

A STUDY ON PLASTIC WASTE MANAGEMENT IN MIRPUR AREA

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ABSTRACT

Plastic waste and its disposal is one of the greatest threat to the environment. In most countries, such as developing countries like Bangladesh, it is one of the most pressing issues. The main objectives of this study are to find out the existing plastic waste management scenario and determine the type and amount of plastic waste managed in Mirpur area, Dhaka. A survey has been conducted among plastic waste collectors (waste picker, feriwala) and at the plastic waste recycling shops to find out the current scenario of plastic waste management at Mirpur-1,2,6,7,10,11,11.5,13 and 14. The survey was done on June, 2022 and January, 2023. In June 2022 and January 2023, the study area had approximately 242 and 239 plastic waste recycling shops, respectively. The shops were divided into three categories based on the amount of plastic waste they handled on a daily basis: large, medium, and small. It was found that about 86.96% of soft plastic and 13.04% of hard plastic were handled on June, 2022 and 88.24% of soft plastic and 11.76% of hard plastic on January, 2023 in the study area. It was discovered that approximately 3047 kg and 4250 kg of plastic waste were handled daily in Mirpur area on June, 2022 and January, 2023 respectively. It can be seen that there was an increase of 39.48% of plastic waste in the study area with a gap of six months.

Keywords: *Plastic waste, plastic waste management, plastic waste recycle process*

1. INTRODUCTION

Waste comes in many different forms, from different sources and is dumped in different ways. The overall end result is that material that is no longer used, stored or otherwise released into the natural environment and affects the overall quality of life. Some sources of waste can be measured, but the impact on the environment is not so easy to quantify. Two significant sources of waste generation are municipal solid waste (MSW) and industrial hazardous waste (Ahmed E. H., 2013; Gustavsson, Cederberg, Sonesson, van Otterdijk, & Meybeck, 2011; McElhatton & Pizzuto, 2012).

Now a day's plastic is the most usable material in the world. Without it, we cannot think about a single day. As we utilize it in our everyday lives, an enormous amount of waste is produced every day. Plastics are used in our daily lives in a number of applications, such as greenhouses, coatings, wiring, packaging, films, covers, bags, containers, etc. Plastic is one of the most popular building materials in modern human culture, but its widespread use has brought us many problems and caused environmental dangers of unprecedented scale. As a result, waste must be managed properly, and one of the best methods is recycling (Ahmed & Moniruzzaman, 2018).

Plastics are used in various fields these days, including engineering, automotive, construction, medical, aerospace, electrical, robotics, etc. Plastics are now a necessary component of our everyday needs. Due to its extensive use, a significant amount of waste is also produced. For this reason, there is a lot of interest in managing plastic waste. Numerous nations are updating their waste management rules concerning plastics. However, modifying legislation alone cannot resolve the growing environmental hazard. Both its implementation and public awareness of the dangerous circumstances are necessary. Thus, people only discard waste after considering its consequences (Nahar, Jihad, & Hafiza, 2023). In the city of Dhaka, the Mirpur area is heavily populated. Thus, waste output is increasing and posing several issues, particularly with plastic waste.

According to ASTM, a plastic is defined as a material composed mainly of an organic substrate of high molecular weight maintaining solidity in its final state, and, in certain stage in the manufacturing processing prior to being turned into finished product, can undergo shaping by flow. However, this definition did not mention numerous additives, coatings, or treatments included in plastic blends and composites encountered during plastics recovery prior to re-utilization. Plastics play a vital function in our everyday living due to its lightweight, versatility, low cost of production, safety and hygiene, durability, chemicals resistance, electrical and thermal insulation in comparison with its competing materials. These properties have positioned plastics to become relatively indispensable in every aspect of life (Abdelhafidia, Babaghayoua, Chabiraa, & Sebaaa, 2015). According to UNEP, about eight million tonnes of plastic is globally dumped into the oceans annually, killing marine life while also penetrating the human food chain. These pose challenges during collection, separation, and recycling of PSW. The durability of plastics causes their accumulation and persistency in the environment with estimated rate of over 25 MT per year (Adrados, et al., 2012). In 2017, approximately 267.8 million tons of total municipal solid waste were generated worldwide. Plastics production was 35.4 million tons, or 13.2 percent (Tulebayeva, Yergobek, Pestunova, Mottaeva, & Sapakova, 2020). The conversion of plastics to their constituent chemicals is often technologically difficult and not profitable. The management of plastics recovered from MSW is a most sensitive industry due to the continual increase in the quantity of plastics recovered from MSW, biodegradability difficulty, and its hazardous effect on the society. The escalating quest for plastics has resulted in accumulation of pyramids of waste plastics in landfills which has occupied vast spaces, thereby contributing to environmental challenges. Due to the versatile application of plastics in numerous areas, there has been global increment in plastics production globally. This escalating quest for plastics has resulted in petroleum depletion as component of non-renewable fossil fuel because plastics are derived from petroleum (Idumah & Nwuzor, 2019). The growth of environmental awareness and less available landfill capacity has initiated plastic waste recycling programs in most developed countries. However, only 5 to 25% of plastic waste is recycled. Their study discussed the prospects of plastic waste

7th International Conference on Civil Engineering for Sustainable Development (ICCESD 2024), Bangladesh management schemes. It was concluded that the present situation of environmental worsening is likely to continue unless long-term remedial measures are adopted (Siddiqui & Pandey, 2013).

The generated research will aid in decision-making about country-level waste collection and management, with the goal of increasing the efficiency and effectiveness of the waste collection and management system. The following are the study’s key goals:

- To find out the current plastic waste management situation in the Mirpur area.
- To determine how much plastic waste is handled in the Mirpur area over six months.

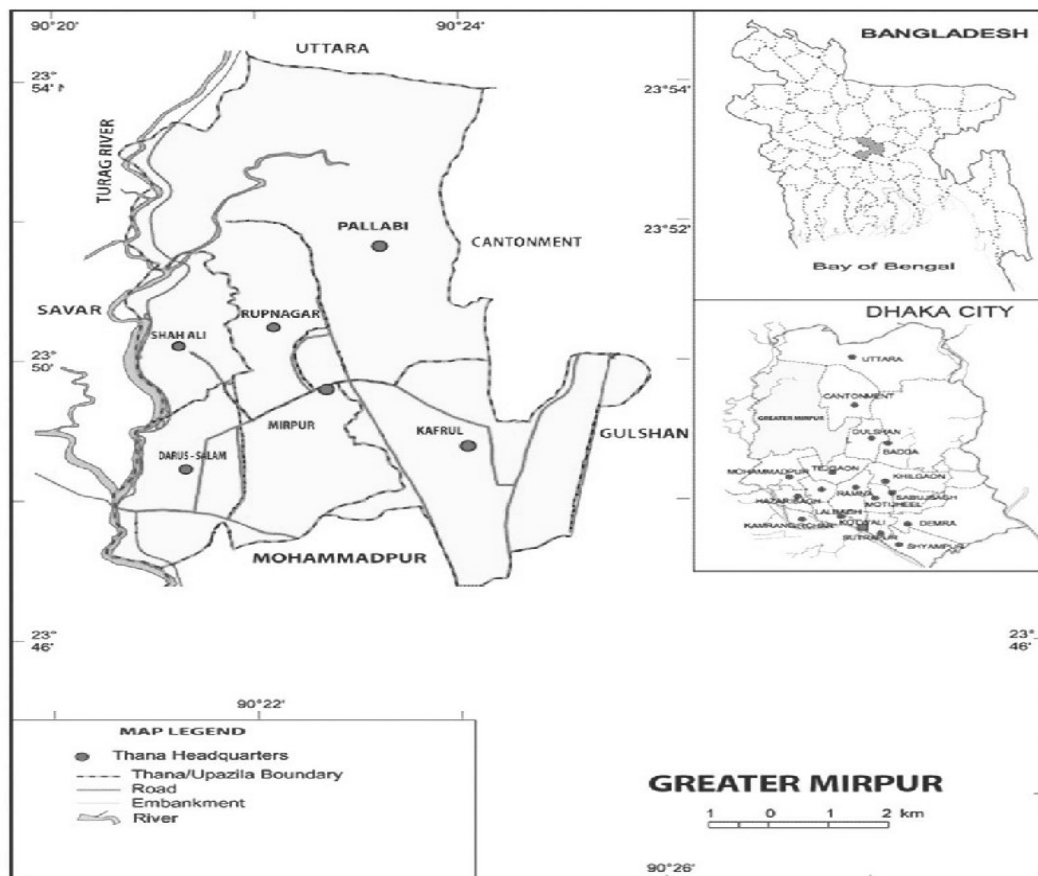
2. METHODOLOGY

2.1 General

Mirpur (Dhaka metropolitan) area 58.66 square kilometres, Population Total 632,664 located between 23° 49’ 20.4600’’ N and 90° 21’ 55.5012’’ E latitudes and in between 23.822350 and 90.365417 east longitudes. Mirpur is bounded by Mohammadpur to the south, Kafrul to the east, Pallabi to the north, and Savar Upazila to the west. It is a densely populated area. This area is occupied by many business shops, markets, offices, schools, and colleges, and tons of waste is being disposed of here. But disposal of waste is not that much of well as most of the people who live here belong to the middle class. Their average income is 30 thousand takas (source; field survey). And most of the time, they don’t use any vehicle of area corporation. And, commonly, people throw away waste beside their home and roadside area. The waste disposal system is not up to the mark here.

2.2 Study Area

The study was carried out at various locations around Mirpur. To find out how plastic waste is currently managed at Mirpur-1, 2, 6, 7, 10, 11, 11.5, 13, and 14, a survey has been executed. The map of the study area is shown in Figure 1.



2.3 Procedure and Data Collection

To find out the present plastic waste management condition, a reconnaissance survey was done in June'22 and January'23 in the Mirpur area. This survey was conducted among people who are related to the recycling process of plastic waste. A survey among primary plastic waste collectors such as feriwala, waste pickers, and plastic waste recycling shops was done. The total survey consisted of two stages

- A survey among primary plastic waste collectors
- Survey at the plastic waste recycling shops

Primary plastic waste collectors are the ones who collect waste from houses, dustbins, or other dumping places and sell it to recycle shops. They collect it from door to door. Waste collectors can be divided

into two categories: feriwala collect waste from houses, and waste pickers collect waste from dustbins or other dumping places. The locations of primary waste collectors while they are at work are unpredictable, so data is collected from their living places, having conversations with them, and from the waste shop owners.

The information about the plastic waste recycling shops is collected in three stages:

a) Finding the location of the plastic waste recycling shops: The shops that recycle plastic waste are grouped in various locations across Mirpur. These stores were found by exploring the area's roads. It is challenging to determine the precise number of stores because some dispersed stores might not be counted. There are around 242 shops detected throughout the study.

b) Categorize the shops: The stores are divided into groups based on how much plastic waste they generate daily. Small stores handle between 5 and 10 kg of plastic waste per day; medium shops handle between 11 and 20 kg of plastic waste per day; and large shops handle more than 21 kg of plastic waste per day. Due to time constraints and the fact that all stores open at similar times, it is impossible to collect information on every store.

c) Conversation with the shop owners and the workers: After categorizing the shops, detailed information about some shops is collected using a questionnaire form. This information includes the quantity of plastic waste, the type of plastic waste, the collection process of plastic waste, the recycling process, etc.

3. RESULTS & DISCUSSION

It was found in this study that waste collectors and waste recycling stores handled and processed plastic waste in Mirpur. Below is a discussion of the many categories of plastic waste, the current management system, the number of recycling shops engaged, and the amount of plastic waste collected.

Based on a field survey conducted in various locations within the Mirpur area, Table 1 shows the amount of different types of plastic waste managed by primary collectors. Table 1 shows that waste pickers collected 197 kg of plastic waste per day on June 22 and 237 kg of plastic waste per day on January 23, representing a 20.30% increase. Between June 22 and January 23, there was a 26.49% rise in the volume of plastic waste that Feriwala collected. From Table 1 & 2, it can also be seen that plastic waste is normally divided into two categories. They are soft and hard plastics. 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.

Table 1: Amount of different types of plastic waste handled by primary waste collectors

Types	Average amount collected (Kg/Day)			
	Waste Pickers		Feriwala	
	June'22	January'23	June'22	January'23
Soft Plastic	95	113	56	63
Hard Plastic	102	124	61	85
Total	197	237	117	148

From Table 2, the amount of different types of plastic handled by plastic waste recycling shops can be seen. On June 22, around 2649.67 kg of soft plastic and 397.33 kg of hard plastic were handled per day. On January 23, around 3750.10 kg of soft plastic and 499.90 kg of hard plastic were handled per day in

the plastic waste recycling shops. There was an increase of about 41.53% of plastic waste and 25.81% of hard plastic.

Table 2: Amount of different types of plastic waste handled by plastic waste recycling shops

Types of Plastic	Amount collected (Kg/Day)		Percentage (%)	
	June'22	January'23	June'22	January'23
Soft Plastic	2649.67	3750.10	86.96	88.24
Hard Plastic	397.33	499.90	13.04	11.76
Total	3047	4250	100	100

Table 3 shows the number of different types of waste recycling shops in Mirpur area. There were around 242 and 239 shops in Mirpur area in June 22 and January 23 respectively.

Table 3: Amount of plastic waste recycling shops in Mirpur Area

Location	Number of shops with type						Total	
	Large		Medium		Small		June'22	January'23
	June'22	January'23	June'22	January'23	June'22	January'23		
Mirpur-1	12	13	14	14	6	6	32	33
Mirpur-2	11	10	16	15	8	8	35	33
Mirpur-6	4	5	9	9	7	7	20	21
Mirpur-7	4	4	9	9	10	8	23	21
Mirpur-11	4	4	8	8	9	9	21	21
Mirpur-11.5	7	7	13	13	7	7	27	27
Mirpur-10	6	6	17	14	8	8	31	28
Mirpur-13	7	7	8	10	11	10	26	27
Mirpur-14	10	11	10	10	7	7	27	28
Total	65	67	104	102	73	70	242	239

From Table 4, it can be seen that, in June 22 and January 23 around 3047 kg and 4250 kg of plastic waste were handled daily in Mirpur area respectively indicating an increase of 39.48%. The highest amount of plastic waste was handled in Mirpur-1 and the lowest was handled in Mirpur-13 in June 22 and Mirpur-14 in January 23. In Figure 2, the amount of plastic waste handled in different locations of Mirpur area is shown.

Table 4: Amount of plastic waste handled in Mirpur Area based on location

Location	Total amount of plastic waste (Kg/Day)	
	June'22	January'23
Mirpur-1	1175	1270
Mirpur-2	640	880
Mirpur-6	210	315
Mirpur-7	120	285
Mirpur-11	150	324
Mirpur-11.5	367	455
Mirpur-10	165	256
Mirpur-13	105	238
Mirpur-14	115	227
Total	3047	4250

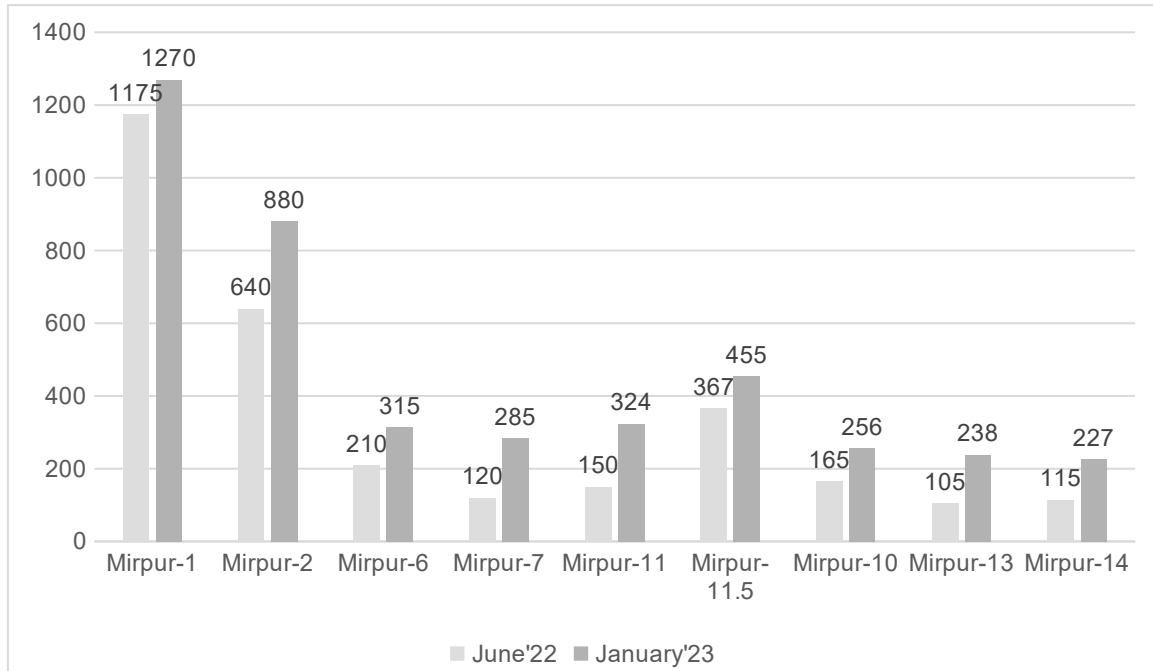


Figure 2: Amount of plastic waste handled in Mirpur Area based on location



Figure 3: Plastic waste recycling scenario in Mirpur area

Waste management helps to reduce pollution, and by adapting to effective waste management practices, emissions of gases such as carbon dioxide and methane from waste can be significantly reduced. It also helps to prevent infectious diseases (Sheppard, Garcia-Garcia, Stone, & Rahimifard, 2020). From the field survey, the present plastic waste management status in Mirpur area can be identified, which is shown in Figure 4.

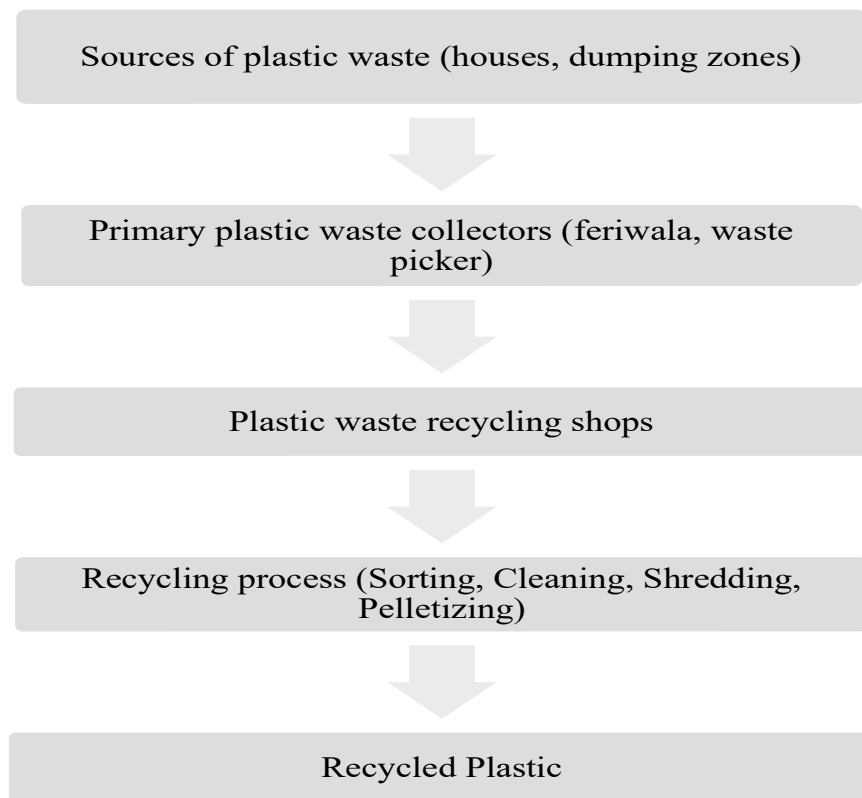


Figure 4: Present Plastic Waste Management Status

In Table 5, the SWOT analysis of plastic waste management system is shown.

Table 5: SWOT analysis of plastic waste management system

Strengths	<ul style="list-style-type: none"> • Frequent collection of plastic waste • Development of platforms for the acquisition and recycling of plastic waste
Weaknesses	<ul style="list-style-type: none"> • Inefficient sorting of plastic waste
Opportunities	<ul style="list-style-type: none"> • Employment • Receiving external support from government and industry associations
Threats	<ul style="list-style-type: none"> • Availability of plastic waste treatment facilities in the region • Health and environmental risks

4. CONCLUSIONS

Based on this study, it can be found that primary plastic waste collectors collect an average amount of 314 kg/day and 385 kg/day of plastic waste from residences, dustbins, and disposal areas in June'22 and January'23, respectively. After that, they sell the plastic waste to various waste recycling shops. Recycling shops separate discarded plastic (3047 kg/day and 4250 kg/day in June'22 and January'23, respectively) and begin additional processes like shredding, pelletizing, cleaning, and sorting. According to this study, the plastic waste generated in the Mirpur area over 6 months increased by around 39.48%. The number of large category shops grew even while the overall number of plastic waste recycling shops decreased slightly.

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