

Original Research Paper

Assessing plastic waste management in Historic Urban areas: The case study of Old Dhaka, Bangladesh

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ABSTRACT

The management of plastic waste has grown to be a major global environmental and social concern, especially in Bangladesh. The techniques employed in Old Dhaka to manage plastic waste are carefully examined in this study, with a particular emphasis on sorting, production, separation, and recycling. The study employs both qualitative and quantitative techniques, including surveys, interviews, and data analysis, to gain an understanding of Old Dhaka's current infrastructure, regulations, and practices for managing plastic waste. In January 2024 and January 2025, the survey was completed. The study area has around 617 plastic waste recycling shops in January 2024 and January 2025. The stores were categorized as large, medium, and small according to the volume of plastic waste they handled each day. It was found that about 41.29% of soft plastic and 58.71% of hard plastic were handled in January 2024 and 39.90% of soft plastic and 60.10% of hard plastic in January 2025 in the study area. In addition, the study explores techniques for sorting plastic waste, emphasizing the value of proper segregation in expediting recycling processes. The report also emphasizes how crucial it is to strengthen recycling capacities to lessen plastic pollution and stop resource depletion.

Keywords: Hard plastic, Old Dhaka, recycling, separation, soft plastic, sorting

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INTRODUCTION

Waste is an inevitable consequence of human activity. The amount and complexity of waste patterns produced by city dwellers have increased as a result of economic growth, urbanization, and rising living standards.^[1] Undoubtedly, plastics are important in day-to-day life because of their longevity (mechanical properties, thermal properties, stability, and durability), resistance to decomposition, and low cost, which support their widespread applicability.^[2] Plastic production has sharply increased over the last 70 years. In 1950, the world produced just 2 million tons. It now produces over 450 million tons.^[3] With approximately 63 million people - 38% of the country's total population - living in urban areas, Bangladesh is one of the fastest urbanizing economies in South Asia (The World Bank, 2020). The advent of a free-market economy has led to the rapid expansion of the plastics

sector during the past 30 years.^[4-6] The import of polymers rose from about 14,000 metric tons in 1990–696,500 metric tons in 2011, a 20-year increase.^[7]

Despite the difficulties caused by its dense population, Bangladesh, a fast-rising country with a population of about 174 million (World Population Prospects, 2024), has demonstrated impressive economic growth.^[8-10] Plastic created the framework for global trade and consumption, and the institutions that were already in place were increasingly dependent on the many types of plastic.^[11,12] We burnt 25.5%, recycled 19.5%, and dumped 55% of our garbage in landfills in 2015. Just 9% of the 6.3 billion metric tons of plastic waste generated in the 20th century was recycled, and Just 1% had more than one recycle.^[13]

The management of plastic garbage is being approached from a variety of angles, with an emphasis on technical advancements

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and sustainable methods. In the 1960s, Bangladesh's first plastic industry began by producing plastic toys, picture frames, and replacement parts for jute mills.^[14] Plastic producers create a wide variety of products, such as toys, building supplies, sanitary products, bottles, lids, and kitchenware, as well as attachments for textiles, electronics, and medications.^[15,16] One of the main concerns is the widespread usage of single-use plastics in Bangladesh and around the world. When plastic products are used more frequently, the environment becomes more polluted.^[17] 12,000 million metric tons of plastic waste will exist on Earth by 2050 if present patterns in plastic usage continue.^[18]

Eleven City Corporations, 298 Pourashavas, and the remaining urban centers makeup Bangladesh's total of 514 urban regions.^[19] Bangladesh generates 800,000 tons of plastic waste annually, with 3,000 tons produced daily.^[20] Pet bottles, soft plastic, and hard plastic are among the several plastic products that are utilized on a daily basis in this nation and finally end up as waste. While recyclable hard plastics are gathered, turned into flakes, and fed back into manufacturing chains, over 17,000 tons of soft plastics are disposed of in landfills each year along with other debris.^[6,21,22] Due to skyrocketing garbage volumes, Dhaka is already dealing with a number of issues, and by 2025, it is expected that there will be 78.44 million people living in the city.^[23] Although there are numerous methods used globally to recover plastic waste, Bangladesh aims to recycle half of its plastic waste by 2025. The purpose of his study was to outline and assess Old Dhaka's present plastics management procedures. Consequently, this research has produced some suggestions and useful views regarding the current situation of the plastics sector in Bangladesh.

MATERIALS AND METHODS

Study Area

Old Dhaka (Puran Dhaka) is a term used to refer to the historic old city of Dhaka, the capital of modern

Bangladesh. It was one of the largest and most prosperous cities of the Indian subcontinent and the center of the worldwide muslin trade. Old Dhaka (Puran Dhaka) population totals 52,80,000 located between 23°42'25" N and 90°24'34" E latitudes. It is a densely populated area where tons of rubbish are disposed of in this neighborhood, which is home to several offices, markets, schools, colleges, and business stores. However, because the majority of the residents are higher and middle class, waste disposal is not so well. The study was conducted at several sites in the Old Dhaka area. A survey has been conducted to learn more about how plastic garbage is being handled in Old Dhaka. Figure 1 displays a map of the study area.

Collection of Plastic Waste

Plastic is a major contributor to environmental degradation that has reached an extreme degree worldwide, as everyone knows. Plastic products are regarded as necessities when used, yet they are waste when thrown away. Nevertheless, the plastic garbage is being recycled and turned into resources. The global endeavor to limit the amount of plastic in the waste stream includes recycling. The World Bank 2021 reports that just 37.2% of Dhaka's plastic garbage gets recycled. Old Dhaka's Kamrnagirchor, Islambag, and Lalbagh have become Bangladesh's plastic recycling hub. Owners and employees of plastic recycling facilities in this region claim that plastic waste is imported from all over the nation and that each facility recycles roughly 3 tons of plastic waste daily.^[5] From waste collection to the sale of recovered plastic products, for example, there are nine steps in the recycling process: Step 1: Collection of plastic waste. Step 2: Purchase and sell plastic waste (including Bhangariwala and waste collectors). Step 3: Sorting or segregating plastic waste according to varieties, color, softness, and hardness; Step 4: Shredded by a crushing machine; Step 5: Washing; Step 6: Drying by hand and by automation; Step 7: Granules

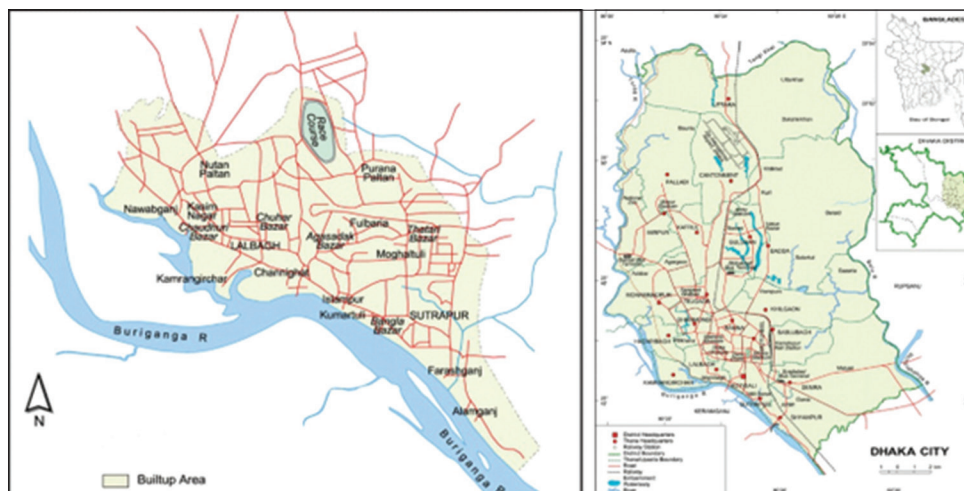


Figure 1: Study area

produced (incineration); Step 8: Reproduction of plastic items using injection molding and handcrafted machines; and Step 9: Final products sold to wholesalers, retailers, and ultimately consumers [Figure 2].

RESULTS AND DISCUSSION

Collection of Plastic Waste

In Old Dhaka, there is no official system in place to collect waste. The end user discards this anywhere and a collector named Tokai (waste picker) gathers it from dustbins, rivers, roads, and drains. Then, the waste plastic is sold to a secondary waste collector, who purchases it at a discounted price for further processing or recycling. Plastic waste is categorized into two which are soft and hard plastic. Soft plastic can be defined as plastic that can be easily crushed. On the other hand, hard plastics are the opposite of soft plastics, which cannot be crushed easily. The quantity of various forms of plastic waste that primary collectors handle is displayed in Table 1. Table 1 shows that waste pickers collected an average of 3.2 kg of plastic waste per day in January 2024. However, on January 2025, the amount of plastic waste collected increased to 3.7 kg per day, representing an 18.95% increase compared to the average daily collection for the month. Between January 24 and January 25, there was a 23.40% rise in the volume of plastic waste that feriwala collected.



Figure 2: Functional elements of plastic waste management

Table 1: The quantity of plastic waste that primary waste collectors manage

Types of plastic waste	Average amount collected (Ton/day)			
	Waste Pickers		Feriwala	
	January 2024	January 2025	January 2024	January 2025
Soft plastic	1.21	1.43	1.83	2.43
Hard plastic	1.97	2.28	2.36	2.74
Total	3.22	3.72	4.20	5.18

Purchase and Sell Plastic Waste

Plastic garbage is bought and sold through an organized supply chain that includes manufacturers, recyclers, and waste collectors. Table 2 shows how much of each type of plastic is processed by recycling facilities for plastic waste. In January 2024, approximately 4.80 tons of soft plastic and 6.33 tons of hard plastic were handled daily. Around 5.31 tons of soft plastic and 7.9 tons of hard plastic were handled daily in the plastic waste recycling businesses as of January 25. The amount of soft plastic and hard plastic waste increased by almost 10.45% and 17.03%, respectively.

The amount of plastic waste handled in a day is shown in [Figure 3]. From the bar chart, we can see that a large amount of hard plastic waste was handled in the Islambag area in January 2025 and a small amount of soft plastic was handled in the Choto Katara area in January 2024.

Recycling Facility

As a result of connecting various recycling phases, an incredible value chain has been established, with hundreds of actors contributing to the process' acceleration and producing a wide range of plastic products. Women make up almost 15% of the approximately 25 lakh human resources directly and indirectly involved in the massive employment, according to active local businesses. In addition to receiving financial benefits, thousands of business owners, employees, and waste collectors are also improving the health of our environment. If they were unable to carry out these actions, Bangladesh would soon be overrun with plastic debris, which could be dangerous for people.

The stores that recycle plastic waste are dispersed throughout Old Dhaka. We discovered these shops by looking around the local roads. Approximately 617 stores were identified throughout the survey shown in [Table 3]. The stores are categorized according to the amount of plastic waste they collect each day. Over 1.0 tons of plastic waste are handled daily by small shops, over 4.0 tons by medium shops, and over 8.0 tons by large shops. Following the shops' classification, a questionnaire form is used to gather comprehensive data about a few of the stores. These data include the amount, kind, and method of recyclable plastic trash collection, as well as the recycling procedure, etc.

Table 2: The quantity of plastic waste that secondary waste collectors manage

Types of plastic waste	Amount collected (Ton/day)		Percentage	
	Amount collected (Ton/day)		Percentage	
	January, 2024	January, 2025	January, 2024	January, 2025
Soft plastic	48.06	53.08	41.29	39.90
Hard plastic	68.35	79.99	58.71	60.10
Total	116.41	133.08	100	100

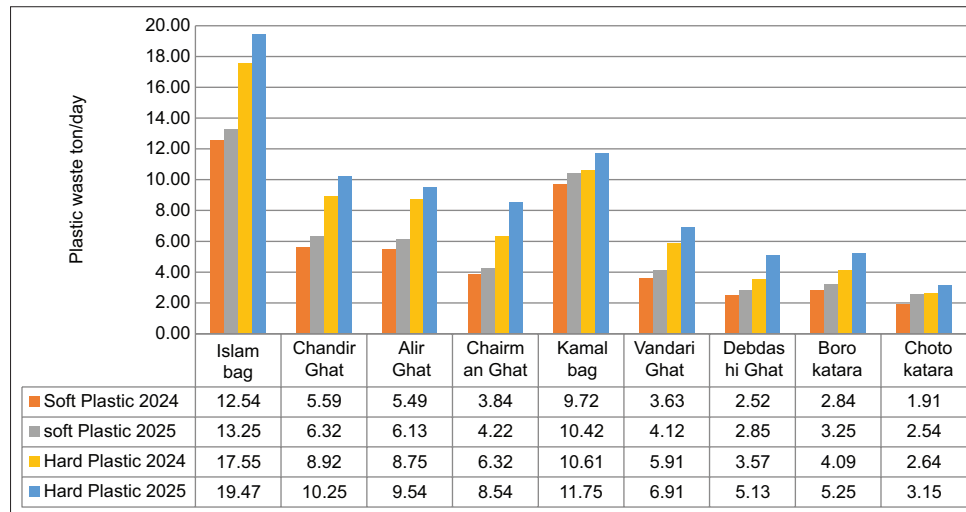


Figure 3: Amount of plastic waste handled

Table 3: Amount of plastic waste recycling shops in Old Dhaka area based on location and category

Shop location	No. of shop with type			Total shop
	Large	Medium	Small	
Islambag	150	108	65	323
Chandir Ghat	10	25	12	47
Alir Ghat	12	18	20	50
Chairman Ghat	8	20	10	38
Kamalbag	7	15	18	40
Vandari Ghat	17	8	12	37
Debdashi Ghat	5	8	17	30
Boro katara	4	15	12	31
Choto Katara	3	10	8	21
Total	216	227	174	617

Plastic Sorting

After gathering the wasted plastics, small waste recyclers categorized them by color and category. Businesses in Bangladesh usually do not use machines to sort plastics. Every step of the sorting process is done by hand shown in [Figure 4].

Plastic Cleaning and Drying

After sorting plastic waste, cleaning the plastics is the most essential phase in the recycling process [Figure 4]. Plastic materials are already extensively contaminated with dirt, grease, or oil, therefore using surfactants (detergents), water, and detergents is essential to remove impurities. Cleaning is done by hand in old Dhaka, Bangladesh. After being hand-cleaned in a river or pond, wet goods are usually left to dry in the sun.

Plastic Shredding

The clean, sorted plastic waste is then chopped into plastic flakes using a shredder. It is important to size-reduce the large

plastic bottles into smaller ones before putting them in the chipper or shredder. The shredder's moving blade splits up plastics into tiny pieces, which then travel down a tube with microscopic holes and into a flake collecting. Businesses in Bangladesh use shredder machinery that was constructed in the nation to produce the flakes shown in [Figure 4]. A blade is also used to slice the plastics, and the flakes are gathered in a bucket or pail.

Plastic Pelletizing

An extruder melts the plastic flakes when they are placed inside. A tiny die-hole was then used to drive the melted flakes out. Reprocessed and recycled plastics are converted into pellets because they are easy to handle and transport shown in [Figure 4]. New plastic products are then made by extruding or pouring the melted recycled plastics into molds. The following challenges and opportunities have been highlighted in the study, along with the relevant discussions. This study investigated the current state of Old Dhaka's plastic waste recycling process. According to the study, waste pickers gathered 37.7% and 61.45% of the total plastic waste in January 2024, respectively, from soft and hard plastic debris. In January 2024, the feriwala gathered 43.7% and 56.25% of soft and hard plastic, respectively, according to the study. In January 2025, the percentage of plastic waste managed by secondary waste collectors increased by 10.45% and 17.03%, respectively, from 41.29% and 58.72% in January 2024. Which means that every day, new plastic products are produced, so the cycle continues. This cycle of making and throwing away plastic will go on until companies begin employing more ecologically friendly substitute materials (like paper).

Numerous issues have been brought up in this area by the plastic recycling industry. First and foremost, because they employ traditional machinery and processes rather than



Figure 4: Plastic waste recycling cycle. (a) Collection of plastic. (b) Sorting and segregation. (c) Shredded by a crushing machine. (d) Washing. (e) Pelletize production by cutter machine. (f) White granules. (g) Reproduction plastic. (h) Final product (plastic belcha, bucket, etc.)

cutting-edge technology, 100% of factories' manufacturing processes continue to be far from environmentally friendly ones. There are numerous small and medium-sized factories in this area, despite the absence of a huge industry. There is an unavoidable high risk because of unorganized factories. The infrastructure of the majority of the factories is quite brittle since it is composed of semi-paka, bamboo, iron angle, and tin. The majority of the building's floor space, from the ground floor to the fourth and even sixth story, is devoted to the production process and a warehouse where chemicals, raw materials, and recycled finished goods are kept.

Plastic is a toxic, non-biodegradable material that is extremely dangerous for both the environment and human health. If plastic garbage is regularly recycled, it will not pose a threat to the environment. The quantity of plastic that ends up in landfills and takes up space in our ecosystem for hundreds of years is decreased by recycling plastic. In reality, though, there are challenges related to plastic recycling companies. According to this study, there are a few obstacles in the plastic recycling business in Old Dhaka, Bangladesh. Lack of a good working environment, lack of high technology, low tendency for expansion, and lack of research were found in the recycling business. Small and medium-sized recycling companies in Kamrangirchor and Islamabad dispose of their plastic garbage, which cannot be recycled, and call for advanced management

procedures that they are unable to implement. Consequently, the Buriganga River and its banks are being clogged with dirty garbage made of plastic. To make plastic recycling a fully feasible tool for preventing pollution, the government must give this issue careful consideration and implement the necessary actions.

CONCLUSION

We end by saying that plastic is definitely a multipurpose material that is used for a variety of applications. The use of plastic is growing over time due to shifting global dynamics, but excessive use is also seriously harming both the environment and human health. We must reconsider and reorganize corporate strategies, consumption patterns, and lifestyles to tackle this threat and challenge. It could seriously harm the ecosystem if it is not managed as soon as possible. A neat, clean, and poverty-free society is one of the foremost goals of Bangladeshis, and the recycling of waste can help make those goals a reality. However, it cannot be placed on the government alone.

The results of this study into the viability of the recycled plastic and recycled plastic business as an industry can assist scholars in carrying out further research on the topic. Above all, we can state with certainty that recycling plastic has

begun to assist in protecting the environment and making it greener and cleaner. To support the expanding industry (plastic recycling), the relevant authorities must take the required actions. Relocating these small and medium-sized recycling factories from the residential area of Old Dhaka to another location is urgently needed. To avoid hundreds of manufacturers closing and owners and employees losing their jobs, these factories must be given priority over huge corporations when it comes to purchasing land. It is necessary to identify risk factors and implement appropriate management strategies. The Department of Environment and the Ministry of Industries must play a key role in guaranteeing environmentally sustainable production processes. This study can help policymakers who are interested in creating efficient waste management regulations. It may also be helpful to people who are worried about environmental contamination and are searching for solutions to protect the environment from plastic pollution. Without that, companies searching for a growing and profitable sector to invest in can get an idea of how profitable recycled plastic could be in Bangladesh thanks to this study. Recycled plastic is becoming more and more popular. Our nation must conduct a variety of analyses to look into its potential and contribution.

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