

**PROJECTION OF THE EXISTING LANDFILL AREA
FOR WASTE DISPOSAL AT THE BARISAL CITY
CORPORATION**

Submitted by

**Rakibul Islam
ID: 173-47-563**

A Thesis Submitted to the Department of Civil Engineering, Daffodil International
University in Partial Fulfillment of the Requirements
for the Degree of
Bachelor of Science in Civil Engineering.



**DEPARTMENT OF CIVIL ENGINEERING
DAFFODIL INTERNATIONAL UNIVERSITY**

AUGUST 2023

LETTER OF APPROVAL

The thesis titled “ **Projection of the existing landfill area for Waste Disposal at the Barisal City Corporation** ” Submitted by Name: Rakibul Islam ID: 173-47-563.

Signature of the candidate



Name: Rakibul Islam

ID: 173-47-563



Name of the supervisor

Dr. Mohammad Hannan Mahmud Khan

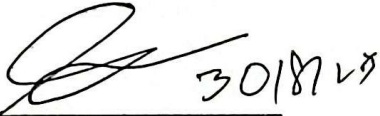
Assistant Professor & Head
Department of Civil Engineering
Faculty of Engineering
Daffodil International University.

This is to certify that this project and thesis titled “ **PROJECTION OF THE EXISTING LANDFILL AREA FOR WASTE DISPOSAL AT THE BARISAL CITY CORPORATION** ” Submitted by Name: Rakibul Islam ID: 173-47-563, under my direct supervision and this work has been carried out by them in the laboratories of the Department of Civil Engineering under the Faculty of Engineering of Daffodil International University has been accepted in partial fulfillment of the requirements for the degree of Bachelor of Science.

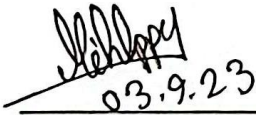
BOARD OF EXAMINERS



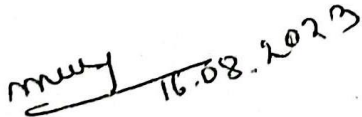
Dr. Mohammad Hannan Mahmud Khan
Chairman
Assistant Professor & Head
Department of Civil Engineering
Faculty of Engineering
Daffodil International University.



Mr. Saurav Barua
Internal Member
Assistant Professor
Department of CE, DIU.



Engr. Md. Imran Hasan Bappy
Internal Member
Lecturer
Department of CE, DIU.



Dr. Muhammad Mukhlesur Rahman
EXTERNAL MEMBER
Deputy Secretary
Ministry of Textiles for Jute.

ACKNOWLEDGEMENT

Initially, the author expresses gratitude to the Almighty Allah, the beneficent and merciful, for enabling the successful completion of the study. The author expresses deep appreciation and indebtedness to Dr. Mohammad Hannan Mahmud Khan, Assistant Professor & Head, Department of Civil Engineering, Daffodil International University, Dhaka and Dr. Miah M. Hussainuzzaman, Associate Professor, Department of Civil Engineering, Daffodil International University, Dhaka, for their valuable guidance, encouragement, and helpful suggestions which made this study possible. The author acknowledges their active interest in the topic and advice throughout the study, which proved to be immensely helpful, and their unrestricted personal guidance which made the research work significantly easier. The author also extends thanks to their family members for their continuous support, encouragement, and love throughout the creation of this work and in their daily life. Additionally, the author thanks all the faculties, academicians, and staff of Daffodil International University for their direct and indirect cooperation in preparing this thesis report. Finally, the author expresses gratitude to all those who extended their helping hands in this regard, whose names cannot be mentioned here.

DEDICATION

Dedicated to
My parent's & my respectable teacher Dr. Mohammad Hannan Mahmud Khan, a
great teacher of Daffodil International University (DIU).

ABSTRACT

Waste generation is an indispensable part of human existence. The proportion of the waste generation in Bangladesh have been rising with population increasing and urbanization. The purpose of this study is to estimate the amount of waste produced in Barishal city and estimate its future landfill needs. The creation of a well-planned and sustainable waste management system is required due to the increasing difficulties urban regions experience in disposing of their trash. The study models the future trash volume using information on waste creation, population estimates and waste management techniques. First, I conducted the fiend survey in person and formulated some questions based on it. I collected the answers from residents and the city corporation authority. Based on that I have completed the calculation. Through analysis I will determine the capacity of landfill and duration will it take to fill. After completing the whole process and the feedback of the residents I could discuss some potential features that might contribute in future management of the wastes for this city.

Keywords:

Present Condition of Landfill, Determination of Volume, Process of Work, Future management.

TABLE OF CONTENTS

Table of Contents

LETTER OF APPROVAL	ii
BOARD OF EXAMINERS	iii
ACKNOWLEDGEMENT	iv
DEDICATION	v
ABSTRACT	vi
TABLE OF CONTENTS.....	vii
LIST OF FIGURES	ix
Chapter 1 INTRODUCTION.....	1
1.1 Background	1
1.2 Objectives of the study.....	2
1.3 Organization of the thesis.....	2
Chapter 2 LITERATURE REVIEW.....	3
2.1 Introduction	3
2.2 Waste collection	3
2.3 Waste collection system.....	3
2.4 Waste management	4
2.5 Waste volume.....	5
2.6 Garbage dump	5
2.7 Waste disposal.....	6
2.8 Waste recycling.....	6
Chapter 3 METHODOLOGY.....	7
3.1 Introduction	7
3.2 Methodology	7
3.3 Location of Landfill	7
3.4 Landfill Area Selection Criteria.....	8
3.5 Waste Collection Vehicle.....	9
3.6 Waste Landfill Area	9
3.7 Characteristic of Landfill	10
3.8 Thoughts of Conscious Citizens.....	11
3.9 Responsibility of City Corporation	11
3.10 Opinion of City Corporation Authority.....	11

Chapter 4 DATA ANALYSIS & RESULT	12
4.1 Introduction	12
4.2 Distribution of City Corporation	12
4.3 Waste Quality of City Corporation.....	13
4.4 Waste Capacity of the Landfill Area	13
4.5 Calculation of waste volume	13
4.6 Result	14
4.7 Discussion.....	14
Chapter 5 CONCLUSION	15
5.1 Conclusion	15
5.2 Future Study.....	15
REFERENCES	16
APPENDIX.....	17

LIST OF FIGURES

Figure No	Figure Caption	Page
2.3.1	Waste collection system	3
2.3.2	Waste collection process of Barishal City Corporation	4
2.4	Types of waste management	5
3.3	Location area map	7
3.4	City corporation inspection photos and some satellite images of garbage area	8
3.5	Waste collection vehicle	9
3.6	Waste landfill area of Barishal City Corporation	10
3.7	Characteristic of landfill	10
3.9	Responsibility of City Corporation	11
4.2	Barishal city corporation wards map	12

Chapter 1

INTRODUCTION

1.1 Background

In 1995 urban Bangladesh produced 0.49 kg per individual per day waste that's calculable to amplify to 0.6 kilograms by 2025 (Nawshad, 2019). The potential reason for usually the expedient and tall development of the urban populace. As an example, in 1999, thirty million individuals, around 2 hundredths of the whole populace of Bangladesh, lived in urban regions; by 2015 it's calculable that sixty-eight million, over 3rd of the whole population, Bangladesh living in urban regions in Bangladesh. As a result, about five- hundredths of the day by day produced trash remains uncollected within the cities of Bangladesh (Bhuiyan, 2005). A 'gap' exists between the day-by-day time and Bangladesh of strong waste that takes off urban organization defenseless to citizens' complaints. Promoted considers around, in show disdain toward of utilizing open resources, the town governments have not given tasteful conservancy organizations to clients. Had this been due to resource issues or specialized inconveniences alone, their assurance would less difficult. Affirmation suggests that regularly not the case. It's in the midst of this setting that this considers endeavors to see at whether or not down and out conservancy advantage transport stems from an administration emergency in Bangladesh.

Thus, this paper:

- Describes the volume, characteristics and collection route of waste in Barishal City.
- Analyzes operational challenges that hinder benefit arrangement and
- Discusses the present waste disposal scenario system of this area.

In old-fashioned cities, wastes were hurled onto unpaved streets and roadways, where they were cleared out construct up to construct up. It was not until 320 BCE in Athens that the essential known law blocking this sharpen was built up. At that time a system for waste departure begun to progress in Greece and inside the Greek-dominated cities of the eastern Mediterranean. In ancient Rome, property proprietors were reliable for cleaning the paths fronting their property. But organized waste collection was related because it was with state-sponsored events such as parades. Exchange procedures were uncommonly grungy, counting open pits found reasonable outside the city dividers. As populaces extended, endeavors were made to transport waste more removed out from the cities.

After the drop of Rome, waste collection and gracious sanitation begun a rot that persevered all through the Center Ages. Near the conclusion of the 14th century,

foragers were given the task of carting waste to dumps outside city dividers. But this was not the case in more diminutive towns, where most people still hurled waste into the streets. It was not until 1714 that each city in Britain was required to have an official forager. Metropolitan strong waste administration (MSWM) within the United States could be a framework comprised of administrative, regulatory, showcase, technology and social subcomponents and can as it were caught on within the setting of its chronicled advancement. American cities needed organized open works for road cleaning, deny collection, water treatment, and human squander expulsion until the early 1800s (Louis, 2004). Squander exchange procedures were still especially grungy, be that because it may. Waste collected in Philadelphia, for outline, was essentially dumped into the Delaware Waterway downstream from the city.

1.2 Objectives of the study

The objectives of this study are as follows:

- Determine the volume of wastes.
- Opportunities for potential landfill approach.
- Recommend future wastes disposal.

1.3 Organization of the thesis

The thesis presents literature review, data analysis and finding of the study in five chapters

Chapter-1 Includes background, objective of the study. Chapter-2 Includes literature review,

Chapter-3 Includes the methodology of the thesis.

Chapter-4 Presents the Survey about waste collection route.

Chapter-5 Conclusions, Recommendation for future study.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

The procedure expected affiliated in this place acknowledge is the manuscript audit of past ponders, survey of the belief of waste accumulation route, judgment of present needs through inquiry and field survey, determinable and emotional test of waste, security of needs for the projected plan, conclusion of the book for appliance for grinding garbage, study of electoral selection.

2.2 Waste collection

Waste collection includes the process of waste management. It involves moving solid waste from its site of production and disposal to a facility for treatment or disposal in a landfill. As part of a municipal landfill diversion program, waste collection also involves the curbside coaction of recyclable goods that aren't technically waste.

Waste collection refers back to the manner of gathering and eliminating numerous types of waste materials from homes, agencies, industries, and public places to make sure proper disposal or recycling. Waste series is critical provider in city and rural regions to preserve cleanliness, hygiene and environmental sustainability. Waste collection is essential for retaining public fitness and keeping the surroundings. proper waste collection facilitates prevent pollution, lessen the unfold of diseases and conserve herbal assets thru recycling and responsible waste control practices. many nations and localities have policies and tips in area to make sure that waste collection is executed successfully and in an environmentally pleasant manner.

2.3 Waste collection system

Essentially there are up to five basic alternatives for collection systems, depending upon the level of effort required from the waste generators. These are described below:

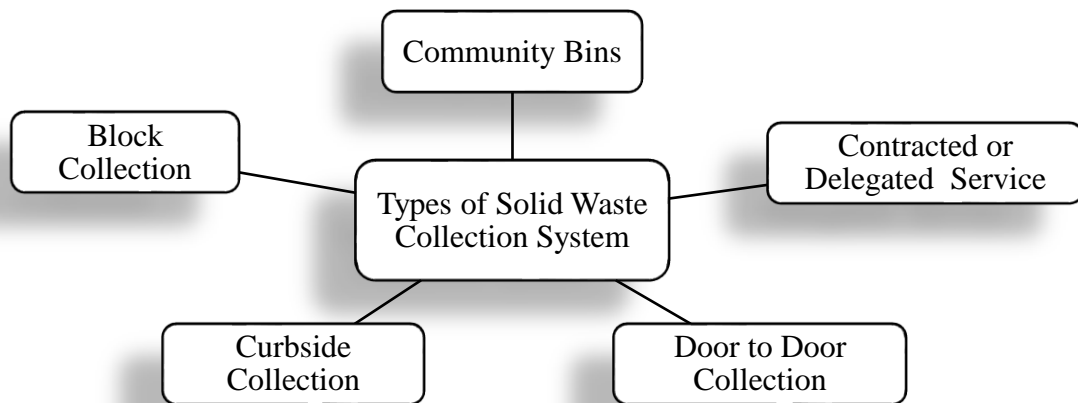


Fig-2.3.1: Waste collection system.

A waste collection process refers to the organized and dependent procedure of amassing, transporting and disposing of waste substances generated through families, companies, industries and different assets. The number one goal of waste series system is to efficaciously and responsibly control waste to reduce environmental pollutants, public health threat and aid depletion. Waste collection system of Barishal City Corporation is Door to Door Collection. Their waste collection process is given bellow:

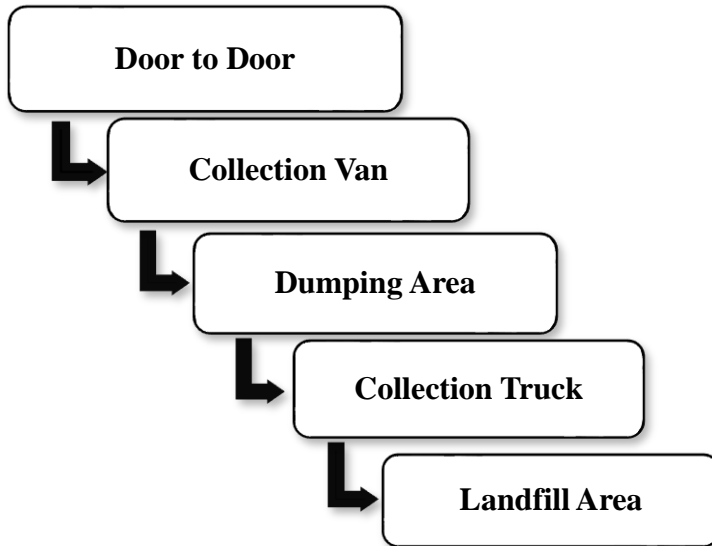


Fig-2.3.2: Waste collection process of Barisal city corporation.

2.4 Waste management

Waste management is a vital service in any society. Sometime recently presenting the strategy of waste management, let's begin with a talk of the fabric being overseen waste. Waste refers to the run of trash materials which a holder disposes of, serious to dispose of or is required to dispose of. Waste is created from private, mechanical and commercial exercises in a given zone and can be taken care of in a diverse way. Such as, landfills are for the foremost portion classified as clean, advancement, metropolitan and mechanical squander locales.

Waste can be classified based on texture, such as plastic, paper, glass, wood, metal, e-waste etc. Regardless of the substance, starting or threat potential, solid waste needs to be supervised dependably to ensure characteristic best hones. As waste administration may be a fundamental point of common cleanliness, it must be solidified into normal orchestrating, sterile, improvement, gracious and mechanical waste goals.

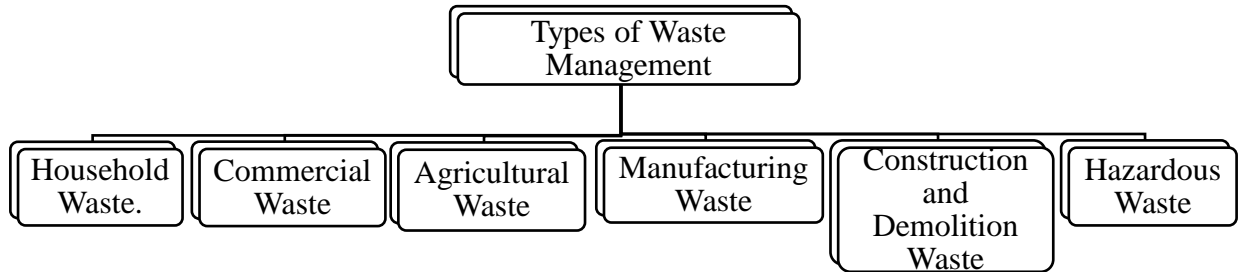


Fig-2.4: Types of waste management.

2.5 Waste volume

Waste volume refers to the amount of waste generated and accumulated over a specific period, usually measured in cubic meters (m³) or cubic feet (ft³). Waste volume can vary significantly depending on the type of waste, the population or industry generating the waste, and the waste management practices in place.

The management of waste volume is an enormous environmental and social concern. right waste control goals to lessen waste era, promote recycling and reuse, and ensure safe disposal of unsafe substances. Waste discount, recycling, composting, and waste-to-strength projects are most of the techniques employed to cope with waste volume and its related environmental effects. moreover, waste management regulations and guidelines play an important role in guiding waste management practices on the neighborhood, nearby, and country wide levels.

2.6 Garbage dump

A garbage dump, also referred to as a landfill or a garbage landfill, is a delegated place in which solid waste is disposed of and buried. it's far a commonplace approach of waste disposal used by many towns and municipalities around the sector. The system includes gathering and transporting waste materials from residential, industrial, and commercial sources to the landfill site. As soon as at the landfill, the waste is unfolding out and compacted to reduce its quantity. This compaction facilitates to maximize using to be had space. Landfills are cautiously engineered to prevent environmental pollutants and contamination of soil and water. Measures which include lining the landfill with plastic or clay boundaries are taken to prevent the leaching of dangerous substances into the surrounding environment.

While garbage dumps serve as a not unusual technique of waste disposal, they're now not without troubles. Improperly managed landfills can lead to environmental pollutants, groundwater contamination, and the emission of greenhouse gases. As an end result, many cutting-edge wastes control strategy's goal to reduce waste through recycling, composting, and waste-to-electricity technology to minimize the reliance on landfilling.

2.7 Waste disposal

Waste disposal means expelling, disposing of, reusing or crushing undesirable materials called waste that's created from horticulture, residential usage or industrial products. Taking after the proper strategies for waste disposal will guarantee lesser contamination and risks for the environment. Waste disposal, the collection, preparing, and reusing or explanation of the waste materials of human society. Waste is classified by source and composition. Broadly talking, waste materials are either liquid or solid in outline, and their components may be either risky or sit out of gear in their impacts on prosperity and the environment. The term misuse is routinely associated to solid misuse, sewage (waste-water), unsafe waste, and electronic waste.

2.8 Waste recycling

In spite of the fact that reusing is one of the pre-eminent basic perspectives of waste administration in created nations, since of the composition of waste and other factors, reusing may not be allocate of a choice in terms of creating nations. Segment of waste materials at the family level is likely a broad wonder; more subsequently in creating nations wherever the division of something commendable is grasped with care, which expects assets and reusable materials from being arranged of.

Arranging for maintainable urban strong squander administration (USWM) in creating nations must address a few forbid issues such as open well-being, environment, show and future costs to society and the vocation of the “actors” within the casual reusing segment. This article presents a framework flow demonstrate which captures the energetic nature of intelligent among the different components of the USWM framework in a commonplace metropolitan city in India. The show gives a stage for wrangle about on the potential and systemic results of different auxiliary and arrangement options for economical USWM (Sudhir, Srinivasan & Muraleedharan,1998).

The Government of Republic of Bangladesh is already thinking about waste recycle. It is expected that a positive decision will be made in this regard very soon.

Chapter 3

METHODOLOGY

3.1 Introduction

Waste in Barisal City originates from different sources such as from house, office, school, clinic, mosque etc. The present Waste Management System and disposal of Barisal City is poor and insufficient. The staffs collect all the wastes from the bins at a fixed time in a day. Then they carry it through van. Then they store it in a selected place. Then all the waste collected by city corporation staffs by their drum truck and they directly dumped the wastes on their dumping zone or disposal place. Our thought is to determine the volume of waste and dispose it properly.

This chapter outlines deferent steps selections of our study area, determine the waste volume. To develop a plan for future waste disposal landfill.

3.2 Methodology

We divided our work procedure into four steps.

- Make a field survey for a comprehensive understanding of the scenario with the help of images.
- Prepare question.
- Collecting responses from different stake holders from the area.
- Calculation of waste volume.

3.3 Location of Landfill



Fig-3.3: Location area map (22°43'41.8"N 90°22'01.7"E).

3.4 Landfill Area Selection Criteria

Selecting a landfill area includes cautious consideration of various factors to ensure the web site is appropriate for waste disposal while minimizing environmental and social impacts. The unique standards may range relying on neighborhood policies, geological situations, and network options. right here are a few commonplace landfill area selection criteria:

- Adequate road access.
- Land availability and size.
- Proximity to the waste generation source.
- Distance from residential area or other sensitive receptors.
- Distance from valuable natural habitats or cultural significance.
- Region's climate and weather patterns.
- Social acceptance and public consultant.
- Long-term viability.
- Financial consideration.

Landfill area of Barisal city corporation is located far away from Barisal city and flowing river. The road is big enough for garbage trucks to drive through. This landfill has sufficient usable space. Landfill area is located away from densely populated areas. Some still images and satellite image of the landfill areas are given bellow:

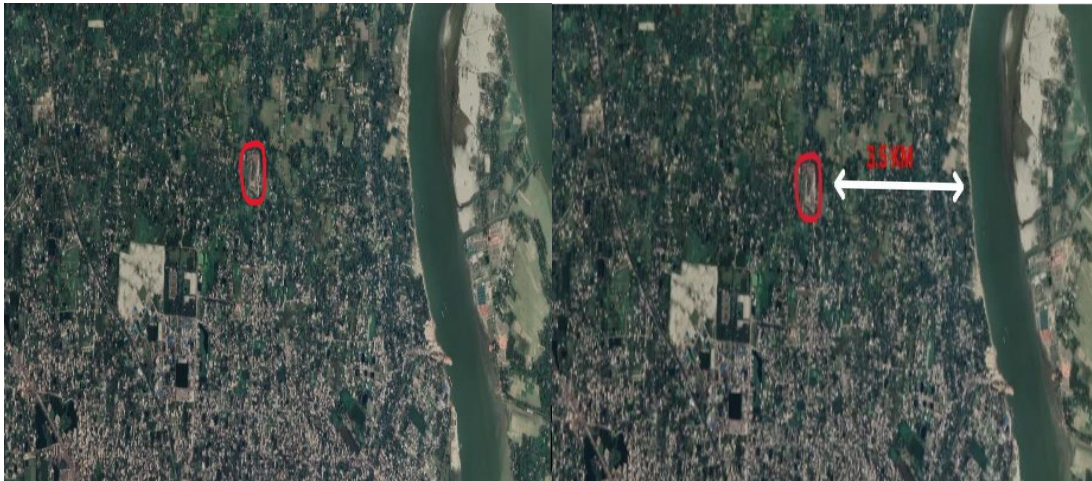


Fig-3.4: City corporation inspection photos and some satellite images of garbage area.

3.5 Waste Collection Vehicle

A waste collection vehicle, also known as a garbage truck, rubbish truck, trash truck or dustbin lorry (inside the UK), is a specialized car designed to collect and delivery municipal strong waste from residential, business, and industrial areas to disposal centers inclusive of landfills or recycling facilities. these automobiles play an essential role in keeping public health and sanitation by way of efficaciously disposing of and dealing with waste materials from populated areas. Waste collection vehicles are an important a part of waste management systems in cities and towns worldwide, supporting hold the environment clean and making sure right disposal or recycling of waste materials. they are operated by skilled employees who comply with strict protection tips to perform their obligations efficiently.

Barisal city corporation uses two types of vehicles. One is truck and the other one is a mini-van. The pictures of the vehicles of Barisal city corporation are given bellow:



Fig-3.5: Waste collection vehicle.

3.6 Waste Landfill Area

Based on our questions answers I visited some places where the waste of this area is collecting and dumping. The collection system of this area is basically door to door system. But they don't collect the waste regularly. For those reasons some of the people of this area are throwing waste at any place. In this area there also a particular designated place for garbage disposal, but it is not near from city corporation. The distance of the landfill area from the city around 4km.



Fig-3.6: Waste landfill area of Barisal City Corporation.

3.7 Characteristic of Landfill

The location of landfill is not near from the center of the city. The distance of the landfill from the center of the city around 4km and 3.5km from the river side. The population density of landfill area is low. Very few people live around the landfill area. There are no social institutions like, school, college, park, playground or religious institutions near by the landfill area. The landfill was created by excavating 18.52 meters of soil. The biggest advantage in this landfill is that they can dump several times more waste here than any flat ground. As a result, it was very convenient for the city corporation to use this place as a landfill.

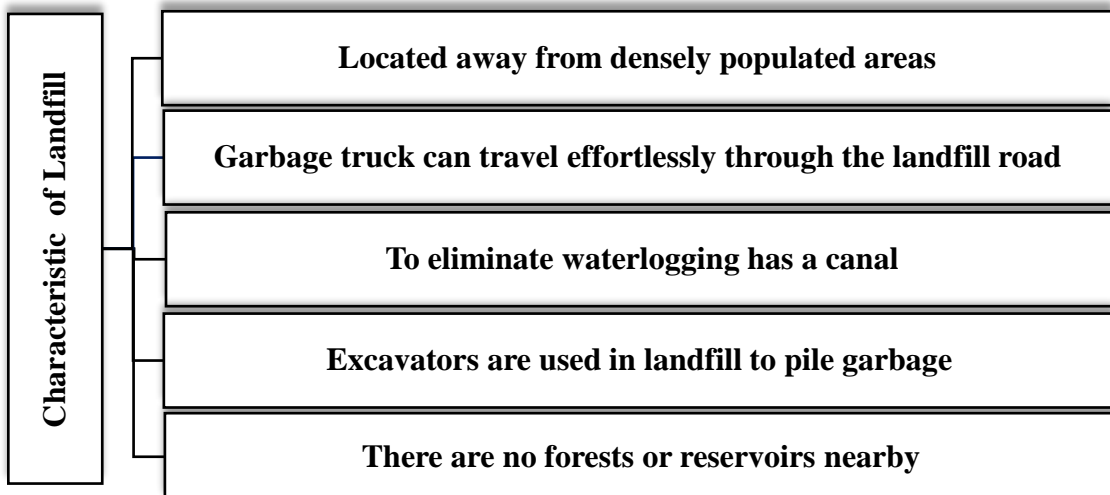


Fig-3.7: Characteristic of landfill.

3.8 Thoughts of Conscious Citizens

Residents can discover and screen the area of waste holders and provide orders, demands and complaints. Residents can to watch the collection days anytime and request a new service quickly. It would be useful to draw citizens absent from untrue waste practices and appropriately apply the nearby authorities' rules. One of the best ways to be more waste-conscious is to think about recycling where and whenever possible. Some permanent citizen thoughts that the waste collection of our area should get a proper system. They thought if we don't take any permanent decision regarding this matter, it would be harmful for our environment and also for our health. So necessary step should take as early as possible.

3.9 Responsibility of City Corporation

The responsibility of a city corporation (or municipality) for waste management commonly consists of quite a number obligations and offerings geared toward maintaining cleanliness and sanitation within the town. these responsibilities may additionally vary relying at the city's size, area, and specific rules; however, some common aspects consist of:

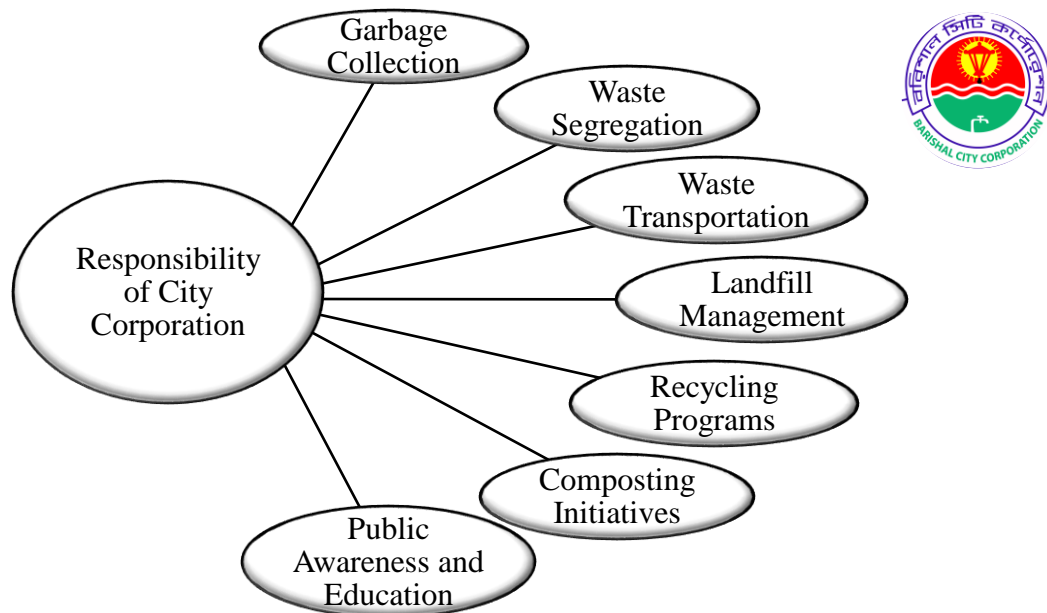


Fig-3.9: Responsibility of City Corporation.

3.10 Opinion of City Corporation Authority

The representatives of City Corporation thought at first, they should make a proper plan. First of all, they want to develop the roads so that truck or mini truck can easily move on the road of landfill area. They also thought that they require some employee for waste management. Their plan is to dispose of the waste properly. They are also working on how to recycle waste so that the landfill area can be used longer.

Chapter 4

DATA ANALYSIS & RESULT

4.1 Introduction

For making a suitable decision data analysis plays a very important role. By combining the data collected through data analysis I get a result. And these obtained results help for completing a survey work.

4.2 Distribution of City Corporation

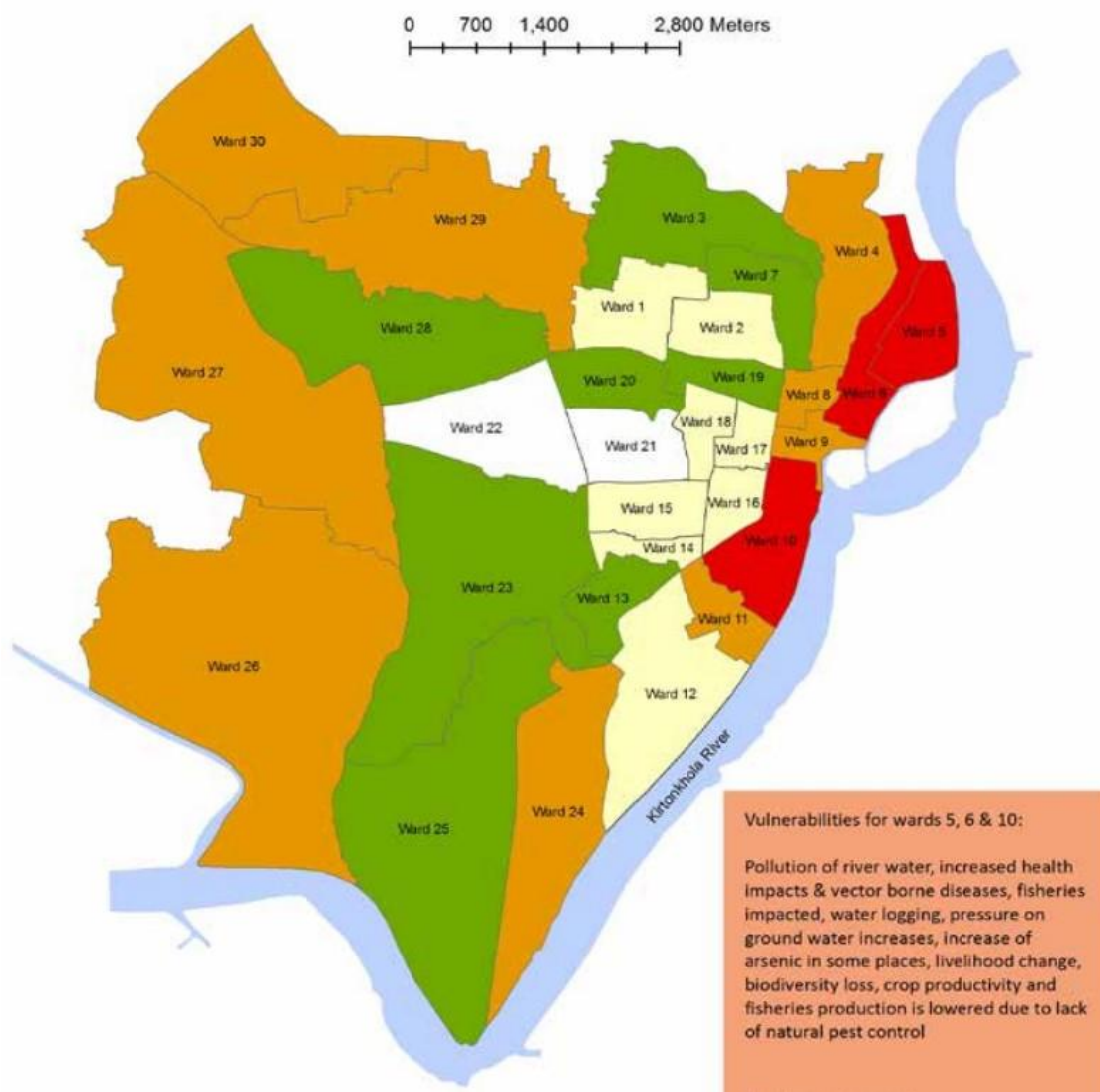


Fig 4.2: Barisal city corporation wards map.

From this map we clearly see that the city corporation divided into 30 wards. For this formation the authorities can perform all kinds of basic functions of the city corporation very easily.

4.3 Waste Quality of City Corporation

As of my journeying, waste management in Barisal city corporation faced large demanding situations. Barisal city corporation has a large and growing populace, which results in growing waste era. The waste control infrastructure and structures have struggled to preserve up with the tempo of urbanization and industrialization, main to issues with waste disposal and its environmental impact.

Some key aspects of the waste quality in Barisal City Corporation include:

- Insufficient Waste Collection
- Open Dumping and Landfills
- Plastic Pollution
- Informal Recycling
- E-waste
- Waste Burning

The Barisal city corporation authorities and various non-governmental companies had been running to deal with these waste control challenges. projects which include waste segregation, composting, waste-to-power tasks, and consciousness campaigns had been undertaken to enhance waste management practices and reduce the environmental impact of waste.

4.4 Waste Capacity of the Landfill Area

Barisal city corporation is governed through specific and properly-defined administrative officials. I went to Barisal city corporation and had a detailed discussion about waste management with the administrative officer there. After a detailed discussion I got a clear idea about the waste disposal system of Barisal city corporation. About 180 tons of waste is generated every day in Barisal city. From them I came to know that Barisal city corporation has 18 acres of landfill area. They had been in a position to inform me the exact length and width of the land and the maximum height they might pile the garbage on the land. As an end result, I can calculate the most garbage keeping ability of the landfill. A 6 meters deep soil was excavated here before the land was constructed. So that, more garbage can be kept here. They will build garbage heaps up to 9 meters above the ground level.

So that, the total height of the landfill will be 15 meters. We know that 1 acre = 4046.86 m². So, 16 acres = 64749.7 m².

4.5 Calculation of waste volume

The current population of Barisal City Corporation in 2023 is 502000, a 3.29% grow from 2022. The population of Barisal City Corporation in 2022 was 487000, a 3.2% grow from 2021. In exactly the same way, the population in 2021 was 472000, a 3.31%

growth from 2020. Now I calculate the annual waste volume from the collective data of Barisal City.

In Barisal city there have some multi storied buildings. Similarly, there are some small single storied houses. However, single storied building is more prevalent than multistoried buildings. Each people produce an average of 0.3 kg of waste per day. As-discarded density of solid waste is 200 kg/m^3 or 0.20 ton/m^3 . So, the daily amount of waste generated in this area is –

The present population of Barisal city corporation is = 502000

Waste generated by per person = $0.35 \text{ kg/m}^3/\text{day}$.

Amount of daily collected waste = $502000 * 0.3 = 150600 \text{ kg/day} = 150.6 \text{ ton/day}$.

The total waste of Barisal city in one year is = $150.6 * 365 = 54969 \text{ ton/yr}$.

The compacted volume of solid wastes to be collected per year = $54969 \div 0.20 = 274845 \text{ m}^3/\text{yr}$.

We already know the height of the garbage from bottom to base level is 6 meters and from base level to 9 meters high. The total length will be 15 meters.

So, the compacted area of solid wastes to be collected per year = $274845 \div 15 = 18323 \text{ m}^2/\text{yr}$.

4.6 Result

From the mathematical term we can see that in Barisal city corporation produce 18323 m^2 waste per year and the landfill area is 64749.7 m^2 . So, if waste is produced like this then it will take time to fill the landfill = $64749.4 \div 18323 = 3.53$ years.

4.7 Discussion

Previously we see that the population of Barisal city corporation day by day. So, from now on the amount of garbage will increase a lot in the future. If the garbage is dumped in this way, the landfill will be full within the next three and a half years. So, for the future we need another big landfill. It needs to be fully developed, properly deepened and banked on all sides. So that we can dispose of more future garbage neatly here.

Chapter 5

CONCLUSION

5.1 Conclusion

In my survey, I characterize the waste. In the investigation I found that in this area 75% of waste collected are food. I assumed that because there are more residential buildings than commercial ones. Landfill plays a very important role for living in a low-lying area. My study area was inside the Barisal City Corporation and the waste was disposed of the prescribed land of Barisal City Corporation. Waste from all areas under Barisal City Corporation was disposed on that land. All types of wastes mainly food waste was dumped. The authority of Barisal City Corporation maintains the landfill and such arranged required facilities to level and fill the ground. The target of our study is to determine the volume of waste and present waste disposal scenario of landfill. There has a particular landfill. All garbage is dumped in this landfill. For determination of volume of waste disposal, I considered the number of apartments, population, quantity of waste, people thinking, waste collection time, suitable route and the opinion of waste collectors.

Through all the data, I calculated the volume of garbage produced by the people in this area. And I have determined the maximum capacity of the landfill where the waste is dumped. As a result, the deadline for filling the landfill in days has been exceeded. So, they have to create a complete landfill area and they have to put more emphasis on waste recycling, composting and incineration. Encourage the composting of organic waste, which contributes to the creation of nutrient-rich soil and lowers landfill methane emissions. The landfill area can be used for longer than the expected time by recycling. The process of incineration involves burning waste materials at high temperatures until they break down to ash, gas, and heat. From the three processes, I recommend waste recycling for future wastes disposal.

5.2 Future Study

I worked to find out volume of waste. Then I have observed and inspected the landfill area. After my inspection I feel that the landfill areas space is not enough for Barisal City Corporation. After a few years this landfill area will be full of garbage. So, they will have to find another landfill area now. And that area should be nicely made suitable for garbage disposal which will be very useful for people in future.

We can take some necessary steps to improve the waste management system. They are:

- Waste Reduction and Recycling.
- Waste-to-Energy Projects.
- Landfill Site Rehabilitation.
- Controlled Landfill Management.
- Waste Sorting and Treatment Facilities.
- Integrated Waste Management.
- Waste-to-Energy Projects.

REFERENCES

- Bhuiyan, S. H. (2005). Benefits of social capital: urban solid waste management in Bangladesh (Vol. 31). Münster, Hamburg and London, United Kingdom: SAGE Publications.
- Louis, D. G. (2004). Municipal solid waste management (MSWM) in the United States. A historical context of municipal solid waste management in the United States, 306-322.
- Nawshad, A. (2019, October 7). When the garbage piles up. The Daily Star. Retrieved from <https://www.thedailystar.net/opinion/environment/news/when-the-garbage-piles-1810375>.
- Sudhir, V., Srinivasan, G., & Muraleedharan, V. R. (1998, December 04). Planning for sustainable urban solid waste management. Planning for sustainable solid waste management in urban India, 223-246.
- Thorneloe, S. A. (2002). The Impact of Municipal Solid Waste Management on Greenhouse Gas Emission in the United States. The Air & Waste Management Association, 1000-1011.

APPENDIX

Questionnaires

1. Size of the landfill area?
2. How many tons of waste are dumped in the dumping zone every day?
3. What are the criteria for selecting dumping zone area?
4. What is the future plan for the dumping field?
5. If the dumping zone fill up, what will be the plan then?
6. What is the plan for recycle the waste?
7. In your area which type of waste generated?
8. Which types of service are provided from city corporation?
9. Is their service regular?
10. Are peoples waiting for the collection stuff?
11. Are they throw their waste in particular place?
12. Do you need a proper waste management system?

Majority Percent of Answer

1. 16 Acores
2. 150.6 ton/day.
3. Unpopulated and close to the town but not in the middle.
4. Increase landfill areas and its depth.
5. Make a well-planned landfill for future.
6. For the future, authorities are working on recycling like the outside world.
7. House hold waste.
8. Door to Door.
9. No.
10. Some of them.
11. Most of them.
12. Yes.