank Group, 2018; Whiteman *et al.*, 2021; Matter *et al.*, 2013; Velis *et al.*, 2023; Pfaff Simoneit, 2023). These issues have been extensively discussed and researched by various authors and organizations, as cited in the references.

CONCLUSION

In Bangladesh, waste management presents a complex challenge that necessitates complete solutions. While we have made progress, there remains room for further improvement. An optimal waste management approach necessitates the integration of public awareness campaigns, infrastructural improvements, and regulatory reforms. Moreover, refusing to purchase items excessively packaged in boxes and bags or covered in plastic is an intelligent approach to minimizing waste. However, the citizens of Bangladesh lack knowledge about waste management. Therefore, it is necessary for both the government and non-governmental organizations to take additional measures to raise awareness. Furthermore, the concerned authorities should implement measures such as establishing a permanent disposal facility, setting a fixed trash collection date, creating a market for recycled garbage, issuing a warning signal before waste collection, and increasing the number of bins. We recommend these actions for effective management in the municipal area. In addition to women, it is important to increase awareness among public and municipal officials, specifically councilors, by implementing new interventions in the municipality area. However, by adopting sustainable practices like recycling and composting, we can reduce environmental damage while also generating economic prospects. Effective cooperation among the government, industry, and communities is crucial for promoting creativity and guaranteeing the sustainable achievement of waste management projects. By placing a high value on environmental stewardship and implementing comprehensive strategies, Bangladesh may lead the way towards a more environmentally clean and healthier future.

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