Smart Household Garbage Disposal Approach in Urban Neighborhoods of Bangladesh: A Case Study at Kallyanpur in Dhaka North City Corporation

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Certificate of Approval

The project report entitled "Smart Household Garbage Disposal Approach in Urban Neighborhoods of Bangladesh: A Case Study at Kallyanpur in Dhaka North City Corporation" by Mobasshara Ahmad Snigdha, Exam roll no: 111215, Registration no: 2015117814 and session: 2020-21, is hereby approved as a creditable study of Geography and Environment carried out and presented in a manner satisfactory to warrant its acceptance as a pre-requisite for the degree to which it has been submitted.

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Student Declaration

This project report is submitted to the Department of Geography and Environment, University of Dhaka, in partial fulfillment of the requirement for the degree of Masters of Science (MS).

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Abstract

Waste management is not the sole responsibility of the government rather it can be efficiently managed with proper public participation at all levels. Currently, waste is simply dumped regardless of its type and nature which is unnecessarily adding up to the total amount of waste in the landfills creating economic loss and environmental hazards. This issue can easily be handled if only we introduce source-based smart waste segregation practice at the very beginning of waste generation which is in our homes and neighborhoods. This study addresses the issues that are currently present in the solid waste disposal system and suggests a smart solution to it that initiates from the neighborhood level. It also tries to find out what are peoples' perspectives towards this new approach and whether or not they are willing to participate by changing their waste disposal habits for greater national interests using methods like Sampling, Questionnaire Survey, Personal Interviews, and Focus Group Discussion. Finally, it concludes with what changes are necessary to implement this new idea in the waste management system of Dhaka North City Corporation.

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Chapter 1

Introduction

1.1 Introduction

Research comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humans, culture, and society, and the use of this stock of knowledge to devise new applications. It is used to establish or confirm facts, reaffirm the results of previous work, solve new or existing problems, support theorems, or develop new theories.

A research project may also be an expansion of past work in the field. To test the validity of instruments, procedures, or experiments, research may replicate elements of prior projects or the project as a whole. The primary purposes of basic research which is opposed to research are documentation, discovery, interpretation, or the research and development of methods and systems for the advancement of human knowledge. Approaches to research depend on epistemologies, which vary considerably both within and between humanities and sciences.

For acquiring knowledge through practical observation there is no other way without observing different physical and socio-economic conditions of various regions of a country. Geographers use spatial analysis to define a particular region that process is based on practical analysis rather than descriptive methods. Usually, as a student of Geography and Environment, we try to learn many important aspects through it.

Although the time span of the project was limited to a few months, Observations, regarding the current household solid waste disposal practice, its shortcomings, and peoples' perceptions regarding source-based segregation in the study area were noted throughout the field study. The focus of the research report would be on the general drinking water sources and the adjustment strategies of the local people inhabiting there.

1.2 General Background

Dhaka City, one of the fastest-growing megacities in the world, is undergoing continuous changes and modifications due to the unplanned hasty urbanization process. As the growth of urbanization takes place at an exceptionally rapid rate the city is unable to cope with the changing situation due to internal resource constraints and management limitations. One of the most critical problems as a result of this is solid waste management.

Dhaka is holding on to a traditional waste management system that has changed little since its independence in 1971. This system allows indiscriminate and open dumping and burning, and disposal of waste into the air, water bodies, landfills, etc. directly. Even after 50 years, such behavior continues unabated and is treated as normal.

Traditional methods are no longer sufficient now to handle this situation. To ensure environmental hygiene and sustainable urban life, smart, sustainable, and integrated solid waste management systems are proposed instead. The generation of solid waste is a major problem in urban areas; thus, its management is one of the important obligatory functions not only for the urban local authority but also for the inhabitants.

Neighborhood-based waste management programs offer populations in low and middle-income countries where there is no, or inadequate, municipal waste management services a low-cost, effective, and engaging waste management system.

1.3 Significance of the Study

There have been many research works that explain the current solid waste management system and how it works. But relatively few studies focus specifically on the collection of source-separated household waste by applying the neighborhood approach in the waste management system.

As we are a country with a limited number of resources, it is very important we assess the feasibility of any idea in the context of reality and use the most sustainable approach possible. Otherwise, without these necessary modifications required by a particular condition of an area, any good idea might fail to draw a positive impact. This work hopes to bridge this gap between traditional concepts and the existing reality which requires a smart, sustainable, and integrated household solid waste disposal system.

1.4 Aim and Objectives of the Study

The aim of this study is to explore how initiating a smart waste disposal approach at the neighborhood level in Dhaka North City Corporation.

The specific objectives of the research project are-

- ✓ To study the current solid waste disposal practice and its shortcomings in the S. A. Khaleque Residential Area, Kallyanpur in Dhaka City.
- ✓ To investigate how initiating a smart waste disposal approach at the neighborhood level can help the current situation.
- ✓ To find out peoples' perceptions towards this new approach and the necessary measures to implement it.

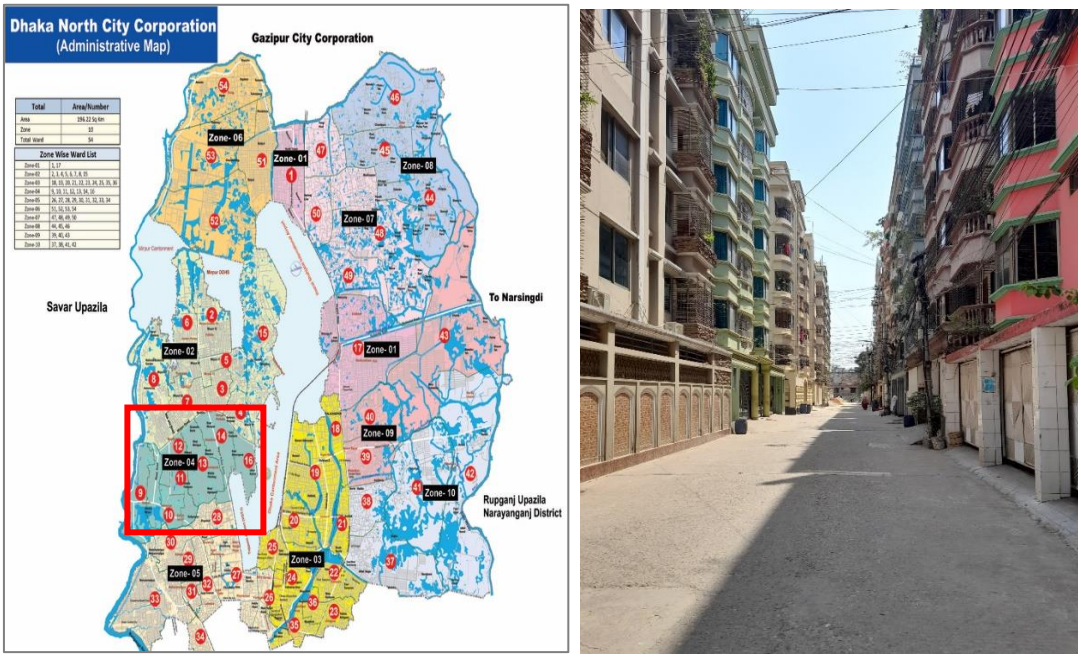
1.5 Study Area

Kallyanpur is a place under Mirpur Thana in Dhaka North City Corporation. This place is known mostly for being the starting point for travelers boarding buses to different parts of the country. But the area isn't just limited to its bus counters. It has a lot more on offer. Mostly, the residential neighborhood has seen a lot of progress in recent years.

It acts as a junction for the nearby areas of Mirpur South, Shyamoli, Gabtoli, and Sher-e-Bangla Nagar. And it's also one of the western edges of Dhaka city proper, serving as a gateway to the North of the country. With numerous housing estates, markets, shops, and a few factories, this place offers a perfect scope to conduct the necessary survey and samplings regarding waste management practices. Particularly, we selected the S. A. Khaleque Residential Area to conduct our project field study.

Basic info of Sreenagar Upazilla

- ⇒ S. A. Khaleque Residential Area
- ⇒ Dhaka North City Corporation (DNCC)
- ⇒ Zone- 04
- ⇒ Ward- 10
- ⇒ Number of Buildings- 52



Source: DNCC Waste Report 2018-19; Questionnaire Survey 2023

Fig 1.1: Location of the Study Area in DNCC

1.6 Limitations of the Research:

A number of problems were there to be faced. Some of them are as follows:

- **The short period of Observation:** The overall period of observation was very short, summing up to a total of three hours only. Hence thorough investigation into the study area was not possible.
- **Overgeneralization:** This report is being prepared on the basis of findings from a total of four interviews of the dwellers in the study area. As proper data analysis from all the researchers was not possible to accumulate, the study suffers from a lack of diversity among perspectives.
- **Biased Responses**: The respondents are often found biased toward the issues which we are investigating.
- **Area Coverage by the Researcher:** It was not possible for every researcher to cover the whole of the study area which occupies a large area.
- **Insufficiency of secondary data:** The number of prior research conducted is less. As a second-year students, we had limited knowledge about how to collect data interviewing respondents.

From my point of view, these limitations hampered the project to some extent.

1.7 Conclusion

In order to acquire profound knowledge and practical experience there is no alternative but a field survey. A survey can modify a potential amateur into an efficient person. (Jerin, 2013). At the end of this chapter, it can be said that the aim and objectives of the study have a definite destination.

Chapter 2

Methodology

2.1 Introduction

The methodology describes the procedures to be followed for carrying out research. It also explains the tools/methods to be used and how they will be used for the collection and analysis of information relevant to the research work. The study has used data from primary and secondary sources. Further information has been collected from different sources like books, websites, reports, and studies conducted by donors, the UN, NGOs, etc.

2.2 Types of Data Collected

(a) Primary Data

Primary data was mainly collected through questionnaires, informal discussions, and consultation meetings with the locals and high-ranking officials. The sources were-

- ***Observation:*** Observational research is a type of correlational research in which a researcher observes ongoing behavior. There are a variety of types of observational research, each of which has both strengths and weaknesses. These types are organized below by the extent to which an experimenter intrudes upon or controls the environment. Observational research is particularly prevalent in the social sciences and in marketing. It is a social research technique that involves the direct observation of phenomena in their natural setting. Here, I tried to observe the current waste disposal conditions in the study area. Besides, I captured many photographs that are relevant to the purpose of the study.
- ***Sample Survey:*** A sample survey is a study that obtains data from a subset of a population, in order to estimate population attributes. I made a questionnaire to survey the residents and workers of the housing area. In total 52 respondents were approached with the questionnaires.
- ***Personal Interview:*** also called a face-to-face survey, is a survey method that is utilized when a specific target population is involved. The purpose of conducting a personal interview survey is to explore the responses of the people to gather more and deeper

information. Personal interview surveys are used to probe the answers of the respondents and at the same time, to observe the behavior of the respondents, either individually or as a group. The personal interview method is preferred by researchers for a couple of advantages. But before choosing this method for your own survey, you also have to read about the disadvantages of conducting personal interview surveys.

- ***Questionnaire:*** A questionnaire is a research instrument consisting of a series of questions (or other types of prompts) for the purpose of gathering information from respondents. Questionnaires are often designed for statistical analysis of the responses; this is not always the case. Questionnaires have advantages over some other types of surveys in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys, and often have standardized answers that make it simple to compile data. However, such standardized answers may frustrate users. Questionnaires are also sharply limited by the fact that respondents must be able to read the questions and respond to them. We made two types of questionnaires; one is for households and the other is for focused group discussion.
- ***Focus Group Discussion:*** A Focus Group Discussion (or FGD) is a qualitative research method in the social sciences, with a particular emphasis and application in the developmental program evaluation sphere. FGDs are predetermined semi-structured interviews led by a skilled moderator. The moderator asks broad questions to elicit responses and generate discussion among the participants. The moderator's goal is to generate the maximum amount of discussion and opinions within a given time period. We divided it into some parts and conducted a discussion. The workers at the Secondary Transfer Station of the study area took part in it as they share a close relationship with the topic of interest in this research.

(b) Secondary Data

Secondary data is to be used to understand the background of the study area, maps, images, and other relevant information have been collected from BBS census reports, journal articles, books, newspapers, and from various internet sources that are related to the objectives of our study.

2.3 Working Procedure

This includes the way the data to be collected were selected and obtained, the fieldwork and data collection, and finally the processing of the obtained data. Hence the methodology of the fieldwork could be broken down into three major segments:

(1) Pre-field Work Preparations

(2) During Fieldwork

(3) Post-field Work Data Processing and Analysis

<u>(1) Pre-field Work Preparations</u>

This part comprises of-

- Site selection
- Collection of Google Earth Image
- Preparing questionnaire

- **Site selection- S**electing the right survey area was a huge task, especially considering the limited amount of time allocated to conduct the field study. I wanted to select an area where I can see the solid waste disposal practices and which can be used as a testing sample. Besides, it needed to be located at a short distance to reduce the amount of traveling time. Finally, after a few discussions with my honorable supervisor, we decided to select the S. A. Khaleque R/A as our study area keeping all these things in mind.

- **Collection of Google Earth Image:** Google Earth Image was downloaded which helped in locating features in the study site during the fieldwork. The required maps were then printed and used.

Fig 2.1: Collecting Google Earth images for field work (*Source: Questionnaire Survey 2023*)

- **Preparing questionnaire:** A questionnaire was developed to obtain quantitative and qualitative data about the waste disposal conditions and public perception in the study area. The questionnaire helped to obtain quantitative data to assess the aspects such as demographic information, household-related information, waste management practices, health-related information, and environmental information.

(2) During Field Work

Field survey: Identifying the location using a map and determination of features in the study area. Comparing the feature with the map. Redrawing will be done if we find any changes. New features will be drawn in the field. Specific numbers will be assigned to the features.

Questionnaire survey: A questionnaire survey has been carried out simultaneously with the field survey. In total 52 questionnaires were completed. The questionnaire contained both structured

and semi-structured questions and collected data on the socioeconomic, household, waste disposal practice, health, and environmental aspects. It has four major queries-

a) **Assess People's Perception**
b) **Required Space and Installation Cost**
c) **Perception of the Waste Collectors**
d) **Secondary Transfer Station (STS) Data**

a) Assess People's Perception

A questionnaire survey will be done using simple random sampling for acquiring data. A detailed questionnaire will be made for the collection of primary data focusing on queries like-

- Are people satisfied/unsatisfied with the existing SWM practice?
- Do they practice segregated/non-segregated waste dumping?
- Are they willing to dump in separate waste bins?
- Are they willing to pay for better services?
- Organic waste – how do you manage it?
- Community composting- preferred or not?
- Recyclable waste -Do they sell/ dump?
- On-site utilization of valuable and reusable items- Interested to participate/not?
- Preferred agents – private/ govt?

b) Required Space and Installation Cost

Here we need to analyze what amount of space is needed to install the bins in each building and whether or not this amount of space is currently available there. Also, the cost of installation should be calculated. Here we will try to find answers to issues like-

- What amount of space is needed to install the bins?
- Whether or not this space is currently available?
- If not, are you willing to create this space?

- What would be the installation costs?
- Are you willing to pay for it on your own?

c) Perception of the Waste Collectors

We should also take into account how this change is taken by the local waste collectors and how it might affect and change their way of participating in this process. We need to find-

- Whether or not they are aware of basic waste types
- If they received any training on this?
- How do they think it can affect their jobs?
- Current monthly income from waste collection

d) Secondary Transfer Station (STSs) Data

Secondary data will be gathered from published and unpublished research reports, journals, books, and newspapers as well as from records and documents of relevant institutions to perform a critical structure observation of the existing STSs system and compare it with the proposed one considering-

- Amount of generated waste- before and after
- Waste collection frequency- same/ changed?
- Transportation costs- before and after
- Number of workers needed in the STS

(3) Post-field Work Data Processing and Analysis

Collected data were entered into a frequency table and processed in SPSS for analysis. Primary and secondary data were analyzed both quantitatively and qualitatively. According to the nature of the data and interpreted. Data tables, graphs, and charts were produced and presented in the study findings section. Data acquired from the field survey were processed by using various GIS and Remote Sensing software such as ArcGIS, ERDAS Imagine, Microsoft Excel, etc.

2.4 Limitations of the Study

- Time constraints in every task were the major problem to carry out this project task.
- Surveyors are not professional and responses vary from person to person which makes the complete study difficult.
- Identification of objects on the map often becomes difficult because of the tree canopy.
- Data can be affected by the characteristics of both respondent and the interviewer.
- The respondent may not provide accurate or complete information.
- The resolution of google earth images is low.

2.5 Conclusion

To undertake the mammoth task, different groups of people were interviewed. With their collective contribution and my hard work, a successful field study has been undertaken and I was able to produce primary data and summarize the dataset for further analysis which will give an idea about the current waste disposal gaps and public perception of source-based segregation.

Chapter 3

Literature Review

3.1 Introduction

Dhaka, the capital and the largest city of Bangladesh, has experienced remarkable economic development since the 1990s in association with the country's rapid Gross Domestic Product (GDP) growth. Accordingly, waste generation has increased rapidly, and its composition has become complicated. Such economic growth leads to higher living standards for residents, who pay more attention to waste cleaning services provided by the local government. It is fundamentally vital for local governments to equip a communication channel to connect the government's cleaning activities with communities for mutual understanding and cooperation.

Although many efforts have been taken to make the city cleaner as a pioneer of waste management in Bangladesh, the DNCC jurisdiction became larger in 2017 corresponding to the autonomous expansion of the urban area, and various issues have yet to be solved.

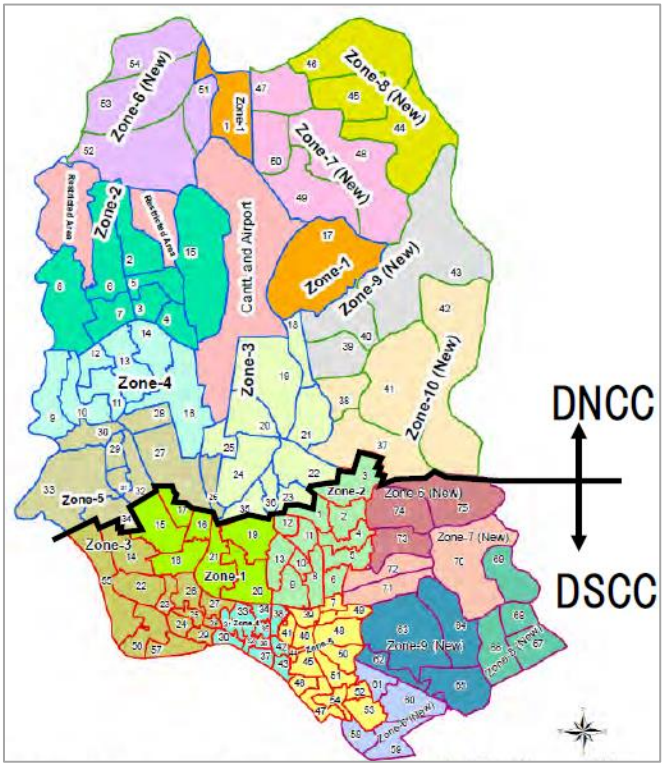


Fig 3.1: DNCC Jurisdiction of Dhaka City (*Source: JICA Project Team 2019*)

3.2 Existing Waste Management of Dhaka City Corporation

Primarily The DCC (Dhaka City Corporation) is liable for collecting and managing waste in Dhaka, Bangladesh. In spite of the limited waste management service of Dhaka, door-to-door community-based waste collection from households to local dust bins is considered a success. Informal waste recycling systems are also highly fruitful in waste recycling and job creation for the poor. Wastes are normally collected in a non-segregated manner and placed into little containers in households. Wastes are then collected by organizations delegated by DCC in vans to the secondary collection points. Waste trucks then carry the waste to the landfill sites. A significant portion of the solid waste is operated by an informal market to be recycled. Scavengers (Tokais) collect the recyclable items from landfills and open dustbins and then sell those to a waste recycling dealer (Bhangari). The items are then washed, dried, and sorted by the recycling dealers and traded in the market.

Fig 3.2: Existing solid waste management system in DCC (*Source: Shamsuddoha M. 2009*)

3.3 DNCC Generated Waste Volume

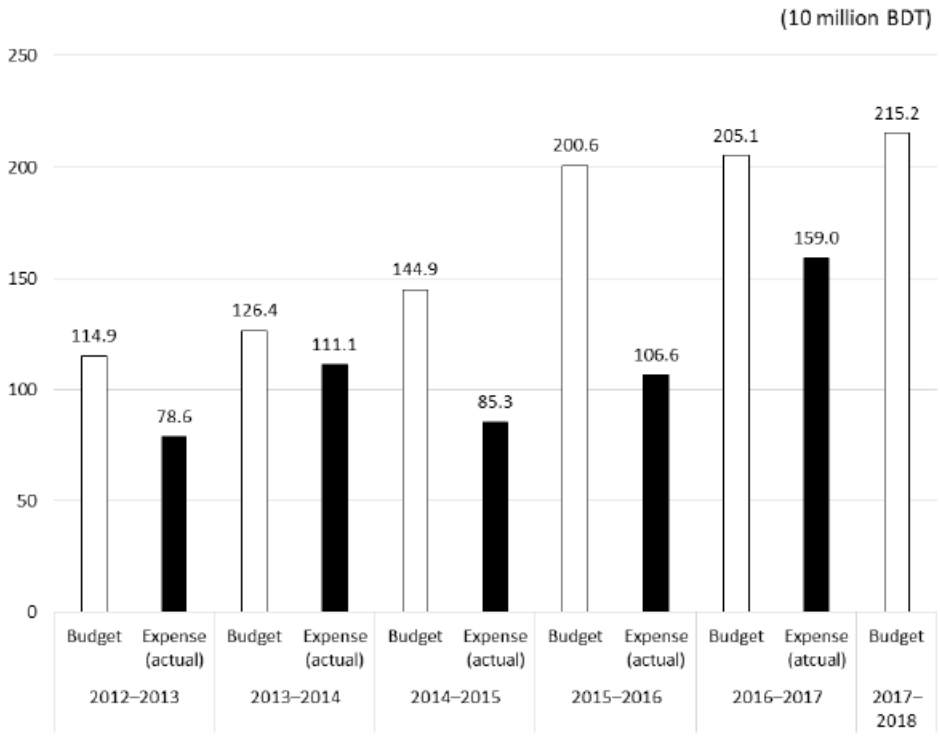
DCC (North) might have to manage over 5637728-ton waste in the next 5 years. The growth percentage of waste collection in 2015-17 and the projected waste volume in DNCC between 2017-18 and 2021-22 are appended in the chart below:

(Source: DNCC Waste Report 2016-2017)

Fig 3.3: Projected waste volume in DNCC during the period between 2021-22

3.4 Expenditures Related to Solid Waste Management

The expenditures of the WMD during the last five years are shown in Fig. 3-3, and the breakdown is shown in Table 3-4. The total SWM expenditures increased in FY 2012–2013 and reached approximately Tk. 1.59 billion in FY 2016–2017, of which 86% and 14% were revenue and development expenditures, respectively. DNCC set a budget of Tk. 23.9 billion for FY 2017–2018 as shown in Fig. 3-3; of this, the SWM budget accounted for 9%, at Tk. 2.15 billion. The conservancy tax income was Tk. 670 million, which is insufficient for covering the total expenditures of SWM.



(Source: DNCC Budget Book 2017–2018)

Fig 3.4: Expenditures Related to Solid Waste Management in DNCC

3.5 Operation-wise Solid Waste Management Expenditure

The operation-wise expenditures of SWM were analyzed as shown in (Fig. 3.5) The SWM operation in DNCC is categorized into four types:

i) Cleaning of roads and drains,
ii) ii) Collection and transport,
iii) iii) Landfill operation, and
iv) iv) Repair works.

The first two categories account for 44% each, and the second two account for 6% each. According to the JICA Project Team analysis based on the DNCC Budget Book 2016–2017, the operation-wise expenditures of Solid Waste Management were analyzed and shown with the following diagram-

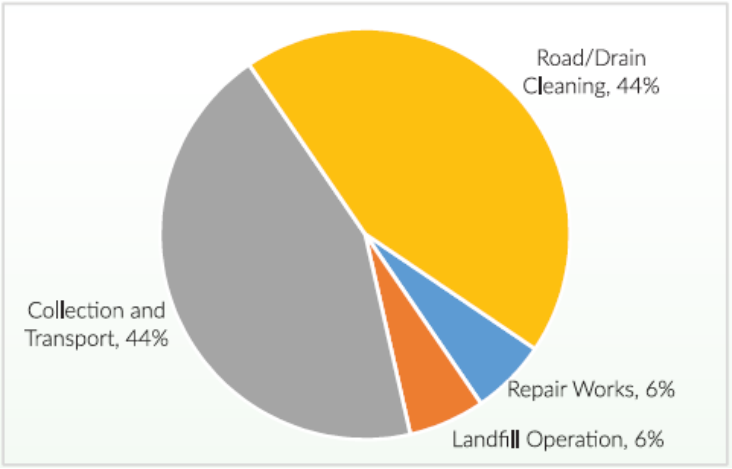


Fig 3.5: Operation-wise SWM Expenditures *(Source: DNCC Budget Book 2017–2018)*

3.6 Solid Waste Generation

3.6.1 Household Waste

Households waste is divided into three categories depending on income level: high income, medium income, and low income. The waste generation amount, population, and unit generation rate in each category are summarized in Table 3.1, based on the survey results collected in 2018 by the JICA Project Team. As of FY 2017–2018, the total waste generation amount was estimated to be 2,137 tons/day associated with a population of 4.8 million; this does not include the population of the expansion area newly added in DNCC in mid-2017. However, the population and amount of waste generated in FY 2018–2019 consider this expansion area.

Table 3.1: Estimated Household Waste Generation by Income in FY 2017–18 and FY 2018–19

Category	Unit Generation Rate[1]	Population[2] (2017–2018)	Waste Generation (2017–2018)	Population[2] (2018–2019)	Waste Generation (2018–2019)
High income	496 g/person/day	1,469,237	728 tons/day	1,511,913	747 tons/day
Medium income	483 g/person/day	2,595,168	1,253 tons/day	3,209,816	1,551 tons/day
Low income	193 g/person/day	767,941	151 tons/day	1,383,935	269 tons/day
Total	—	4,832,346	2,132 tons/day	6,105,664	2,567 tons/day

(*Source: DNCC New Clean Dhaka Master Plan 2019*)

Table 3.2 shows the household waste generated in FY 2017–2018 and FY 2018–2019; the amount of waste in the latter includes the extension area. The waste generated in the existing 36 wards by a population of 4.8 million was 2,132 tons/day in FY 2017–2018; 2,567 tons/day was generated by 6.1 million people in the total 54 wards.

Table 3.2: Estimated Household Waste Generation by Ward in FY2017–2018 and FY2018–2019

		2017–2018		2018–2019				2017–2018		2018–2019	
Category	No.	Population	Waste (tons/day)	Population	Waste (tons/day)	Category	No.	Population	Waste (tons/day)	Population	Waste (tons/day)
Existing Ward	1	200,104	96	202,613	96	Existing Ward	29	59,758	26	60,507	27
	2	165,792	81	167,871	82		30	203,751	90	206,306	91
	3	103,343	50	104,639	51		31	56,095	27	56,799	27
	4	82,145	40	83,175	41		32	79,664	39	80,662	40
	5	128,939	63	130,556	64		33	125,278	53	126,848	54
	6	178,785	87	181,027	88		34	116,317	49	117,775	49
	7	124,179	60	125,736	61		35	80,860	35	81,874	36
	8	121,451	59	122,974	60		36	77,492	33	78,464	33
	9	77,794	34	78,769	34	New ward	37	28,384	10	95,799	32
	10	95,936	38	97,139	38		38	30,749	11	103,780	35
	11	105,930	44	107,258	46		39	72,215	24	243,735	83
	12	127,229	52	128,825	52		40	75,162	25	253,683	86
	13	171,620	65	173,771	65		41	21,288	7	71,849	25
	14	178,815	89	181,057	90		42	4,896	2	16,524	6
	15	189,781	93	192,160	95		43	9,825	3	33,161	11
	16	155,470	77	157,420	78		44	13,739	5	46,370	16
	17	214,493	98	217,183	100		45	17,685	6	59,690	21
	18	69,449	31	70,319	31		46	14,427	5	48,692	17
	19	105,120	50	106,438	50		47	43,358	15	146,340	49
	20	107,660	51	109,010	51		48	42,726	14	144,207	48
	21	104,923	51	106,239	52		49	43,329	14	146,241	49
	22	175,015	83	177,209	83		50	44,000	15	148,507	49
	23	69,609	28	70,482	28		51	12,447	4	42,011	14
	24	112,743	26	114,156	26		52	14,266	5	48,150	17
	25	108,871	45	110,236	45		53	12,737	4	42,988	14
	26	74,099	36	75,028	37		54	12,072	4	40,744	13
	27	98,496	48	99,731	49	Total		4,832,346	2,132	6,105,664	2,567
	28	72,034	31	72,937	32						

Source: JICA Project Team analysis based on BBS "Population Census 2011," "Population Projection of Bangladesh 2011–2061," and "Waste Amount and Composition Survey Report (2018)"

3.6.2 Street Waste

In the survey results gathered by the JICA Project Team in 2018, variation occurred in the unit generation rate of street waste by zone. As of the FY 2017–2018, the total waste generated was estimated to be 331 tons/day with a population of 4.8 million; in FY 2018–2019 was 431 tons/day with a population of 6.1 million. The increments of street waste were set at 1% per year.

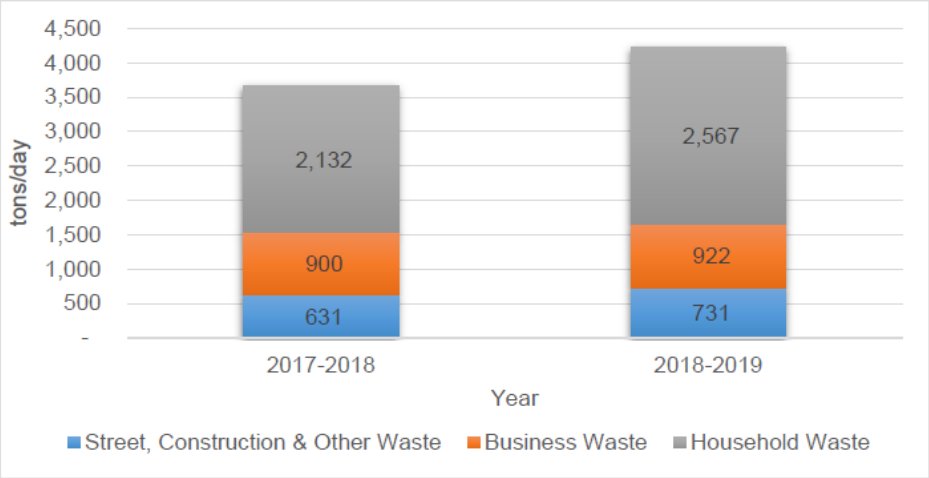
Table 3.3: Estimated Street Waste Generation in FY 2017–2018 and FY 2018–2019

Unit Generation Rate by Ward[1]	Population[2] (2017–2018)	Waste Generation (2017–2018)	Population[2] (2018–2019)	Waste Generation (2018–2019)
24–427 g/person/day	4,832,346	331 tons/day	6,105,664	431 tons/day

Source:
[1] JICA Project Team, "Waste Amount and Composition Survey Report (2018)"
[2] BBS "Population Census 2011" and "Population Projection of Bangladesh 2011–2061"

3.7 Total Waste Generation

The total waste generation of the three aforementioned waste types—household waste, street waste together with partial construction waste, and business waste—was approximately 3,663 tons/day in FY 2017–2018 and 4,220 tons/day in FY 2018–2019.



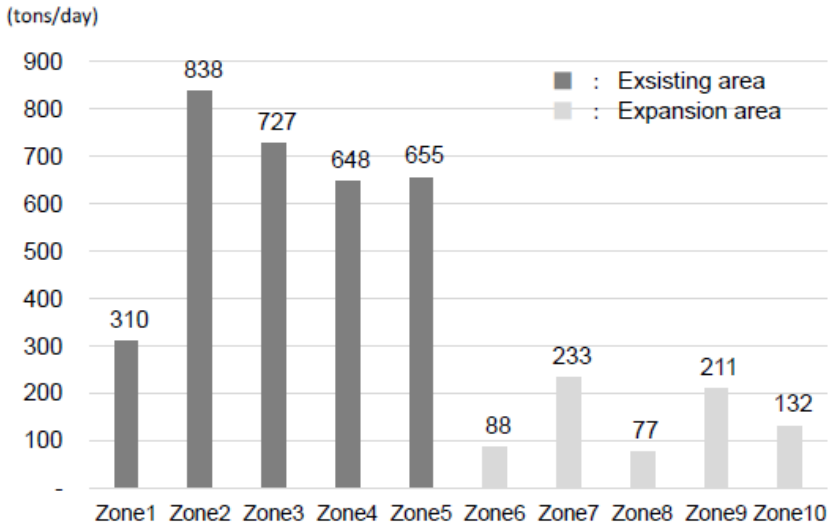
Source: JICA Project Team analysis based on BBS "Population Census 2011," "Population Projection of Bangladesh 2011–2061," "Economic Census 2013," and "Waste Amount and Composition Survey Report (2018)"

Fig 3.6: Estimated Waste Generation by Waste Type

3.8 Waste Generation by Zone

The waste generation by zone in the FY 2018-19 is shown in Fig. 3-6. The zonal average of waste generation is estimated at 392 tons/day with the maximum at 838 tons/day in Zone 2, and the minimum at 77 tons/day in Zone 8. Waste generation in the existing area is 3,179 tons/day, and

741 tons/day in the expansion area (81% and 19% of the total waste generation respectively). The zonal waste generation reflects the population size and business activities in each zone.



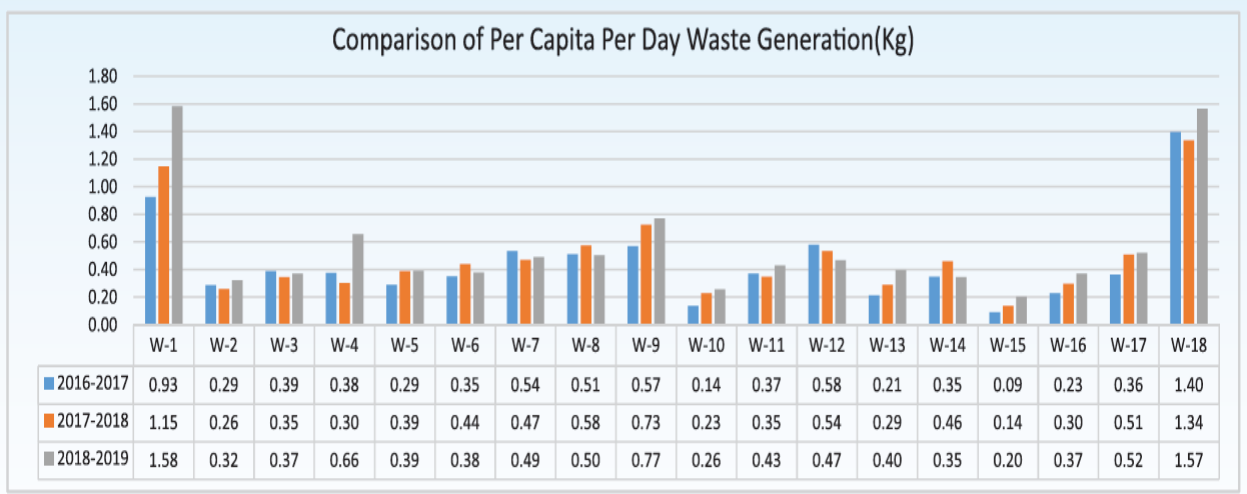
Source: JICA Project Team analysis based on BBS "Population Census 2011," "Population Projection of Bangladesh 2011–2061," "Economic Census 2013," and "Waste Amount and Composition Survey Report (2018)"

Fig. 3.7: Estimated Waste Generation by Zone

3.9 Per Capita Waste Generation

Due to economic and employment opportunities, people's life-style has been changed in Dhaka City. Per capita waste generation has increased by 31.2%, 12.1%, and 11% in FY 2016-2017, FY 2017-2018, and FY 2018-2019 respectively. In 2018-2019, per capita per day waste generation is found 0.641Kg which was found 0.575Kg and 0.513Kg in 2017-2018 and 2016-2017 respectively.

Per capita, waste generation varies from ward to ward due to economic status and lifestyle patterns. People in Ward-26 (Kawran Bazar area) have been generating much more waste compared to other wards and per capita per day waste is 1.88 Kg. Per capita waste generation in Ward-1 (Uttara). Ward-19 (Gulshan area) and Ward 21 (Niketon area) are found to be higher than the other wards. Per capita per day waste in different wards is highlighted in the following subsequent charts:



	W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8	W-9	W-10	W-11	W-12	W-13	W-14	W-15	W-16	W-17	W-18
2016-2017	0.93	0.29	0.39	0.38	0.29	0.35	0.54	0.51	0.57	0.14	0.37	0.58	0.21	0.35	0.09	0.23	0.36	1.40
2017-2018	1.15	0.26	0.35	0.30	0.39	0.44	0.47	0.58	0.73	0.23	0.35	0.54	0.29	0.46	0.14	0.30	0.51	1.34
2018-2019	1.58	0.32	0.37	0.66	0.39	0.38	0.49	0.50	0.77	0.26	0.43	0.47	0.40	0.35	0.20	0.37	0.52	1.57

Fig. 3.8: Per Capita Waste Generation by Ward (*Source: DNCC Waste Report 2018*)

3.10 Solid Waste Composition

The waste composition survey was conducted during the Master Plan preparation by the JICA Project Team. The collected waste in the survey was sorted into 16 types, as shown in Table 3.4

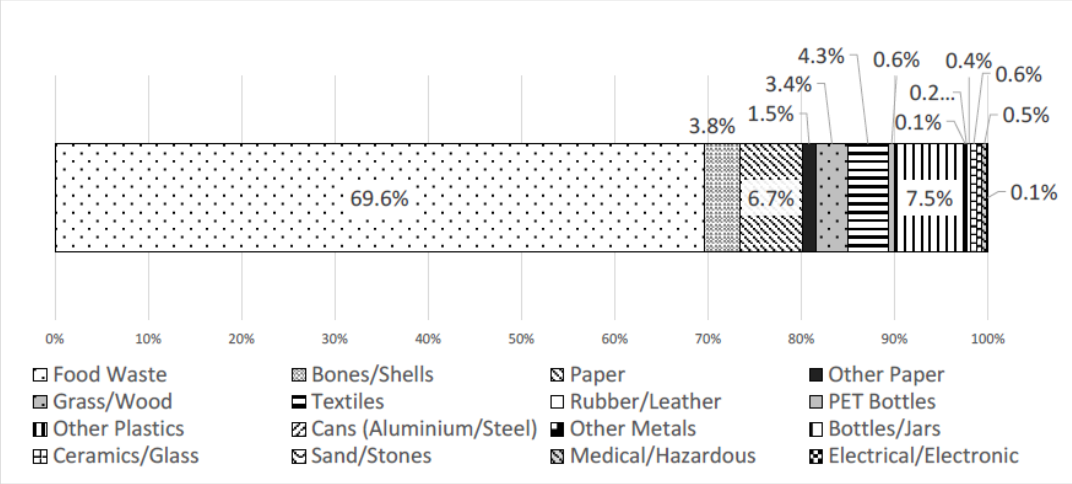
Table 3.4: Types of Waste by Composition

Waste Type	
1. Food Waste	9. Other Plastics
2. Bones/Shells	10. Cans (Aluminum/Steel)
3. Paper	11. Other Metals
4. Other Paper (including disposable diapers and sanitary napkins)	12. Bottles/Jars
5. Grass/Wood	13. Ceramics/Glass
6. Textiles	14. Sand/Stones
7. Rubber/Leather	15. Medical/Hazardous
8. PET Bottles	16. Electrical/Electronic

(Source: DNCC Waste Report 2018)

3.10.1 Household Waste Composition

The composition of household waste is shown in Fig. 3-8. Food Waste accounted for 69.6% of the total waste, which is the highest proportion. Other Plastics and Paper each accounted for approximately 7%.



Source: JICA Project Team, "Waste Amount and Composition Survey Report (2018)"

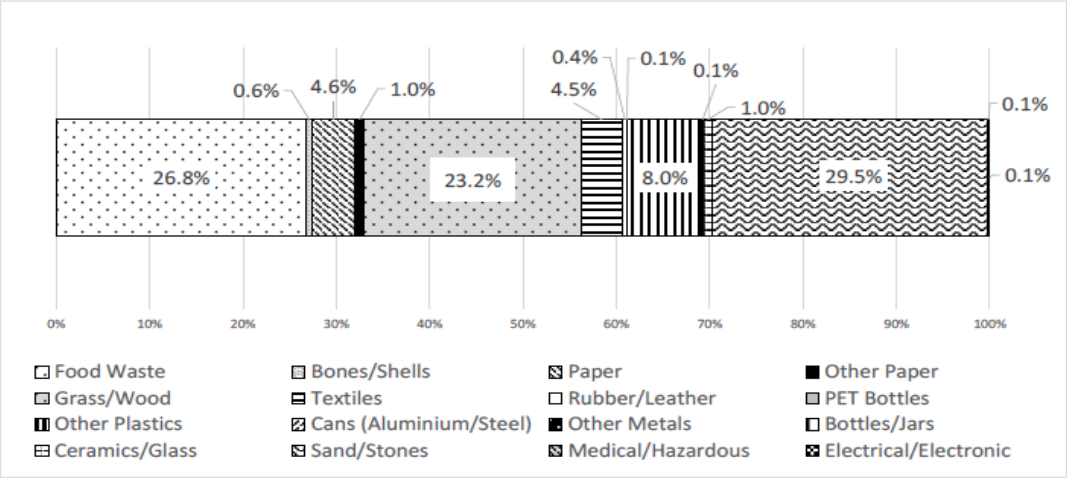
Fig 3.9: Composition of Household Waste

3.10.2 Street Waste Composition

Street waste means the soil material collected through various routine highway maintenance activities, including street sweeping, ditch cleaning (ditching), and cleaning out catch basins and other stormwater management infrastructures.

Motor vehicles deposit oil, rubber, and mud; in addition, there is sometimes accidental spillage of a vehicle's load. Animals drawing vehicles deposit excrement on the road surface. At large construction sites, mud is often carried out by motor vehicles and deposited on adjacent roads; in wet weather, this can cause danger to other traffic by skidding. Traffic wastes are largely unavoidable but some legislative control is possible in the cases of load spillage and construction.

The composition of street waste is shown in Fig. 3-9. Sand/Stones, Food Waste, and Grass/Wood accounted for more than 20% of the street waste generated. Paper, Textiles, and Other Plastics also made-up significant proportions.



Source: JICA Project Team, "Waste Amount and Composition Survey Report (2018)"

Fig 3.10: Composition of Street Waste

3.11 Current Waste Flow

a) Primary Waste Collection

Waste collection from the points of generation, or households and buildings, is generally considered to be a primary collection. A door-to-door waste collection system is common in almost all wards of DNCC to accommodate the high population density and long distances to SCPs. The business entities providing primary collection or door-to-door collection services are recognized as PCSPs or primary waste collection service providers (PWCSP). Heads of households and land occupiers under City Corporations are responsible for carrying their waste to collection points where dustbins or containers are located and to secondary transfer stations (STSs). In general, CBOs, NGOs, private companies, housing societies, and individuals are common PCSPs.

According to the survey conducted by the JICA Project Team in 2018, approximately 454 PCSPs are regularly working in the DNCC area. An association of PCSPs in DNCC, known as the Primary Waste Collection Service Providers Association (PWCSP Association), was formed to cater to the well-being of PCSPs and their workers. However, the participation of PCSPs is currently only 55%; that is, of 454 PCSPs, 206 PCSPs do not belong to the PWCSP Association.

The selection and acknowledgment process of the PCSP is neither fully transparent nor legitimate. Local political leaders often control the primary collection business because many PCSPs are not registered at DNCC. This situation is considered to be a severe problem that hinders the improvement of PSCPs to be legally and properly controlled.

b) Secondary Waste Collection

After the PCSP's activity, the secondary collection of the waste from Secondary Transfer Stations (STSs) is the City Corporation's responsibility.

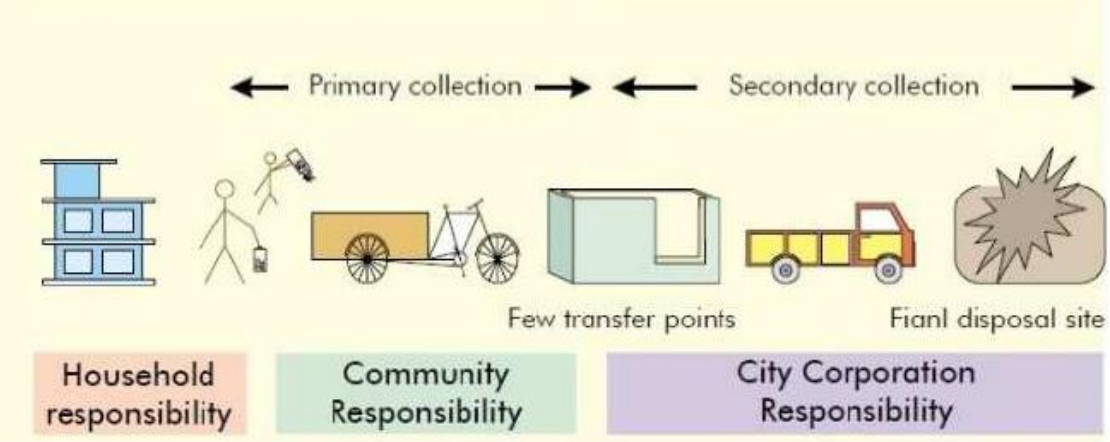


Fig 3.11: Current Flow of Waste at Neighborhood Level (*Source: Ahsan R. 2015*)

3.12 Conclusion

The amount of waste in DNCC is increasing day by day due to the increased number of infrastructure developments, shopping complexes, restaurants, markets, and bazaars along with roadside tea stalls, floating vendors, flower markets on the footpath, etc.

Though DNCC is collecting Municipal Solid waste that citizens generate each day, still many citizens discharge waste into open spaces, drains, canals, and own backyards rather than dump it in DNCC's designated collection points.

Chapter 4

Results and Discussion

4.1 Introduction

One of the major objectives of the field study was to observe the existing household solid waste disposal practices in the study area as well as try to find out what are peoples' perspectives towards this new approach and whether or not they are willing to participate by changing their waste disposal habits for greater national interests. For the field survey, we collected data on four main themes of the study area. They are-

A. **Peoples Perspective**
B. **Bin Installment Space and Cost**
C. **Waste Collectors Information**
D. **Secondary Transfer Station Data**

4.2 Peoples Perspective

(a) Gender

Among all the fifty-two respondents who were interviewed regarding the current household waste disposal practice in the study area, around 39 of them were male, and 13 of them were female. As women do not feel safe meeting and letting unknown people in the house, the number of female respondents is relatively low. Also, because the project survey was done on weekends to ensure the presence of the residents in the households, most of the male bread owners were available. As a result, they faced the interviews.

Table 4.1: Gender of the Respondents

Gender	Number of Respondents
Male	39
Female	13

(*Source: Questionnaire Survey 2023*)

(b) Family Types

As the study area that was chosen to conduct the survey was an urban residential area, most of the families that we interviewed were single families. Around 41 respondents who took part in the interview were living in single-family households. But there were also some joint family households as well. In our survey, we found 11 such individuals who were sharing the home with a joint family.

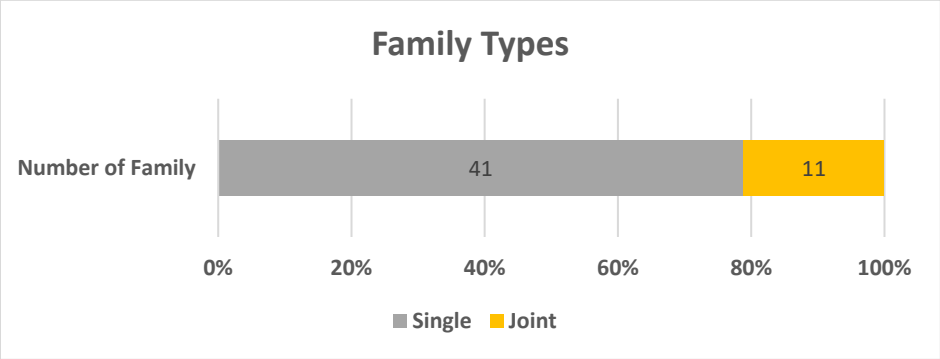


Fig 4.1: Family Types in the Study Area (*Source: Questionnaire Survey 2023*)

(c) Occupation

From our project survey, we found respondents with various types of occupations including government service holders, judges, bankers, industrialists, businessmen, private jobs, police, doctors, engineers, journalist, etc.

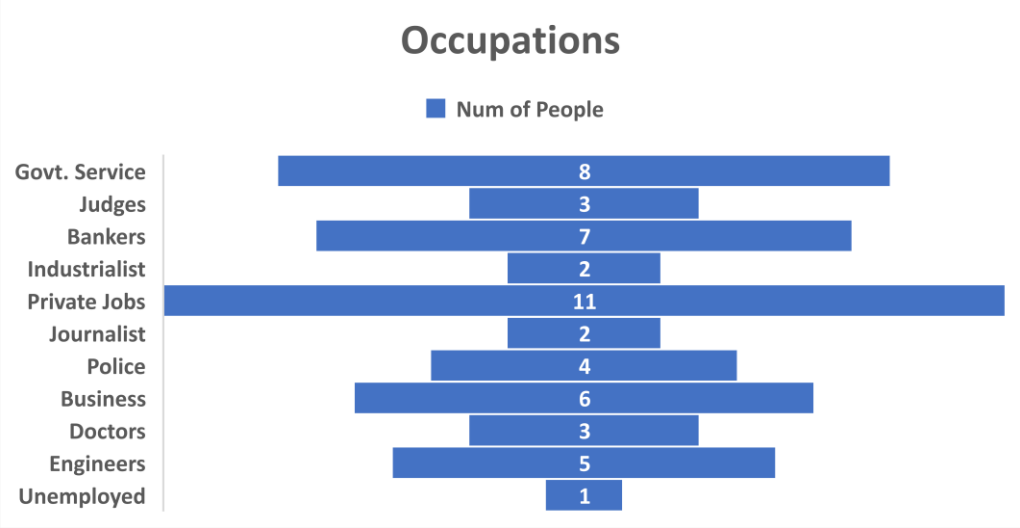


Fig 4.2: Occupation of the Respondents (*Source: Questionnaire Survey 2023*)

(d) Dominant Waste Type

The dominant waste type that was generated in the study area was found to be organic or food waste as identified by 39 respondents, followed by plastic and paper waste.

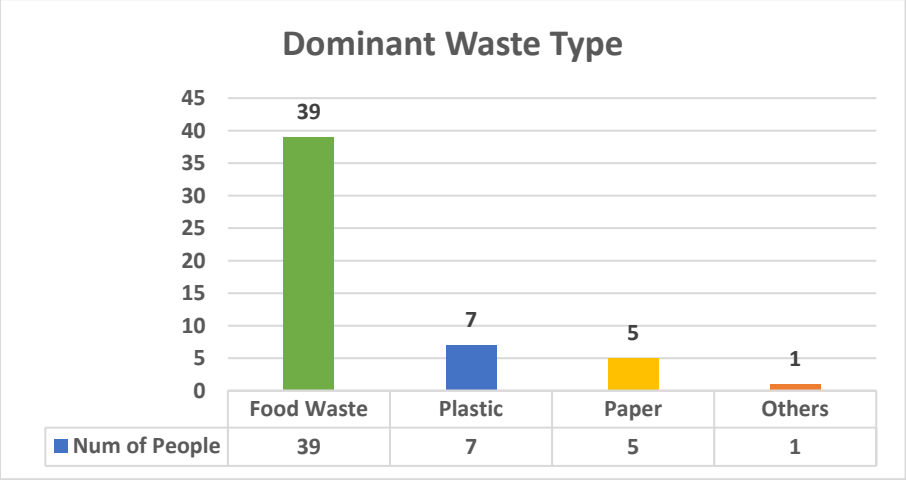


Fig 4.3: Dominant Waste Type in the Study Area (*Source: Questionnaire Survey 2023*)

(e) Waste Disposal Method

From the project survey, we found that around 94% of the residents dispose of their household waste in a non-segregated manner. Yet some families try to dump it separately as per the waste type. The percentage of this type is only about 5.77%.

Table 4.2: Waste Disposal Method in the Area

Waste Disposal Method	Number of Respondents	Percentage (%)
Segregated	3	5.77
Non-segregated	49	94.23
Total	52	100

(*Source: Questionnaire Survey 2023*)

(f) Current Solid Waste Disposal Condition

From the data analysis of the field survey, it is prominent that most of the residents are not satisfied with the current waste disposal system in the study area. Besides, a significant amount of people were found to be neutral about this. They showed their busy lifestyles as the reason behind it.

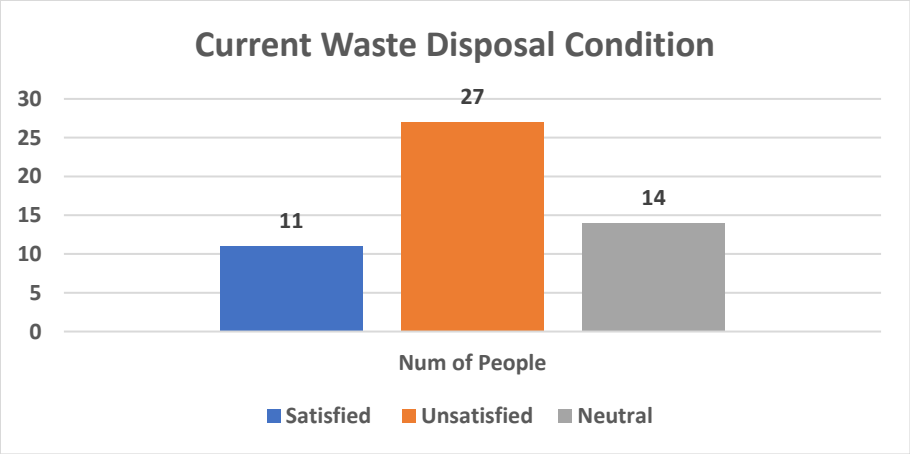


Fig 4.4: Current Solid Waste Disposal Condition in the Area (*Source: Questionnaire Survey 2023*)

g) Monthly Fees to Pay

The monthly payment for getting the waste collection service, different buildings and households in the study area pay different amounts of money. This charge ranges from Tk 100 to Tk 150 monthly. As there is no proper payment structure for the waste workers available, they can as for whatever amount they want. The most common charge for the housing building was around 150Tk per month plus different bonuses.

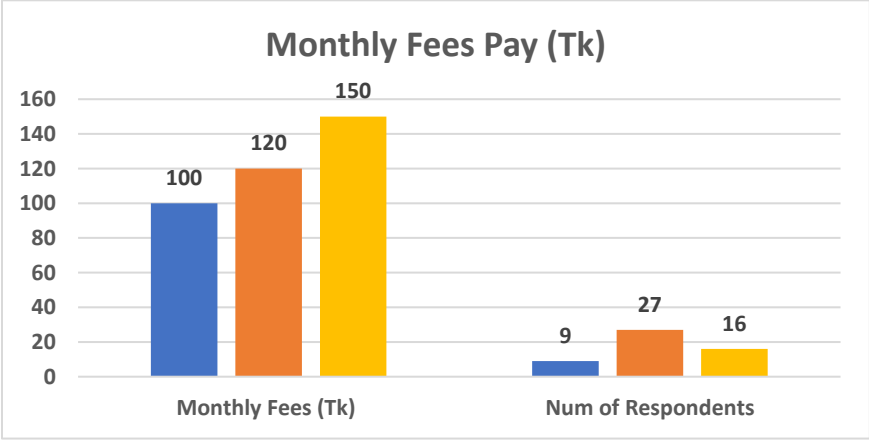


Fig 4.5: Monthly Fees to Pay per Flat (*Source: Questionnaire Survey 2023*)

(h) Awareness of Community Composting

Most of the people interviewed were found to be unaware of the concept of community-based composting of organic waste in the colony. This was a very new idea to them.

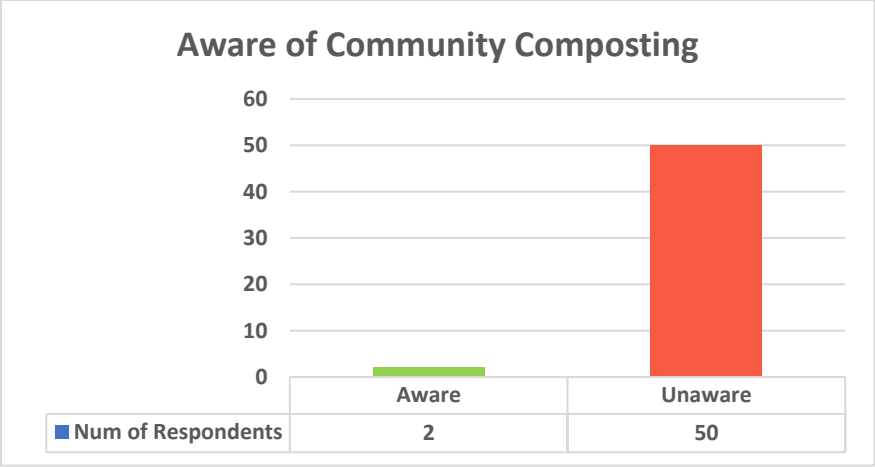


Fig 4.6: Awareness of Community Composting (*Source: Questionnaire Survey 2023*)

(i) Perspective on Community Composting

People in the study area had mixed perspectives toward the community-based composting concept due to a variety of reasons of their own. But in most cases, the reply was positive which is around 67% of the respondents. The other 33% did not find it helpful.

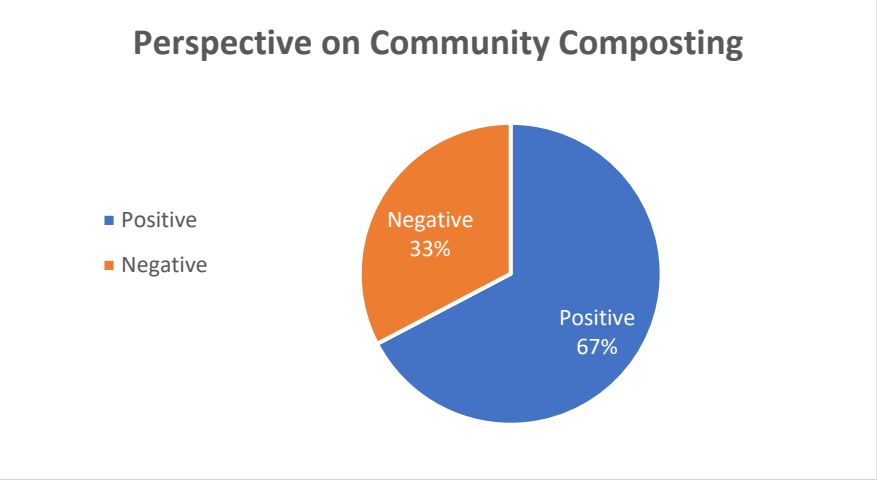


Fig 4.7: Perspective on Community Composting (*Source: Questionnaire Survey 2023*)

(j) Preferred Way of Composting

When asked to choose between individual and community composting approaches, most of the respondents (55.77%) chose to go with the community composting idea. As per them, it will ease the process with collective help. Whereas, the other 44.23% preferred the individual way to avoid conflict of choices with others while composting the waste.

Table 4.3: Preferred Way of Composting

Preferred Way of Composting	Number of Respondents	Percentage (%)
Individual	23	44.23
Community	29	55.77
Total	52	100

(*Source: Questionnaire Survey 2023*)

(k) Solid Waste Collection Frequency

The waste collection frequency of the study area was mostly regular as found from the responses of 30 interviewees. Around 22 people said they do not experience regular service.

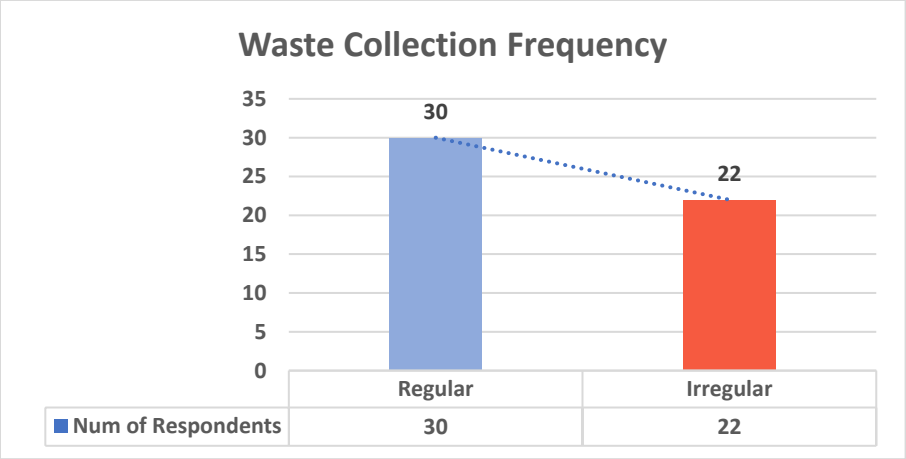
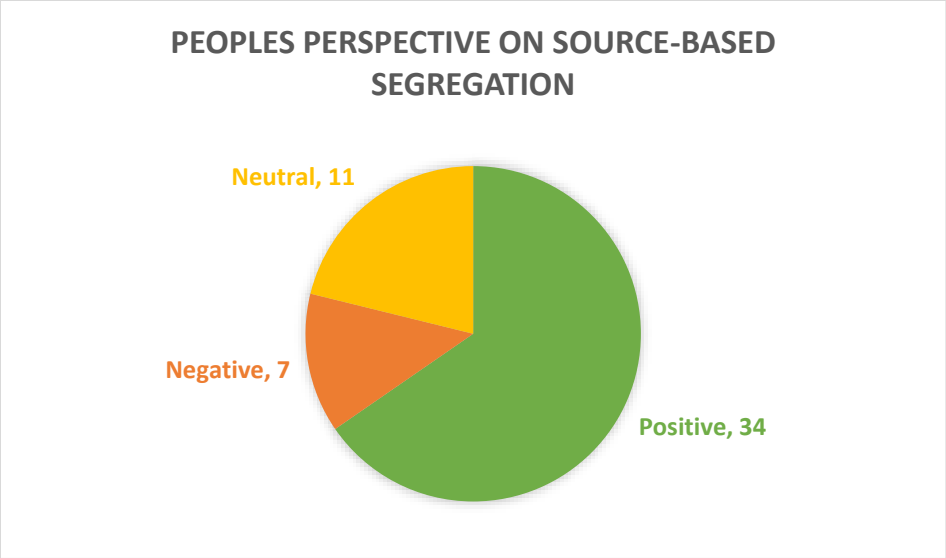


Fig 4.8: Solid Waste Collection Frequency (*Source: Questionnaire Survey 2023*)

(l) People's Perspective on Source-based Waste Segregation

We told the people in the study area about the source-based segregation method of waste instead of the current non-segregated waste disposal practice. Though a large number of the respondents (around 34) appreciated the idea and initiative, there were also people who were neutral (11) and doubtful about this.

This is because the people of our country have never actively participated in waste management. They think it is the sole responsibility of the city corporation or the govt. to take care of the waste that they generate. Therefore, having their part in this process seems very unrealistic to them.



(Source: Questionnaire Survey 2023)

Fig 4.9: People's Perspective on Source-based Waste Segregation

(m) Environmental Issues

The current practice of non-segregated disposal of waste in open plastic drums/ barrels as well as the irregular collection frequency of these mixed waste is creating many environmental issues in the study area. Unpleasant odor problems and mosquitoes are prominent ones that have been addressed by most of the respondents.

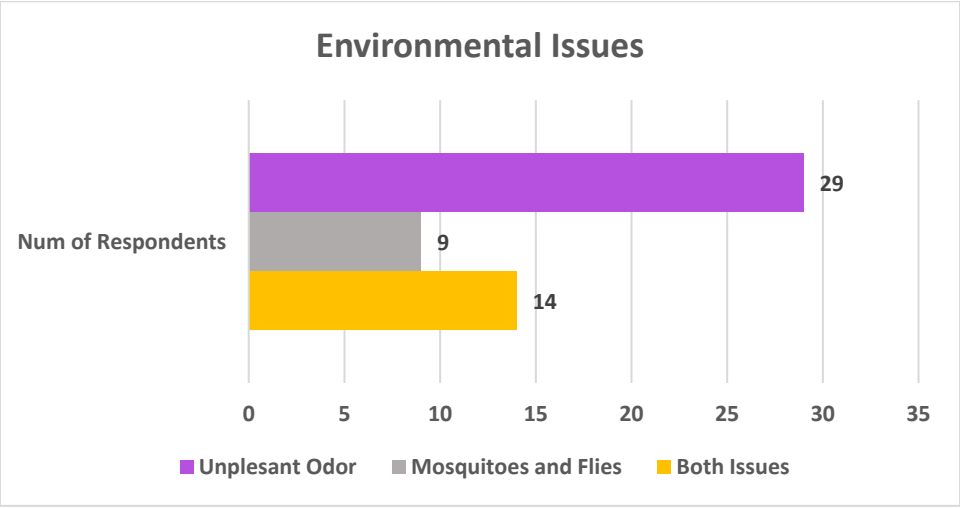


Fig 4.10: Environmental Issues Faced by the Residents (*Source: Questionnaire Survey 2023*)

4.3 Bin Installment Space and Cost

(a) Space Availability for Bin Installment

In the current existing setting of the households of the study area, most of the buildings there do not have any spare place available that can be used for bin installment. Of the total 52 structures in the complex, it involves about 35 of them. Only 17 buildings, which were made in recent times have space available for bin installment.

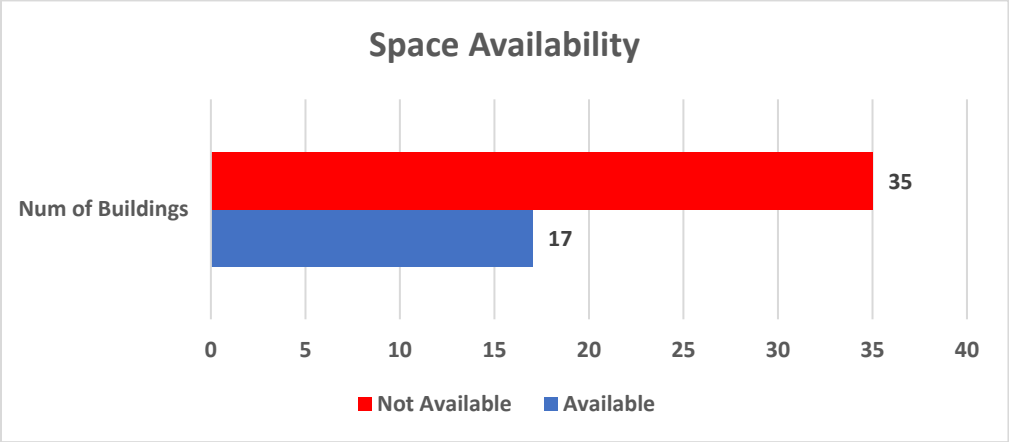


Fig 4.11: Space Availability for Bin Installment (*Source: Questionnaire Survey 2023*)

(b) Eager to Create Bin Space

Among all the respondents, around 44.23% were eager to create a space for bin installment, and the other 40.38% were not willing to provide any space inside the building comprises as they believe waste should never be kept inside rather it is a thing which should be on roadsides. The remaining 15.38% remained neutral in this aspect. As per them, because they do not own the building, they don't have any kind of say about it.

Table 4.4: Eager to Create Bin Space

Eager to Create Bin Space	Number of Respondents	Percentage (%)
Yes	23	44.23
No	21	40.38
Neutral	8	15.38
Total	52	100

(*Source: Questionnaire Survey 2023*)

c) Participate in Funding

To initiate the pilot project of installing separate bins to allow source-based segregation, we asked the residents if they will participate in the fundraising for that. Around 56% of the people responded positively and around 27% wished to refrain from it. The remaining 17% was neutral.

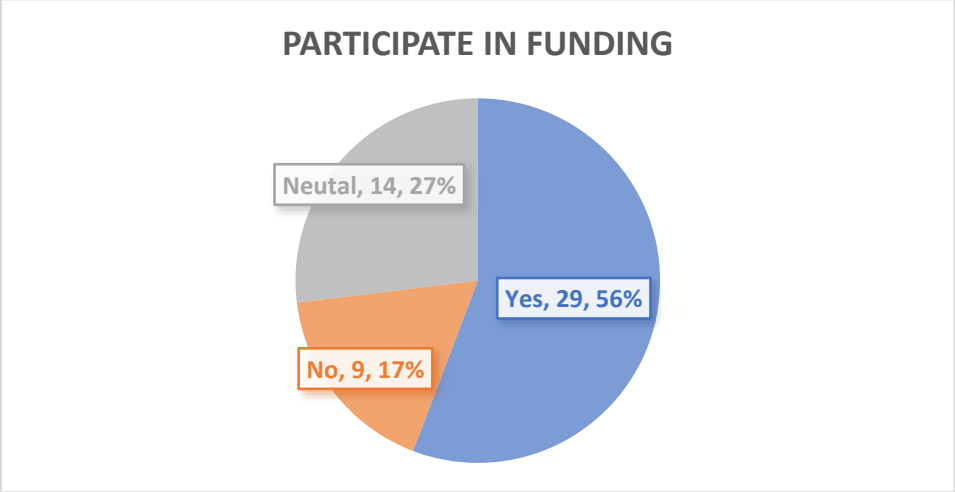


Fig 4.12: Participate in Funding (*Source: Questionnaire Survey 2023*)

c) Safety Condition of Bins

Before installing separate bins for each household, it is important to ensure how safe it will be in the household and long it will last to provide service. If the security of bins is not ensured, it will then be just a waste of money to collect funds and invest in the bins. Around 69.23% of respondents marked the condition of the bins in their buildings as safe. They believed that the strict security of the housing society is enough for ensuring this. On the other hand, around 30.77% of residents think that their building lacks the safety criteria for bin installment.

Table 4.5: Safety Condition of Bins

Safety Condition of Bins	Number of Respondents	Percentage (%)
Safe	36	69.23
Unsafe	16	30.77
Total	52	100

(*Source: Questionnaire Survey 2023*)

4.4 Waste Collectors Information

(a) Education Level

The waste collectors of the study area mostly had primary and secondary-level education. Only a few could reach the higher secondary level of education.

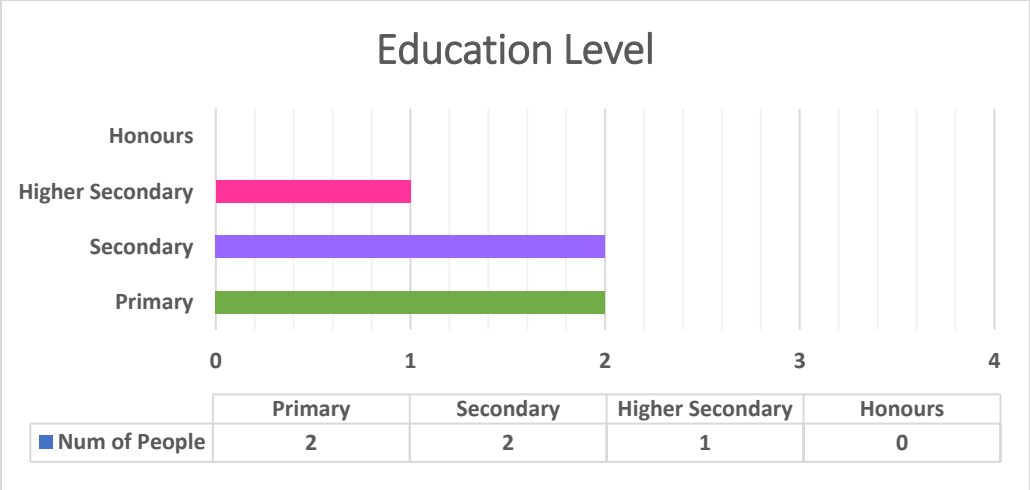


Fig 4.13: Education Level of the Waste Collectors (*Source: Questionnaire Survey 2023*)

(b) Knowledge of Waste Type

Among the five primary waste collectors who come to pick waste from the study area, four of them had basic knowledge about the waste types which they gained from their working experience.

Table 4.6: Knowledge of Waste Type

Knowledge of Waste Types	Number of Workers
Yes	4
No	1

(*Source: Questionnaire Survey 2023*)

(c) Training Received

None of the waste collectors received any form of training neither from the PCSPs management nor from the City Corporation officials prior to joining the work. They execute their work solely based on their own acquired knowledge from field experiences.

Fig 4.15: Any Training Received by the Workers (*Source: Questionnaire Survey 2023*)

(d) Specific Duty Sector

The primary waste collectors mostly do not have any specific duty sector. The same worker can be seen performing various kinds of work at different places and housings. We can see the same scenario in the following table.

Table 4.7: Specific Duty Sector

Duty Sector Specified?	Number of Respondents
Yes	1
No	3
Somewhat	1

(*Source: Questionnaire Survey 2023*)

(e) Monthly Charges per Flat

The pay scale of the primary waste collectors is not specified by the PCSP management. As a result, in the same housing society, various buildings pay different charges per month for the same services. This is ethically not right to put residents in such a condition. Also, it creates irregularity and uncertainty for the workers in getting their payments on time. Besides, workers claimed that they also have to share a percentage of their little income with the PCSP management committee as well as the local political leaders as there is no proper monitoring of this.

A similar condition was seen in our project survey as well. We found a varied monthly payment of 100tk, 120tk, and 150tk interviewing individuals in the same housing society.

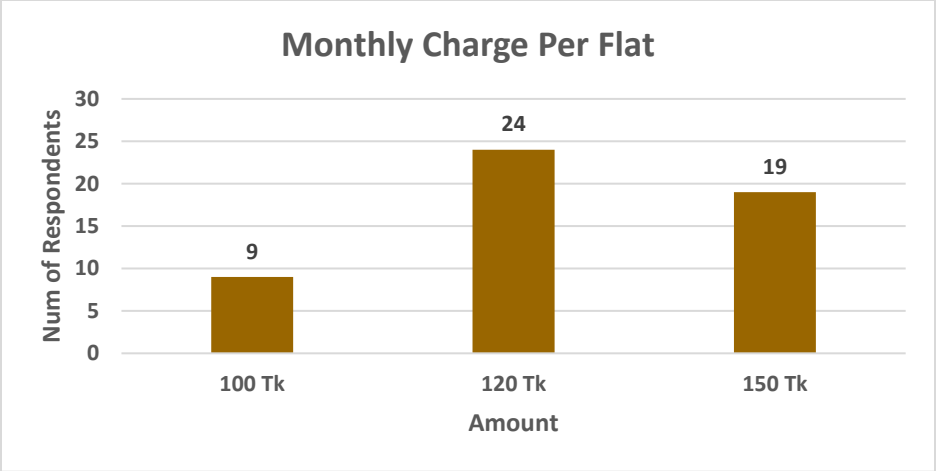


Fig 4.16: Monthly Charges per Flat (*Source: Questionnaire Survey 2023*)

(f) Safety Tools Provided

Most of the primary waste collectors have not received any safety gear such as gloves, PPE, etc. either from the PCSPs or the DNCC. They perform all their tasks barehanded. The project survey also indicates the same.

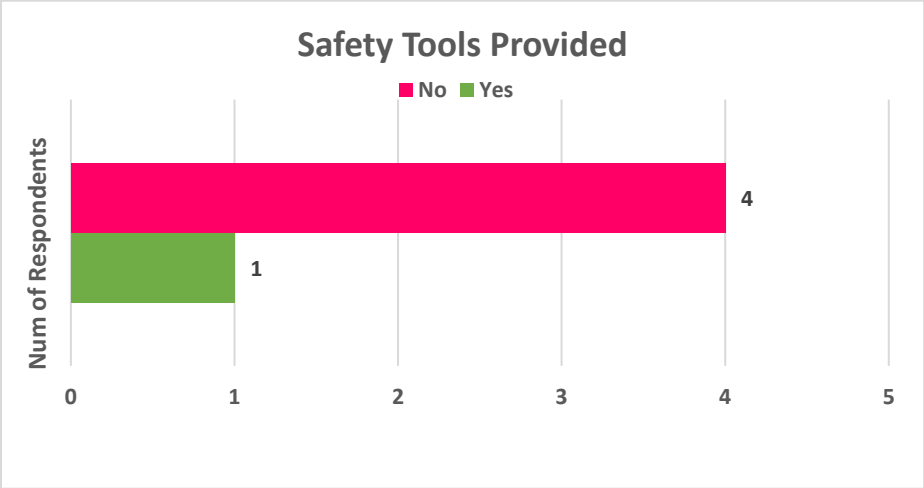


Fig 4.17: Safety Tools Provided (*Source: Questionnaire Survey 2023*)

(g) Workers' Perspective on Source-based Segregation

The majority of the workers see the source-based segregation practice as helpful for their execution of tasks. According to them, this will make their work much easier if they get an initial segregated product. Also, they do not think this approach will any way harmfully affect their current jobs.

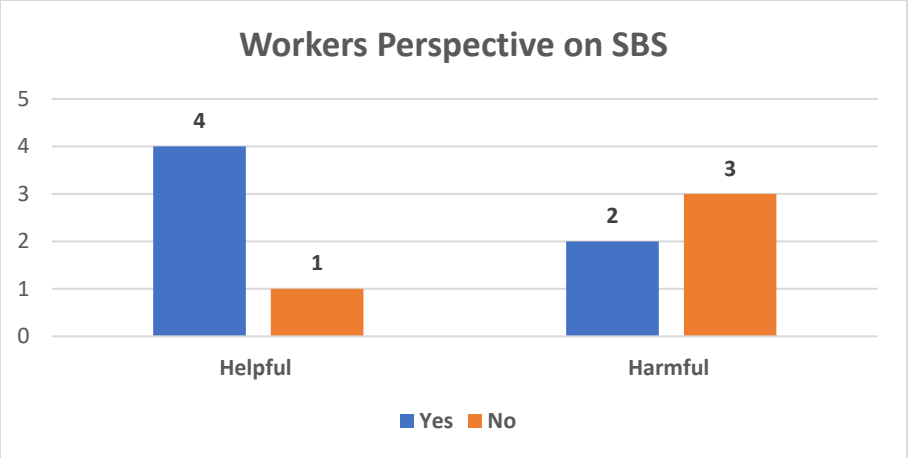


Fig 4.18: Workers' Perspective on Source-based Segregation (*Source: Questionnaire Survey'23*)

(h) Health Issues

Of all the waste collectors in the study area whom we interviewed, almost all of them faced some kind of health issue working barehanded with the waste which includes skin diseases, Diarrhea, Lung Issues, etc.

Table 4.8: Health Issues of Waste Collectors

Health Issues	Number of Respondents	Worker 1	Worker 2	Worker 3	Worker 4	Worker 5
Skin Diseases	3	Yes	Yes	No	No	No
Diarrhea	1	Yes	No	No	Yes	No
Lung Issues	1	No	Yes	Yes	No	No

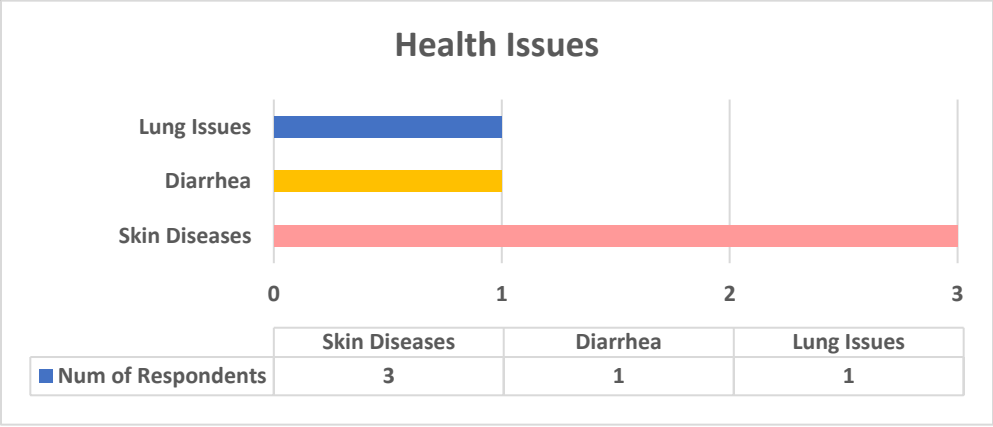


Fig 4.19: Health Issues of Waste Collectors (*Source: Questionnaire Survey 2023*)

4.5 Secondary Transfer Station Data

(a) Gender

Most of the workers at the Secondary Transfer Station are male with a small number of females who mostly do the sorting tasks of waste. In our surveyed Secondary Station, there were 14 male and 1 female worker.

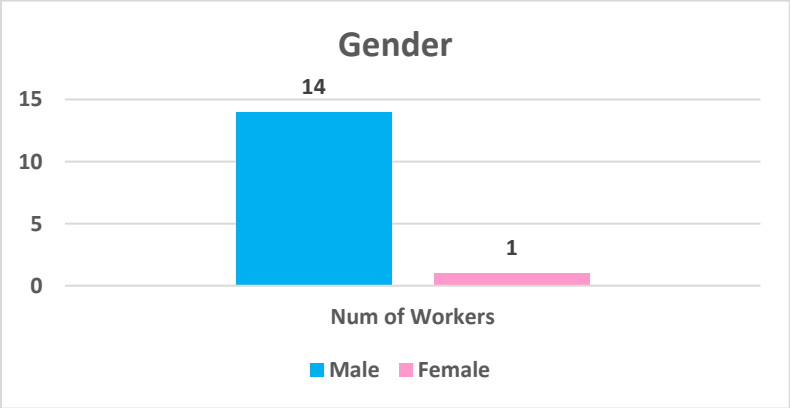


Fig 4.20: Gender Distribution of STSs Workers (*Source: Questionnaire Survey 2023*)

b) Collected Waste Amount at STS

In the Secondary Transfer Station's waste storage, food waste is the most dominant one as is it also generated in higher amounts in the households. Our STS receives around 8000 Kg of food waste per day. The amount of recyclable waste is about 1800 Kg per day and 2040 Kg of other waste types accumulate in the secondary station.

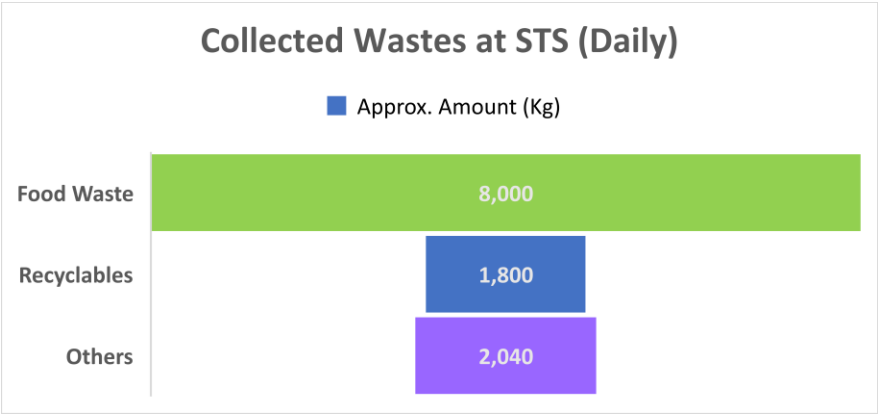


Fig 4.21: Collected Waste Amount at STS (*Source: Questionnaire Survey 2023*)

(c) Segregated Waste at STS

From the accumulated mixed waste at the STS, Plastic, Paper, and Bones are separated to further sell them to the recycling shops. In our surveyed secondary station, the workers separate around 40 kg of plastic, 20 kg of paper, and 10 kg of bones per day which they sell to earn extra income.

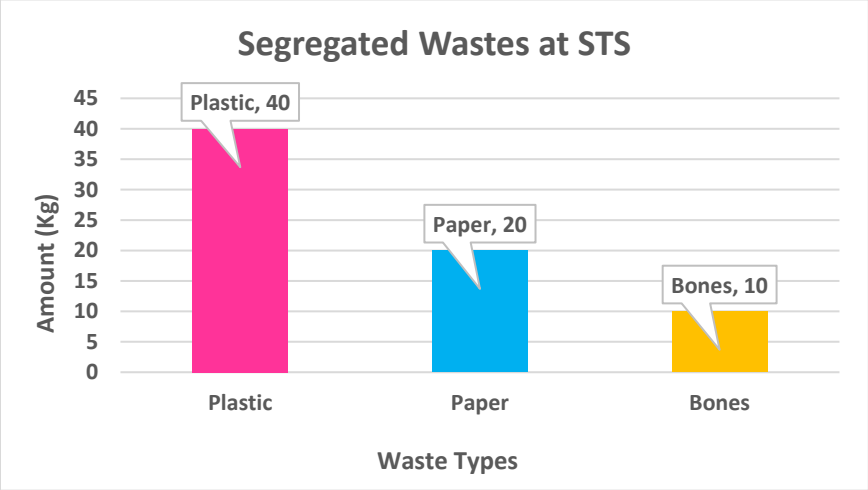


Fig 4.22: Segregated Waste at STS (*Source: Questionnaire Survey 2023*)

(d) Source of Workers' Income

Currently, no formal recycling system is provided for households in DNCC. Although some households separate recyclables and sell them to buyers, most households combine their waste for discharge. This mixed waste is collected by primary collectors or is taken to secondary collection points (SCPs) by a household member. However, some households still dump their waste in open spaces, drains, or rivers.

The primary collectors separate some recyclables from the mixed waste and then sell them to recycling shops. In this way, they earn extra income from the shops in addition to regular salaries paid by the PCSP. After collecting the recyclables, they bring the remaining waste to the SCP from which the waste is transported to the Amin Bazar LFS.

Waste pickers separate some recyclables at the SCP or the LFS. Supporting staff members in charge of loading the waste from the SCP to collection vehicles sometimes take recyclables from the accumulated mixed waste to recycle shops. Finally, the recycling shops sell these items to the recycling industry in Dhaka.

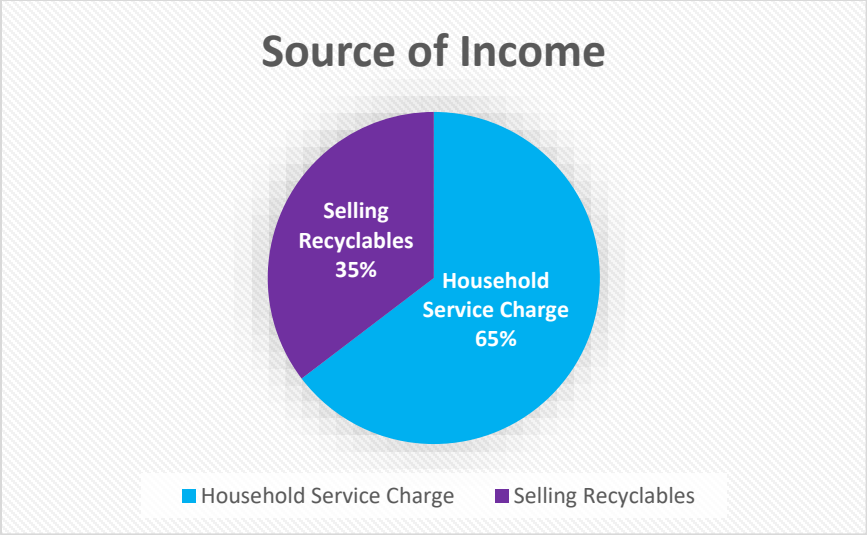


Fig 4.23: Source of Workers' Income (*Source: Questionnaire Survey 2023*)

4.6 Conclusion

From the above analysis, it can be said that the current household solid waste disposal practice and its corresponding actors and factors are influencing the whole waste management process significantly. Therefore, if we want an efficient waste management scheme for the city, we first make necessary smart transitions starting from its base.

Chapter 5

Challenges of Smart Waste Disposal

5.1 Introduction

According to the DNCC Waste Report 2018-2019, The waste in DNCC is comprised of different types such as Municipal Solid Waste (MSW). Electronic Waste, Hazardous Medical Waste, Food Waste, Construction Waste, and Industrial Hazardous Waste but DNCC waste management function is focused on MSW. The composition of MSW that DNCC deals with includes 'anything that people throw into DNCC's waste bins and collection points. As per the report, the Waste Management Department (WMD) in DNCC covers the following functions at the neighborhood level:

- Monitoring of primary waste collection activities by the private companies and PCSPs:
- Procurement and maintenance of waste collection vehicles & landfill equipment;
- Promoting Occupational Health and Safety of Cleaners.

But in the field study, we found these involvements significantly missing at the neighborhood level which is causing a lot of mismanagement and challenges at the source of waste generation sites. Those will be discussed here at various levels of the solid waste flow.

5.2 Challenges for Smart Waste Disposal

The field study at the Khaleque Housing has been completed in a befitting manner. In the study of the current disposal of household wastes in the neighborhood, some practical knowledge and fallouts have been identified. Those shortcomings of the current waste disposal practice at various levels of the waste flow would be discussed here in order to find the way-outs from this current situation toward smart and sustainable household solid waste disposal systems. At a neighborhood scale, the levels/sectors of waste flow where the existing challenges can be found are-

1) **Household-Level Challenges**
2) **Waste Collectors-Level Challenges**
3) **Secondary Transfer Station-Level Challenges**

5.3 Household-Level Challenges

Currently, at household level waste disposal, we have found the following existing challenges from our field study which is unnecessarily adding up to the waste in the landfills making the overall waste management process costly and inefficient.

Challenges-

(i) Mixing of Waste
(ii) No Further Usage/ Reuse
(iii) Lack of Public Cooperation
(iv) Not Enough Space for Bin Installment

(i) Mixing of Waste

Currently, at the household level, there is no practice and scope for separate waste disposal. As a result, people tend to collect and dump waste randomly without considering the waste types and their further reusability. At least 80-90% of the total waste can be recycled, which now goes to dump sites or landfills in the absence of the practice of segregation of waste at source.

A similar scenario was found in our study area as well. From the 52 respondents whom we interviewed, around 49 individuals accepted that they practice non-segregated waste disposal methods and only 3 respondents said they try to dump waste separately according to its types.

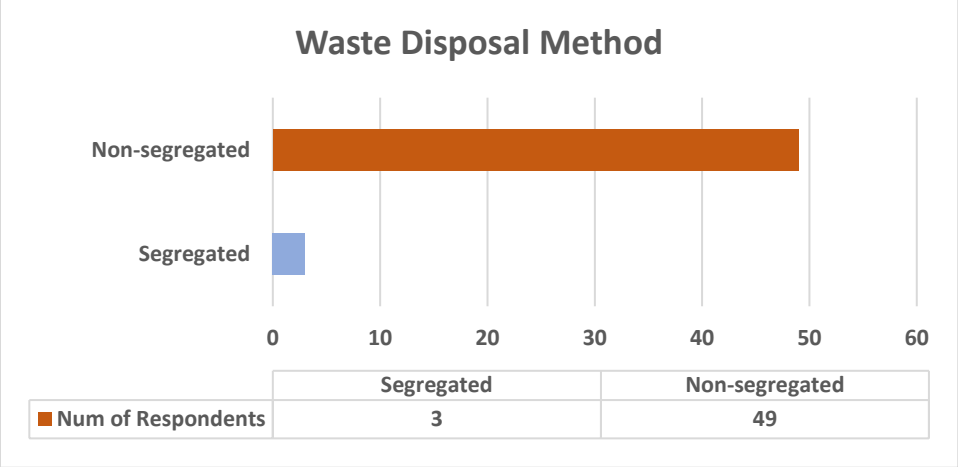


Fig 5.1: Waste Disposal Method in the Study Area (*Source: Questionnaire Survey 2023*)

Fig 5.2: Mixing of Waste (*Source: Questionnaire Survey 2023*)

(i) No Further Usage/ Reuse

According to the report of New Clean Dhaka Master Plan 2018–2032, non-recyclable waste generated from households and local businesses is collected mainly by primary collectors and is simply transported to the landfill via municipal collection points without any further use. In FY 2017–2018, the total waste generated was 3,663 tons/day; this includes 2,678 tons/day of incoming waste to the landfill sites and only 303 tons/day sent to the recyclables shop.

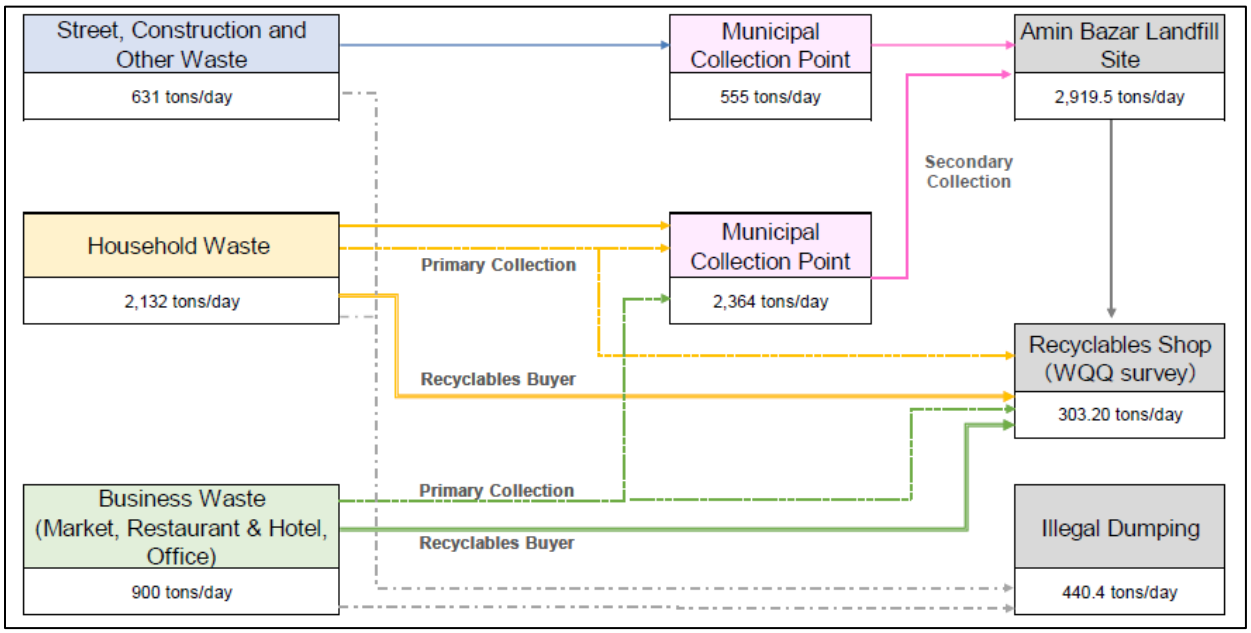


Fig 5.3: Waste Flow in DNCC in FY 2017–2018 (*Source: JICA Project Team 2018*)

There is also a lack of reduce and reuse tendency of commodities that have been seen among the people of the study area due to their lack of environmental awareness and accountability as responsible citizens. Only a few practices reuse organic wastes as natural fertilizers for their roof gardens and recyclable waste for various crafts.

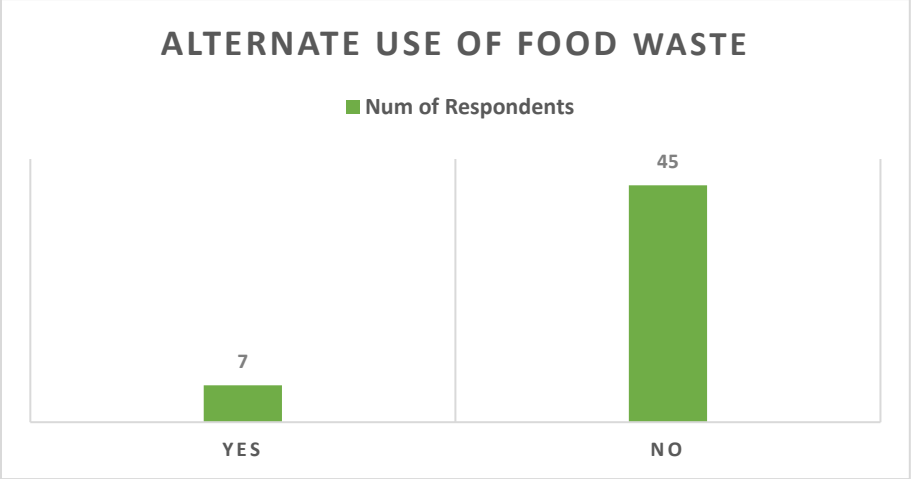


Fig 5.4: Alternate Use of Food Waste *(Source: Questionnaire Survey 2023)*

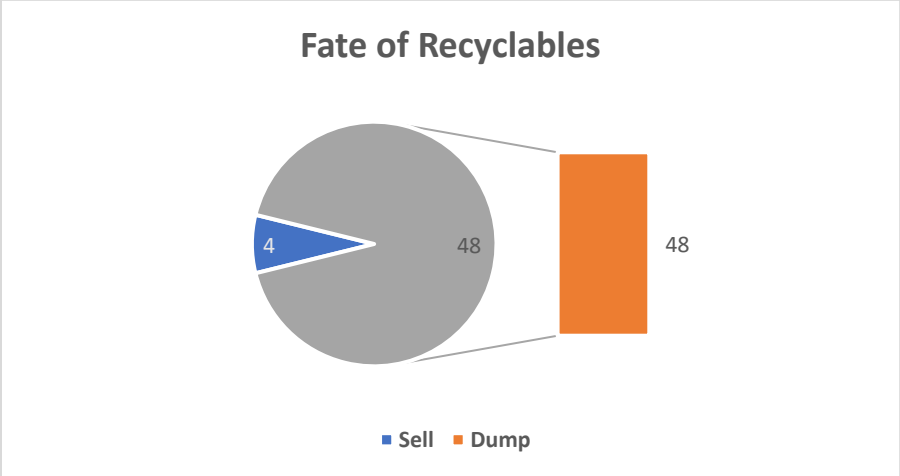


Fig 5.5: Fate of Recyclables *(Source: Questionnaire Survey 2023)*

(ii) Lack of Public Cooperation

According to the report of National 3R Strategy for Waste Management, the average resident as well as industrialist views waste management as a City Corporation's or Pourashava's responsibility. The public carries a negative perception of the role played by the local body mainly because of the conspicuous quantities of waste lying uncollected on city roads for days. At the

same time, there is widespread resistance to the call for the separation of waste at the household level. The City Corporation or Pourashava tends to shy away from one of its customary responsibilities and hand over the same responsibility to the households, who reflect the blame back at the Pourashava. This lack of civic awareness and public cooperation has always plagued the City Corporation or Pourashava's efforts to keep the city clean.

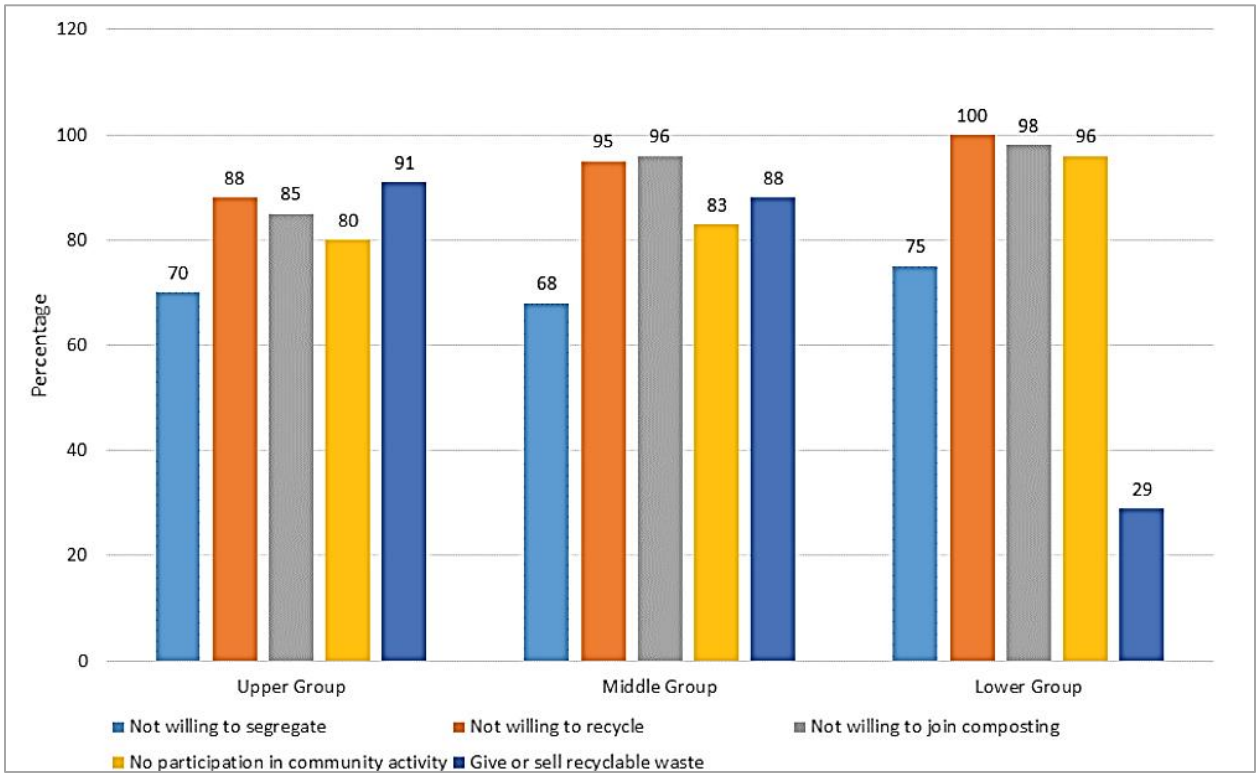


Fig 5.6: Waste segregation, recycling, composting, and community activity status of diff. group of people in Dhaka (*Source: AHMSU Prodhan, Kaeser A. 2020*)

(iii) Not Enough Space for Bin Installment

As the people in our country are less concerned about the waste that they generate, there is no practice of creating or keeping spaces for bin installment or waste disposal sites inside the building in current construction trends. Also, most of them are skeptical about the idea of keeping the waste bins inside the buildings as the barrels that are normally used for waste disposal are kept mostly open which spreads a bad smell. Rather, they prefer to keep them on the roads outside the building.

From the field analysis of our study area, it has been found that buildings located on Road-1 & Road-2 are newly constructed and have sufficient bin spaces inside, whereas, buildings located on

other roads (Road- 3,4,5, and main road) are old buildings and they mostly lack this inside space. Instead, they keep their bins outside of the buildings.

(Source: Questionnaire Survey 2023)

Fig 5.7: Outdoor Bin Area (Left) and Indoor Bin Area (Right)

5.4 Waste Collector Level-Challenges

Waste collection from the points of generation or households or buildings is typically considered a primary collection. Door-to-door waste collection activity is common in almost all the wards of DNCC. It is prevalent due to the high pressure of population density and the distance of the secondary collection point. This task is done by waste collectors who initiate the solid waste collection process. They work under a system known as Primary Collection Service Providers (PCSP) or Primary Waste Collection Service Providers (PWCSP). Now, even though DNCC declares monitoring of primary waste collection activities by private companies and PCSPs as one of their management functions, at the field level we found no involvement of City Corporation in such a manner. The lack of supervision and accountability is thus creating havoc at the very beginning of the waste collection process making the whole system inefficient.

Challenges -

i) **Unstructured Management of PCSP**
ii) **Lack of Training and Education**
iii) **Lack of Safety Measurements**

i) Unstructured Management of PCSP

The entities providing primary collection or door-to-door collection services are recognized as Primary Collection Service Providers (PCSP) or Primary Waste Collection Service Providers (PWCSP). There are registered or unregistered individual persons or organizations or associations with one or more rickshaw vans and with or without hand trolleys. The status or pattern of primary collection service providers is variable amongst the wards and it also varies with the pattern of the community. However, clubs, CBO, NGOs, private companies, housing societies, and individuals are the typical forms of PCSP. Ordinary PCSP van services are the most prevalent contributing approximately 60% to the total no of PCSPs.

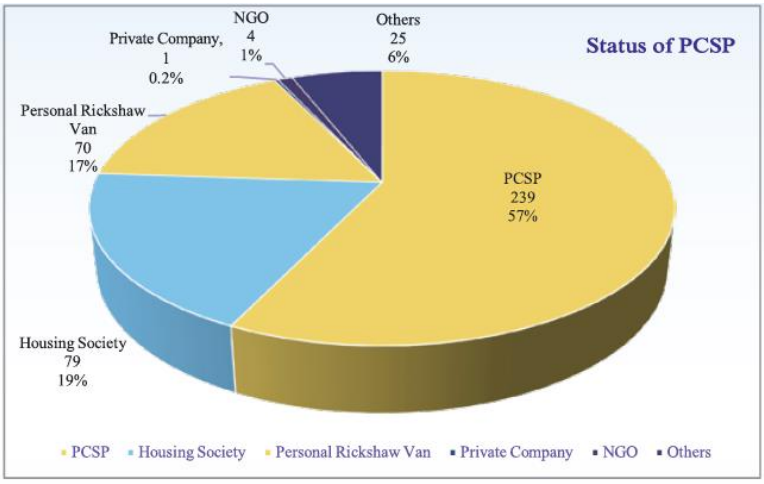


Fig 5.8: Status of PCSP of DNCC (*Source: DNCC Waste Report 2018-19*)

As per the DNCC Waste Report 2018-19, the registration process of PCSP was developed and mainstreamed with the assistance of the JICA Expert Team in 2007 and the same system is still being followed, using the same forms and formats for application and monitoring with little changes in the registration process by DNCC.

But according to the survey conducted by the JICA Project Team in 2018, approximately 454 PCSPs are regularly working in the DNCC area. An association of PCSPs in DNCC, known as the Primary Waste Collection Service Providers Association (PWCSP Association), was formed to cater to the well-being of PCSPs and their workers. However, the participation of PCSPs is currently only 55%; that is, of 454 PCSPs, 206 PCSPs do not belong to the PWCSP Association. This lack of supervision by DNCC is causing the following issues for the workers under PCSPs-

a) No Employment Records or Registration

b) Unspecific Duty Sector

c) Imprecise Pay Scale

d) Irregular Working Schedules

a) No Records or Registration

The permission and registration system of PCSPs was developed as part of JICA's first technical cooperation project from 2007 to 2013. DNCC adopts the same system for its application and monitoring with minor changes in the registration process. The PWCSP Association is newly incorporated in the permission and registration system. However, the selection and acknowledgment process of the PCSP is neither fully transparent nor legitimate. It allows many ineligible candidates who do not maintain the basic standards of waste management to start a PCSP service of their own just with the sole purpose of making illegal money out of this.

Besides, the workers working under these PCSP systems have no registration or employment records. As a result, they work almost as a non-entity and anonymously which raises concern for both the PCSP employers and the workers. Because if any issue or emergency situation arises on any side, there will be no way to trace a worker in the system. Also, as it is now impossible to identify which worker works for which PCSP, it is very easy for employers to go away with any wrongdoing or injustice. This should not be the scenario.

b) Unspecific Duty Sector

Currently, there is no practice of specifying a worker's duty station or sector in the waste disposal system under the PCSPs. The same worker can be seen collecting waste from different housing societies as well as separating the waste later on at the Secondary Transfer Station. We have found the same scenario in our field study as well.

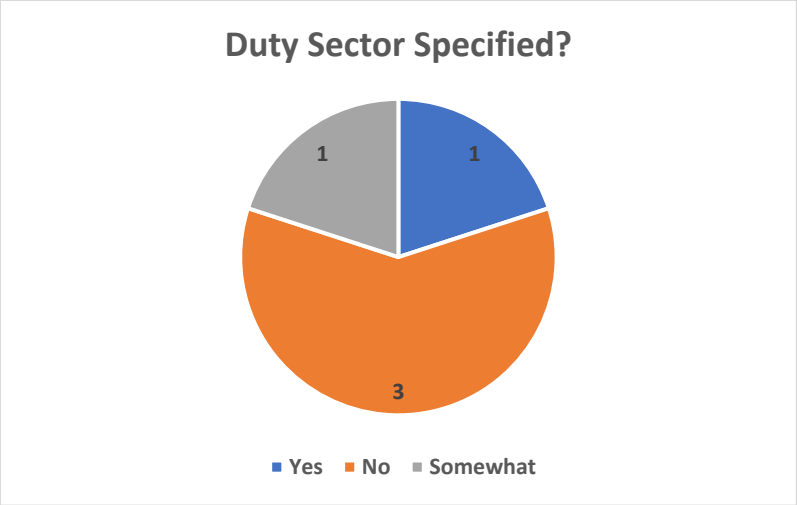


Fig 5.9: Specific Duty Sector *(Source: Questionnaire Survey 2023)*

c) Imprecise Pay Scale

The pay scale of the primary waste collectors is not specified by the PCSP management. As a result, in the same housing society, various buildings pay different charges per month for the same services. This is ethically not right to put residents in such a condition. Also, it creates irregularity and uncertainty for the workers in getting their payments on time. Besides, workers claimed that they also have to share a percentage of their little income with the PCSP management committee as well as the local political leaders as there is no proper monitoring of this.

A similar condition was seen in our questionnaire survey in the study area as well. We found a varied amount of payments of Tk 100, Tk 120, and Tk 150 per month by interviewing individuals in the same housing society.

Table 5.1: Imprecise Pay Scale

Monthly Charge Per Flat	Number of Respondents
100 Tk	9
120 Tk	24
150 Tk	19

(*Source: Questionnaire Survey 2023*)

d) Irregular Working Schedules

There is also no particular timetable or schedule for waste collection fixed by the PCSP management. As a result, workers come to collect waste according to their will and irregularly. This creates piling up of waste in the plastic barrels causing bad odor and other environmental pollutions in the residential areas or housing societies.

ii) Lack of Training and Education

The informal sector service providers such as the waste pickers, including young children, remove a considerable quantity of daily waste from the city streets and dustbins. Together, they make an enormous contribution to urban solid waste management in the city, which is not well recognized or appreciated. Even though DNCC claims to formulate a Safety and Sanitation Committee (SSC) through the Clean Dhaka project in all Wards and Landfills to ensure the safe and sanitary working environment of the cleaners and workers of the WMD as well as distributing a worker's manual that contains work procedures at the start, health & safety instructions, and on-job training to contribute to changing the mindset of the cleaners and drivers for mutual assistance, there is no visible on-field application of these has been found at the primary level of waste flow.

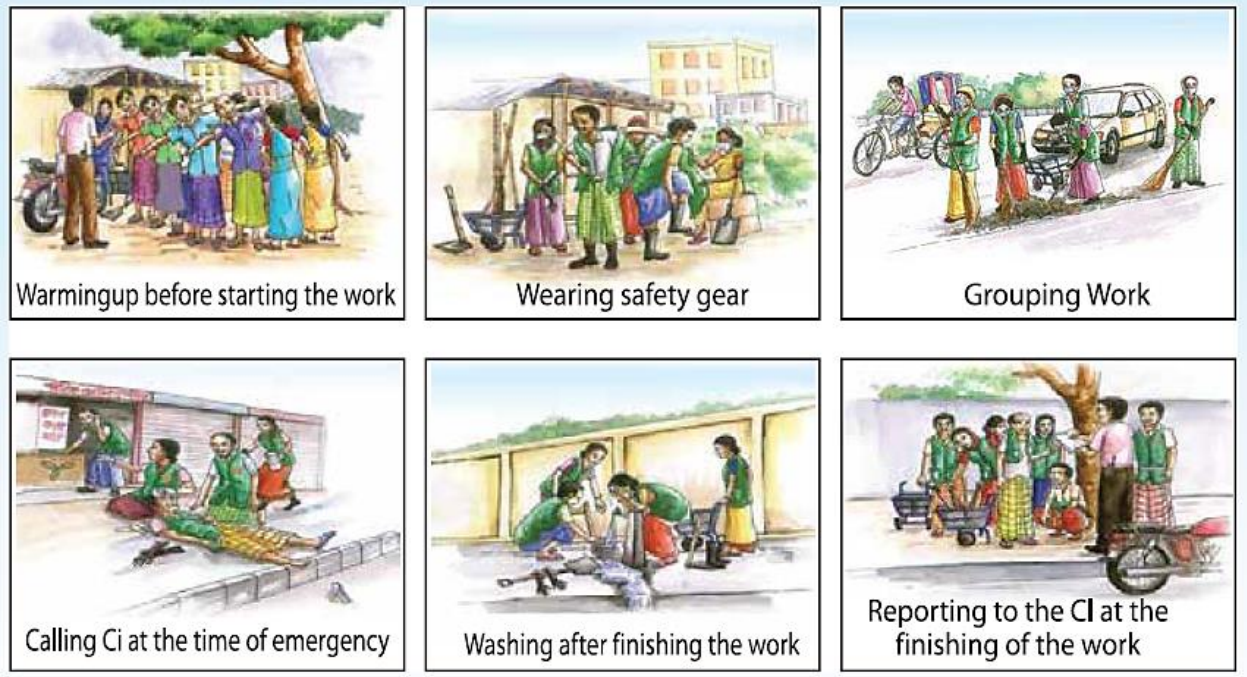


Fig 5.10: Working Manual by DNCC (*Source: DNCC Waste Report 2018-19*)

Primary waste collectors are not getting any formal training before joining their work in the solid waste disposal system. Many of them have no idea about waste types, how to carry them efficiently to the STSs, how to separate and organize each type of waste, etc. Our survey also revealed that the current situation is the same as described.

iii) Lack of Safety Measurements

Dhaka North City Corporation claims to arrange several cleaners' workshops and seminars for cleaners' safety and sanitation issues to enhance work efficiency, motivate and encourage them by providing safety gear, and raise awareness for the cleaners' work environment. But in reality, field workers suffer regularly from working in unhealthy and non-sanitary environments, such as getting ill and skin diseases from touching garbage bare hand or getting injured from touching sharp materials. The PCSPs do not provide workers with necessary safety gear, such as masks, gloves, and first aid boxes to prevent such incidents which is essential for improving the workplace environment for the field workers of waste management. Besides, the involvement of young children in such working environments is also an area of concern.

Fig 5.11: Skin Disease due to Lack of Safety *(Source: Questionnaire Survey 2023)*

5.5 Secondary Transfer Station (STS)-Level Challenges

Domestic waste generated in households is collected at the sources by PCSPs and is carried to the STSs. STS facilities have been newly constructed in DNCC, and conventional and arm-roll containers are stored at the STS facilities. PCSPs collect waste in their rickshaw vans and transfer it into containers stored in the STS facilities. The accumulated waste at STSs is then transported to final disposal by dump trucks and compactors. Currently, there are about 52 STSs present in the DNCC. However, there are still several issues that prohibit the solid waste disposal system from becoming smart and fully effective even at this level -

Challenges -

(i) Lack of Supervision and Monitoring
(ii) No Database and Record-Keeping
(iii) Haphazard Dumping
(iv) Inefficient Usage
(v) Health Risks

(i) Lack of Supervision and Monitoring

There is no proper supervision, guidance, or monitoring of the number of workers and the activities that are done at the STSs by the workers. The workers are mostly seen to work as per their wish and it is solely upon them to decide when and how to store, separate and manage the incoming different types of waste depending on their knowledge.

There is no defined working structure, schedules, and methods for the workers to follow. Once a month only a cleaner under the DNCC come to visit the station and collect money from the workers that they get from selling the recyclables to the stores. These are most of the time the same workers who collect the waste from the households and they are not even registered under PCSPs or DNCC.

Fig 5.12: Lack of Supervision and Monitoring *(Source: Questionnaire Survey 2023)*

(ii) No Database and Record-Keeping

The STSs currently do not have a functional record-keeping method to assess the ward-wise and street-wise volumes of waste handled regularly. Stress is that without adequate record keeping and realistic databases, it is difficult to improve the quality of planning and delivery of basic services according to the needs of the city.

(iii) Haphazard Dumping

The unsupervised actions flow of less-educated and untrained workers at the STSs is leading to the haphazard dumping of waste. The STSs feature at least three huge containers, which can be easily used for the waste to be stored separately according to its kind and further usability. But it is not the scenario in reality. Rather, waste can be seen spread everywhere inside the STS which makes the separation work more difficult and creates an unbearable working environment for the waste workers.

Fig 5.13: Haphazard Dumping of Waste at STS *(Source: Questionnaire Survey 2023)*

(iv) Inefficient Usage

In 2015, DNCC constructed the first Secondary Transfer Station (STS) to avoid open dumping in designated and undesignated spots. Before that, both designated and undesignated spots were in open environments, mostly large concrete bins or containers either on footpaths or the roadside. The aim was to prevent the problems or inconveniences faced by people due to the occurring bad odor and environmental pollution from the dumped waste.

But even this basic aim of building the STSs was not fulfilled at all let alone the functional efficiency, as people are still experiencing the same issues outside every STSs because of its lack of maintenance and practical usage which is leading the stored waste to rot and be there for an undefined amount of time. Thus, they have failed to properly contain the waste and its corresponding environmental problems. Except for extracting a handful of recyclables, it is only adding up waste to the landfill sites. If they followed proper waste management, monitoring and sorting methods, STSs could easily serve as much more than just being temporary dumping and storage sites of waste.

(v) Health Risks

The waste collection staff normally works under considerably unsafe conditions at the STSs. They pick up garbage for deposit at transfer stations and then separate the waste there barehand without any typical safety gear such as masks, hand gloves, and sometimes boots. It is a hazardous job that exposes its workers to infections, especially with the little protective measures they apply. They are exposed to foul odors, dust, ants, and flies and get dirty easily. As a result, the workers face many health hazards and are at high risk for developing diseases resulting from exposure to this hazardous working environment.

Fig 5.14: A Worker Working Barehand at STS *(Source: Questionnaire Survey 2023)*

5.6 Conclusion

Improper solid waste management is considered to be one of the most burning and serious environmental problems in Bangladesh. Solid waste is irreparably degrading the urban environment and placing a serious threat to natural resources. In Municipal Solid Waste Management (MSWM) of developing countries, five typical problem areas can be identified:

i) inadequate service and management
ii) operational inefficiencies of services
iii) limited utilization of recycling activities

Chapter 6

Summary Findings, Recommendation, and Conclusion

6.1 Introduction

The waste problem will not be solved if it only relies on the government without community interaction in waste management itself. Widiarti explained that waste management in the future needs to be more focused on changing people's perspectives and behavior and prioritizing community involvement in its management (bottom-up) because it is evident that a top-down approach does not work effectively. Therefore, initiating a smart waste disposal program is necessary to make current waste management truly effective and efficient. However, one way of doing it is that the community needs to understand the 3R program, namely Reduce, Reuse, and Recycle. The Banten Province Environment Agency explains the definition of 3R as follows:

- **Reduce**; as much as possible to minimize the goods or materials we use. The more we use materials, the more waste is generated.
- **Reuse**; wherever possible select reusable items. Avoid using single-use items (disposable, throw away). This can extend the usage time of the item before it becomes trash.
- **Recycle**; As much as possible, items that are no longer useful can be recycled. Not all goods can be recycled, but nowadays there are many informal industries and home industries that use waste to become other goods.

Fig 6.1: Smart Waste Management (*Source: Pratama et al., 2021)*

6.2 Summary Findings

Summary findings are very important for any project survey report. It is the easiest way to know about the whole findings of a field survey by highlighting the bullet points of the survey. The summary findings of the case study regarding household waste disposal at S. A. Khaleque Residential Area are given below:

1) **Household Level**
   - People are either neutral or unsatisfied with the current household waste disposal system.
   - Currently, waste disposal is solely non-segregated using plastic barrels or drums.
   - The dominant waste type was found to be organic/ food waste in the study area.
   - The residents do not try to make any further use of the organic or recyclable waste. Most of them simply dump it and very few sell the plastic and paper waste.
   - Most of the buildings at present do not have any separate space for bin installment.
   - They are positive about the source-based segregation of waste.
   - Though they are welcoming to this positive change, they do not want to get directly engaged.
   - Almost none heard about the community-based composting approach but they like this idea.
   - There is no coordination between the PCSP and DNCC.
   - Environmental pollution (Odor, Mosquito, etc.)

2) **Waste Collectors Level**
   - Number of waste collectors assigned in the study area- 5 (Male)
   - They are not registered under the PWCSP or DNCC.
   - Their duty station and sector are mostly not fixed as well. The same worker can be seen working at various places doing different tasks.
   - They have either primary education or no education.
   - They are given no training prior to joining the work.

- No proper schedule for waste collection. As a result, waste collection often gets irregular.
- The salaries are undefined. This mainly comes from the monthly household fees (65%) and from selling the recyclables (35%) at recycling stores.
- Maintenance cost is sometimes borne by drivers rather than PCSP owners.
- Insufficient or no safety gear (no uniforms or personal protective clothing)

3) Secondary Transfer Station (STSs) Level

- Around 15 workers work at the Secondary Transfer Station.
- No supervision or monitoring by the DNCC
- No standards for waste collection or handling practices
- Inefficient segregation of waste.
- Food waste-
  (8000 kg/ day)- Dumped in the Landfills.
- Separate/ Keep-
  - Plastic/ Glass (30-40) Tk per kg
  - Paper (10-20) Tk per kg
  - Bones (sold to fertilizer company)
- There are 3 Big Containers (Each can hold 12 tons of waste) and 22 Small Carts/ Vans (Each can hold 4 tons of waste)
- Limited or no uniforms or personal protective clothing
- Lack of safe working environment and prevalence of injuries
- Almost no health care such as vaccinations or primary treatment

6.3 Recommendation for Smart Transition

DNCC needs to shift from simply removing the waste in the city to a higher-level Smart Solid Waste Management. The initial steps that are needed right now for the smart transition are discussed below-

Table 6.1: Current Waste Disposal Practices and their Smart Transitions at Different Levels

Sectors/ Levels	Current Practices	Smart Transitions
Household	• Mixing of Waste • No Further Usage/ Reuse • Lack of Public Cooperation • Not Enough Space for Bin Installment	▪ Introduce Source-based Waste Segregation ▪ Creating Space for Bins ▪ Community-based Composting ▪ Awareness Raising Campaigns
Waste Collectors	• Unstructured Management of PCSPs • No Employment Records or Registration • Unspecific Duty Sector • Imprecise Pay Scale • Irregular Working Schedules • Lack of Training • Lack of Safety Gears	▪ Structured Management of PCSP ▪ Training and Education ▪ Segregated Waste Collection ▪ Safety and Security
Secondary Transfer Stations (STSs)	• Lack of Supervision and Monitoring • No Database and Record-Keeping • Haphazard Dumping • Inefficient Usage • Health Risks	▪ Segregated Storage and Transport of Waste ▪ Waste Reduction ▪ Better coordination between PCSP and City Corporation ▪ Provide Safety Gears

(*Source: Questionnaire Survey 2023*)

Household Level Transitions-

a) **Introduce Source-based Waste Segregation**
b) **Creating Space for Bins**
c) **Community-based Composting**
d) **Awareness Raising Campaigns**

a) Introduce Source-based Waste Segregation

The task is to introduce source-based waste segregation practice at the very beginning of waste generation which is in our homes and neighborhood. If we see the average physical composition of DCC Solid Waste, around 68% of it is organic waste, 10% is paper products and around 5% consists of plastic and rubber. Separating only these three waste items can easily prevent 83% of total waste from unnecessarily reaching landfills. Instead, we can use it in a more sustainable way by composting and recycling them in the neighborhood. And it all begins with a simple practice of using separate bins for dumping different wastes.

Fig 6.2: Source-based Waste Segregation *(Source: Sacramento City College 2022)*

This can lead to the availability of better-quality recyclables which subsequently enables people to fetch higher prices for recyclables, reduce the frequency of injury of the waste collector/recyclers, assist in promoting recycling of inorganic waste, reducing the use of virgin materials in the production process of new products. and at the same time reduce waste transportation.

b) Creating Space for Bins

A 95 Gallon Bin occupies an area of (30.5x 28) = 854 square inches which is around 6 square feet area. So, it can easily be assumed that installing a set of three such dustbins in a building will take approximately (3x 6) = 18 square feet area or at best (20-24) sq feet.

Fig 6.3: Basic Bin Sizes for Waste Storage *(Source: Atkinson 2018)*

c) Community-based Composting

Composting is a means of recapturing value from waste through the utilization of a natural biodegradation process to convert organic materials into soil additives. It has the potential to reduce the cost of waste disposal, minimize large-scale public health risks, produce clean and readily marketable finished products, and help to increase the recovery rate of recyclable materials.

A community-scale composting program is a terrific way to increase local resilience, build sustainability awareness, and provide quality soil amendments for local use. Food scraps and yard trimmings can easily be turned into beneficial compost for a community garden or local urban farm. Especially for apartment dwellers, community-scale composting is one approach to preventing landfill disposal of compostable organic materials. It has the potential to reduce waste generation while benefiting the earth by returning nutrients to the soil. This program can also engage and enhance a community or a local school with a fun educational experience. Moreover, it was found that by converting organic waste one can reduce methane emissions, a Green House Gas (GHG), and harness carbon financing.

d) Awareness Raising Campaigns

Public awareness-raising activities should be implemented in an effective and cost-saving manner mainly through community-level activities on the ground. According to the current DNCC practices and future prospects, the following city-wide public awareness activities are implemented during their Master Plan period.

i) Public awareness activities and workshops
ii) Clean Dhaka Campaign/Festival
iii) Information sharing via the DNCC's website, magazine, and SNS
iv) Environmental education at schools
v) Public relations and public awareness strategy development, including regional public relations programs

<u>Waste Collector Level Transitions-</u>

(a) Structured Management of PCSP
(b) Training and Education
(c) Segregated Waste Collection
(d) Safety and Security

a) Structured Management of PCSP

DNCC should improve the PWCSP's service through capacity building and empowerment activities such as-

⇒ A Registration System
⇒ Supervision and Training
⇒ Periodic Inspection and Monitoring
⇒ Transparent Selection Process of PCSPs
⇒ Stakeholder dialogue and other programs, etc.

b) Training and Education

Waste collectors are people who usually have very little or no academic knowledge or background. As a result, they often lack many basic understandings regarding our surroundings and environment. Therefore, it is very crucial to train and teach them the basics of the task before sending them to the field. As they work at the core of our waste disposal system, their well-being and education are very significant for a smart waste management transition. The PCSPs and DNCC should provide them with the following-

- ⇒ Training and Workshops
- ⇒ Environmental Education
- ⇒ Knowledge about Health and Safety Basics, etc.

c) Segregated Waste Collection

The waste that is segregated at the source of generation which is our households and neighborhoods should also be collected separately. Otherwise, the whole point of source segregation of waste will be meaningless if the collectors continue to pick them randomly regardless of their types and natures. Therefore, once the source segregation practice is implemented the workers should also change their waste collection practice.

For example, food wastes may need to be collected regularly as they tend to rot very quickly but the recyclables can be kept for a longer period of time as they do not decompose. So, collection frequency and collected waste will highly depend on the waste type.

d) Safety and Security

Improvement in the working environment of cleaners is important for better Occupational Health, Safety, and Environment (OHSE). It is also essential for cleaners to learn knowledge on OHSE to protect themselves. The components are given below-

(i) Provide safety gear and first-aid kits

(ii) Formulate a Safety and Sanitation Committee (SSC)

(iii) Introduce a Working Manual for reference

(iv) Periodic Health Checkups, etc.

Secondary Transfer Station Level Transitions-

(a) Segregated Storage and Transport of Waste

(b) Waste Reduction

(c) Better coordination between PCSP and City Corporation

(d) Provide Safety Gears

a) Segregated Storage and Transport of Waste

The initiation of the source of based segregation of waste should also be maintained here that would be transported to the station through separate carts or vans by the primary waste pickers. The secondary transfer stations are allocated a minimum of three or four large containers to store the incoming waste. Instead of the current practice of haphazard mixing and dumping, we should use these containers to separate the waste as per their basic nature and types. This on the one hand will help the better separation and quality maintenance of the recyclables, and on the other hand, reduce the trip frequency and transportation cost of the waste picker trucks.

b) Waste Reduction

At least 80-90% of the total waste can be recycled, which now goes to dump sites or landfills in the absence of the practice of segregation of waste. The quality and efficiency of the recycling plants highly depend on the quality of the segregated wastes. Study shows that with 3R practice two trucks full loads of recyclables can be minimized.

Once the waste has been collected, it is taken to a nearby composting plant. Organic waste is converted into compost using a method that does not produce bad smells. The following diagram shows the pathway of waste reduction. The organic waste is piled around a bamboo rack to allow a good circulation of air which speeds up the breakdown of the waste. Sawdust is mixed with the waste to increase the air content. The pile is turned frequently in order to maintain the temperature and to ensure equal decomposition throughout the pile. Water is used to speed up decomposition. Chicken and cattle manure are added to increase the nitrogen in the compost. This process takes 40 days. The pile is then left to mature without turning or watering for 15 days.

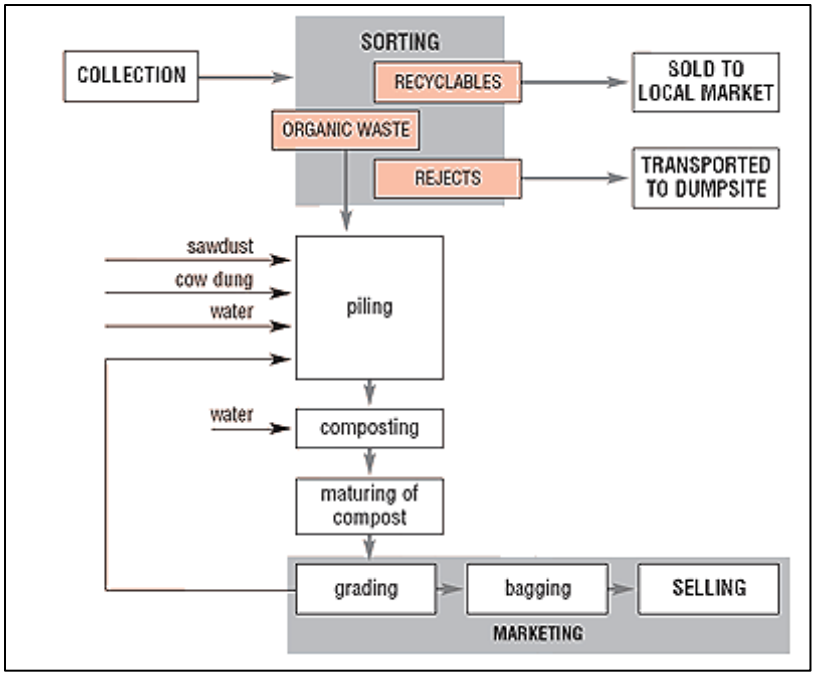


Fig 6.4: Reduction of Waste *(Source: Enayetullah I. 2004)*

c) Better Coordination between PCSP and City Corporation

To reform the organizational structure of DNCC should coordinate with the PCSPs in an integrated and systematic manner. This capacity-building program includes better coordination, monitoring, and evaluation of the waste disposal and sorting process. In addition, the capacity development of management personnel is required to encourage ward-wise and zone-wise management in building on the fundamental planning skill, which will reactivate field-level activities.

d) Provide Safety Gears

Although the workers involved in the plastic recycling industry are making a significant positive contribution to our environment and economy, they are carrying out their activities for their survival in unhygienic conditions. At present there is no incentive package offered by the government to improve their efficiency and working condition.

Like the primary waste pickers, the secondary station workers also work barehand without any PPE or safety gear. But they are at risk of getting more severely affected by the waste, as they are

not only just involved in the disposal process but also do they sort them being unprotected which leads to some serious kinds of health impacts. The PCSPs and DNCC should provide the necessary safety gear and equipment to the workers as well as impose rules and regulations to ensure its proper and regular use among the worker while they are working.

6.4 Conclusion

Waste will not be something that can harm society if it is managed properly. The results of this study show that the smart waste disposal program in waste management not only produces products from processed waste but also increases public involvement and knowledge and changes behavior in managing waste. Waste management is also a great opportunity for the government to mobilize the community to take an active role in overcoming the waste problem. This can be used by the government to fully support movements that are created from the community with budget assistance and continue to collaborate with various institutions or community leaders in providing education and empowerment to the community regarding awareness and independence in managing waste into products with high selling value. Apart from being effective in overcoming the waste problem, it can also provide a good opportunity to improve the overall quality of our city environment.

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Appendix

Appendix-1: Questionnaire

নমুনা নংঃ
রোড নংঃ
বাসা নংঃ

অংশ-কঃ জনমিতিক উপাত্ত

লিঙ্গ- □ পুরুষ □ মহিলা

পেশা- _____

পরিবারের ধরন- □ একক □ যৌথ

আপনার বাড়িতে কোন ধরনের আবর্জনা বেশি উৎপাদিত হয়?- □ জৈব □ অজৈব

□ অন্যান্য _____

আবর্জনা ফেলার ধরন- □ পৃথকীকৃত (Segregated) □ অপৃথকীকৃত (Non-segregated)

বর্তমান আবর্জনা ব্যবস্থাপনায় প্রদত্ত মাসিক খরচঃ _____

আপনি কি এলাকার বর্তমান আবর্জনা ব্যবস্থাপনায়-

□ সন্তুষ্ট; কারণ-_____

□ অসন্তুষ্ট; কারণ-_____

আপনি কি আবর্জনা ফেলতে পৃথক পৃথক ডাস্টবিন ব্যবহারে আগ্রহী? □ হ্যাঁ □ না

আপনি কি উন্নত আবর্জনা ব্যবস্থাপনায় প্রয়োজনে অতিরিক্ত খরচ বহনে রাজি? □ হ্যাঁ □ না

আপনি আপনার বাসার জৈব বর্জ্যের কি কোনো বিকল্প ব্যবস্থাপনা করেন?

□ হ্যাঁ; কীভাবে_____

□ না

আপনি আপনার বাসার অজৈব বর্জ্যের কি ব্যবস্থাপনা করেন?

□ ফেলে দেই

□ বিক্রি করি

□ অন্যান্য; _____

আপনি কি এলাকাভিত্তিক সাম্প্রদায়িক জৈব সার প্রস্তুতকরণ প্রক্রিয়ার ব্যাপারে অবগত আছেন?

□ হ্যাঁ □ না

আপনি কি এলাকাভিত্তিক সাম্প্রদায়িক জৈব সার প্রস্তুতকরণ প্রক্রিয়ায় অংশগ্রহণে আগ্রহী?

□ হ্যাঁ □ না

জৈব সার প্রস্তুতকরণ প্রক্রিয়ায় আপনি কোন উপায় বেশি পছন্দ করবেন?

□ ব্যক্তিগত; কারণ-_____ □ এলাকাভিত্তিক; কারণ- _____

আপনার বাসার অজৈব বর্জ্যের ব্যবস্থাপনায় আপনি কি ধরনের ব্যবস্থা পছন্দ করবেন?

□ ব্যক্তিগত উদ্যোগ □ সরকারি হস্তক্ষেপ □ বেসরকারি এজেন্ট

এলাকার বর্তমান অপৃথকীকৃত আবর্জনা ব্যবস্থাপনার পরিবেশগত ঝুঁকি কি আপনার অভিজ্ঞতায়?

_____

এলাকার বর্তমান অপৃথকীকৃত আবর্জনা ব্যবস্থাপনার জন্য আপনি কী ধরনের স্বাস্থ্য ঝুঁকিতে পড়েছেন?

_____

অংশ-খঃ ডাস্টবিন সংক্রান্ত উপাত্ত

পৃথক ডাস্টবিন স্থাপনের পর্যাপ্ত জায়গা বিদ্যমান? □ হ্যাঁ □ না

পৃথক ডাস্টবিন স্থাপনের পর্যাপ্ত জায়গা তৈরিতে আগ্রহী? □ হ্যাঁ □ না

পৃথক ডাস্টবিন স্থাপনের জন্য প্রয়োজনে নিজস্ব তহবিল গঠনে আগ্রহী? □ হ্যাঁ □ না

ডাস্টবিন ব্যবস্থাপনা ও নিরাপত্তা জনিত উদ্যোগে- □ আগ্রহী □ অনাগ্রহী

অংশ-গঃ বর্জ্য সংগ্রহকারী কর্মীদের উপাত্ত

লিঙ্গ- □ পুরুষ □ মহিলা

শিক্ষাগত যোগ্যতা- □ প্রাইমারী □ মাধ্যমিক □ উচ্চ মাধ্যমিক □ স্নাতক/ অনার্স

বর্জ্যের ধরন সম্পর্কে ধারণা- □ আছে □ নেই

আপনি কি আবর্জনা ব্যবস্থাপনায় কোনো প্রকার প্রশিক্ষণ গ্রহন করেছেন? □ হ্যাঁ □ না

আপনি বর্জ্য ব্যবস্থাপনার কোন অংশে কাজ করেন? □ সংগ্রহ □ বাছাই □ পরিবহন

□ অন্যান্য _____

বর্জ্য ব্যবস্থাপনার কাজে আপনার মাসিক আয়- _____

আপনার মতে আবর্জনা ফেলতে পৃথক পৃথক ডাস্টবিন ব্যবহার কি উপকারী? □ হ্যাঁ

কারণ- _____

_____

□ না

কারণ- _____

_____

আবর্জনা ফেলতে পৃথক ডাস্টবিন ব্যবহার কি আপনার পেশাকে ক্ষতিগ্রস্থ করবে? □ হ্যাঁ

কীভাবে? _____

□ না

বর্জ্য সংগ্রহের সময় কি আপনি বর্জ্য তার ধরন অনুযায়ী আলাদা করেন? □ হ্যাঁ □ না

বর্জ্য ব্যবস্থাপনার কাজে আপনি কি কোনো সুরক্ষা পোশাক ব্যবহার করেন?

□ হ্যাঁ

কি কি ধরনের সুরক্ষা পোশাক ব্যবহার করেন? _____

□ না

সুরক্ষা পোশাক ব্যবহার না করার কারণে আপনি কি ধরনের শারীরিক ক্ষতির সম্মুখীন হন?

□ চর্মরোগ □ ডায়রিয়া □শ্বাসকষ্ট □ অন্যান্য _____

অংশ-ঘঃ সেকেন্ডারি ট্র্যান্সফার ষ্টেশন (STS) উপাত্ত

দৈনিক সংগ্রহকৃত আবর্জনার পরিমাণ- _____

সংগ্রহকৃত আবর্জনা পৃথকীকরণ করা- □ হয় □ হয় না

পৃথকীকৃত বর্জ্যের ধরন- □ জৈব □ অজৈব □ অন্যান্য _____

পৃথকীকৃত বর্জ্যের পরিমাণ- □ জৈব _____ □ অজৈব _____ □ অন্যান্য _____

প্রয়োজনীয় কর্মী সংখ্যা- _____ কর্মীর কাজের ধরন_____

কর্মীদের মাসিক আয় _____

দৈনিক বর্জ্য পিকআপ- _____

বর্জ্যের চূড়ান্ত গন্তব্য- □ জৈব _____ □ অজৈব _____ □ অন্যান্য _____

বর্জ্য ব্যবস্থাপনার কাজে আপনি কি কোনো সুরক্ষা পোশাক ব্যবহার করেন?

□ হ্যাঁ

কি কি ধরনের সুরক্ষা পোশাক ব্যবহার করেন? _____

□ না

সুরক্ষা পোশাক ব্যবহার না করার কারণে আপনি কি ধরনের শারীরিক ক্ষতির সম্মুখীন হন?

□ চর্মরোগ □ ডায়রিয়া □শ্বাসকষ্ট □ অন্যান্য _____

Appendix-2: Photographs


GIRL
DRAGONS


TURAN
TURAN