

# Assessing the Current Scenarios and Future Prospects of the Country's First Regional Integrated Landfill and Resource Recovery Center: A Case Study of Jashore Municipality

Animesh Kumar Mandol, Md. Zahidul Islam

**Abstract:** *The Jashore Pourashava, which was established in 1864 (Jessore Sadar Upazila, n.d.) and is located in the southwestern region of Bangladesh, is one of the oldest in the Bengal Province. The area has a current population of around 447,914 (Kabir, 2020) people and covers an area of 14.72 (Jessore Sadar Upazila, n.d.) square kilometer. The objective of this study is to evaluate the present conditions and potential future prospects of the country's first Regional Integrated Landfill and Resource Recovery Center (IL&RRC). While the solid waste collection system in the Pourashava is functioning well, there is a need to increase the number of Secondary Transfer Stations (STS) and manpower. The operation of the Biogas Plant and Compost Plant is progressing and the management of the Fecal Sludge Treatment Plant, Leachate Treatment, and Integrated Landfill is not up to the mark. The ground water test result has found satisfactory compared to Bangladesh Drinking water standard that is indicated no impact of leachate.*

**Keywords:** Integrated Landfill and Resource Recovery Center (IL&RRC), Waste Management in Jashore Municipality, Biogas Plant, Compost Plant, Fecal Sludge Treatment Plant, Leachate Treatment Plant

## 1. Introduction

Jessore, a district located in the southwestern region of Bangladesh, is part of the Khulna Division. The district's name has been a subject of controversy regarding its origin. One widely held belief is that it is derived from the Bengali words "Jasho" and "Har," which means "loss of glory." Another theory suggests that the area was previously called "Jasor," meaning "bridge" in Arabic, due to its terrain being intersected by deep watercourses. The current name, "Jessore," is thought to be a phonetic corruption of the word "Jasor." It was first referred to as "Jessore" during the reign of Raja Bikromaditto, the father of Protapoditto. (Bangladesh Bureau of Statistics, n.d.)

The waste generated within Jashore Pourashava encompasses several types such as municipal solid waste (MSW), electronic waste, hazardous medical waste, food waste, construction waste, and industrial hazardous waste.

Jashore Municipality's solid waste collection system comprises two stages: primary collection and secondary collection. Primary Waste Collection Service Providers has collected waste door to door and send to secondary transfer station. Here the secondary transfer station means the armed container has placed in the different location of different ward of Jashore municipality. Within the 9 wards of Jashore Municipality, there are 132 arm-rolled containers used as Secondary Transfer Stations (STS) and 217 plastic dustbins for waste collection. After the STS and dustbins are full, the waste is transported to the landfill site for disposal. The waste disposal site in Jessore is an open dump located in Jhumjhumpur, approximately 3.5 km away from the city center. The landfill site covers an area of roughly 13.97 acres and has been in use for over three decades.

The research involved gathering both primary and secondary data and took place between January 2023 to April 30, 2023.

Its primary objective was to assess the current state of solid waste management practices, as well as the conditions of the biogas plant, compost plant, fecal sludge treatment plant, leachate treatment plant, and integrated landfill located at the Jashore Jhumjhumpur waste disposal site. The study also aimed to compare the groundwater test results with those of previous reports. The data collected focused on the solid waste collection, transportation, storage, and disposal system in a selected area. The research findings revealed the shortcomings of the current waste management system and provided recommendations for future improvements by the authorities.

## 2. Objectives

**Objective of this study can be defined as**

- Determine the existing system for collecting solid waste in Jashore Municipality.
- Evaluate the current practices disposing and treating solid waste in the waste treatment plant.
- Assess the potential impact of leachate from the solid waste disposal site by conducting water tests and analyzing the results.

## 3. Methodology

A methodology refers to a set of general principles or rules that can be used to derive specific procedures or techniques for solving various problems within a particular field of study. In contrast to a procedure, a methodology is not a formula but relatively a set of practices that can be adapted to different situations within a particular field. The methods section of a research report describes the steps to be taken to investigate a research problem and the reasons for using particular procedures or techniques to collect, select, process, and analyze data. By providing an explanation of the methods used to gather and examine data, the reader is able to assess the study's credibility and dependability. In

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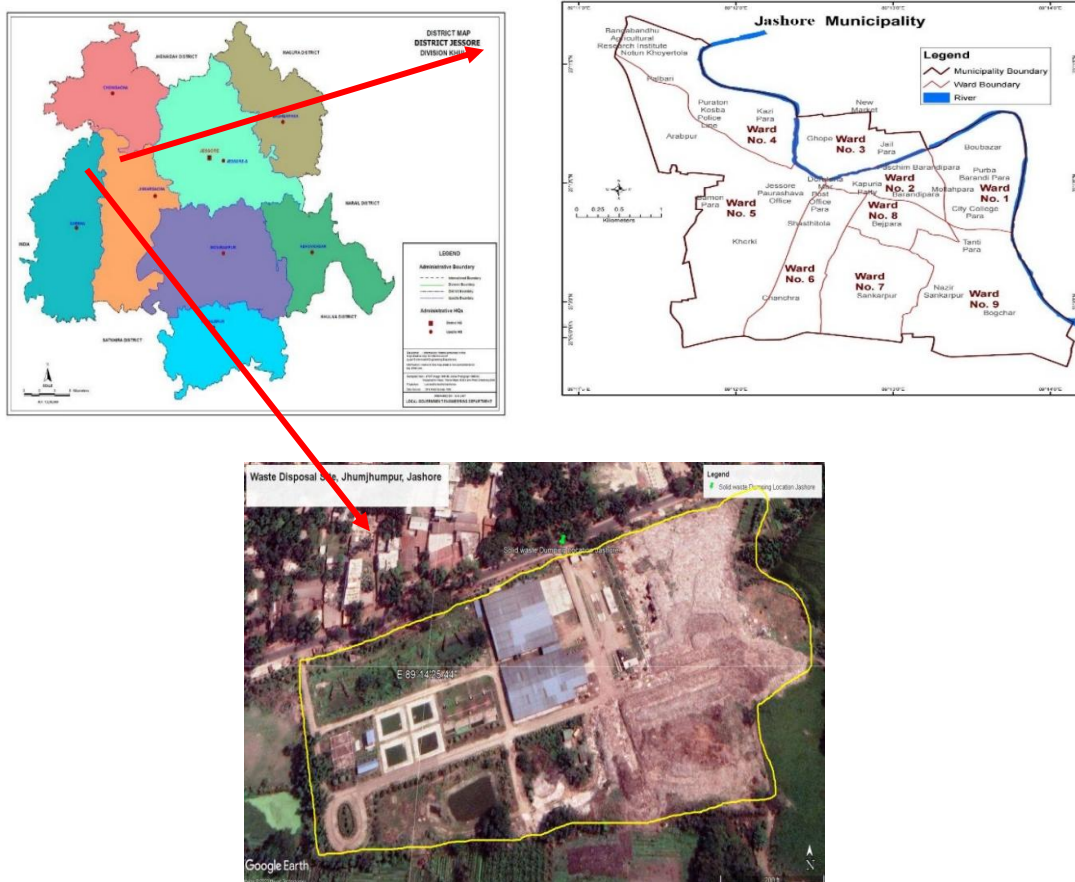
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developing countries, the informal sector, particularly the urban poor, manages waste reuse schemes as a means of employment. Decentralized systems appear to work better in providing urban infrastructure, especially where centralized systems are not yet established, and when end-users aim to

function independently of higher-level institutions and authorities.(Kabir, 2020)

#### 4. Study Area

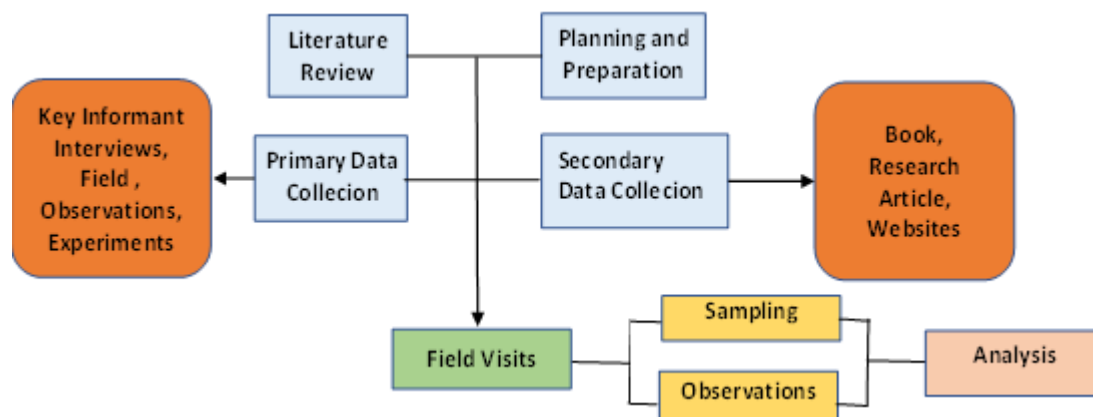


**Fig-1:** Study Area, Jashore Municipality  
Source: Google Pic.

Jashore is a district situated in the Khulna division of Bangladesh, which was founded in the year 1864. It lies at a latitude of 23°08'49.61"N and a longitude of 89°13'13.77"E, with an elevation of 8 meters above sea level. The area has a gradual slope from north to south and is the largest, oldest, and most significant municipal area in the southwestern

region of Bangladesh. The population of JashorePourashava, covering an area of 14.72km2, is 447914.(Kabir, 2020)

#### 5. Study Design



**Figure 2:** Flow Chart of the Methodology for the Study

## 6. Data Collection

### Primary Data Collection

Empirical field observations, inventory-based quantitative data collection, questionnaire surveys, formal and informal interviews were all utilized to gather primary data. The waste collection process and selected dumping area were also visited to collect primary data. In addition, the opinions and suggestions of various individuals were sought, including the Sub Assistant Engineer, Assistant Engineer, Executive Engineer, Urban Planner, Finance Officer, Survey Team, Conservancy Inspector, Staff of the Waste Treatment Plant of the Jashore Municipality, as well as the Cleaner, Sweeper, and Waste Pickers.

Furthermore, ground water samples were taken from two different locations in the waste treatment plant to compare them to the previous study report and assess the impacts of leachate

### Secondary Data

To complement the primary data, secondary data was obtained from a variety of sources, including books, research articles, newspapers, and websites.

### Sampling

A total number of 30 respondents from the Jashore Municipality officials and 20 workers were selected by

purposive sampling. Among them 10 were officials, 8 were plant workers 6 were cleaner, 6 were waste pickers.

### Limitation of the Study

- 1) The given timeframe is insufficient for gathering crucial information and completing the thesis paper.
- 2) The study requires comprehensive written materials, which are often lacking, and updated information may not be available in the Jashore Municipality.
- 3) The Jashore municipality does not have an annual waste report, which is a potential hindrance to the study.
- 4) The study is constrained by a shortage of manpower and the limited funding available to conduct it.
- 5) Due to the officials of the Municipality being occupied with other more tasks, it was not achievable to obtain certain information and the structural drawings of the integrated landfill.

## 7. Result and Discussion

The waste generated within JashorePourashava encompasses several types such as municipal solid waste (MSW), electronic waste, hazardous medical waste, food waste, construction waste, and industrial hazardous waste. Waste Management Department (WMD) in the Municipality covers the following areas:

### 1) Waste Management

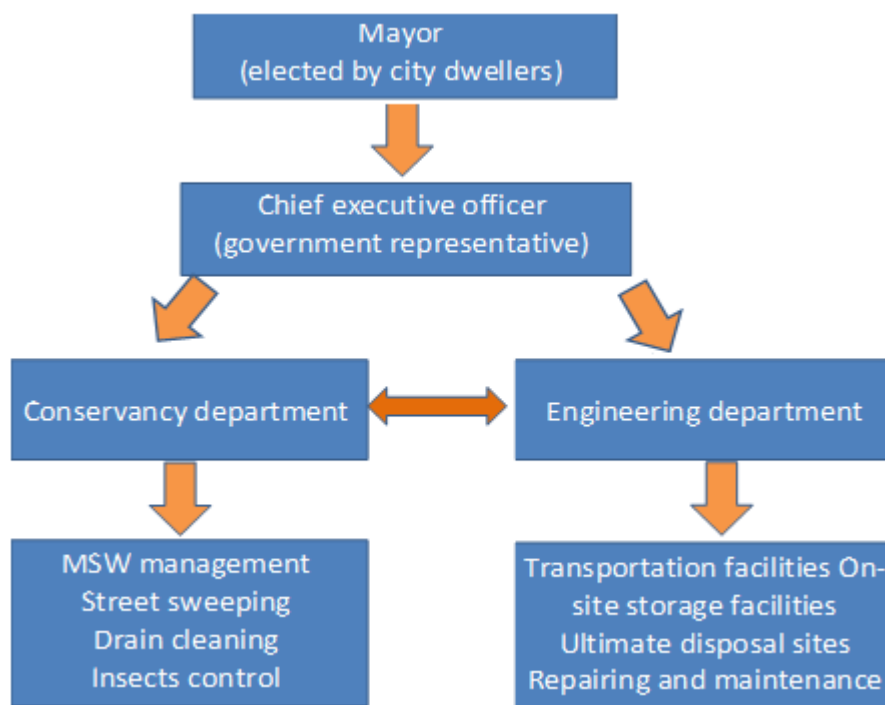


Figure 3: Flow of MSM Management

Source: (Ahsan et al., 2014)

- The regular cleaning of streets and drains.
- Oversight of the waste collection activities conducted by private companies and Primary Collection Service Providers (PCSPs).
- Transportation of waste from the secondary transfer station (STS) to the landfill site.
- The construction, operation, and maintenance of waste management infrastructure such as the STS, workshop, and landfill components.
- Procurement and upkeep of waste collection vehicles and landfill equipment.
- The operation and maintenance of the jhumjhampur landfill site with a focus on environmental protection.

- Promotion of occupational health and safety for cleaners.
- Public awareness campaigns to educate people about proper waste management.
- Capacity building for Waste Management Department officials through national and international training, seminars, workshops, and site visits.
- Planning and budgeting for waste management activities.
- Monitoring of medical waste management processes.

**2) Population Trend**

According to Holding assessment 2018, the population of Jashore Municipality is 447914. Jashore Municipality has 9 wards.

**Table 1: Population and Household**  
Source: Jashore Municipality

Ward no	Ward name	Characteristics of the ward	No. of house-holds in the ward	Population of the ward
Ward-1	Barandi para	Residential and middle income people live in this area	3071	59187
Ward-2	Khaldhar road	Residential and paper waste shops	1872	31885
Ward-3	Ghop	Jail Khana	1327	36855
Ward-4	Garib Shah Majar & puratankasba	Residential area and market	2883	44670
Ward-5	M, M College, Kharki	Middle class and educated professional area	3985	91388
Ward-6	Rail Station, Ray Para	Residential area and middle income people area	1849	35451
Ward-7	Shankarpur	Recyclable waste market and residential area	2641	61313
Ward-8	Bejpara	Mixed income households and market	1541	31115
Ward-9	Bogchar, Hushtala	Agricultural land and high to middle income people	3287	56050
<b>Total</b>			<b>22456</b>	<b>447914</b>

**3) Waste collection and Transportation system**

Jashore Municipality's solid waste collection system comprises two stages:

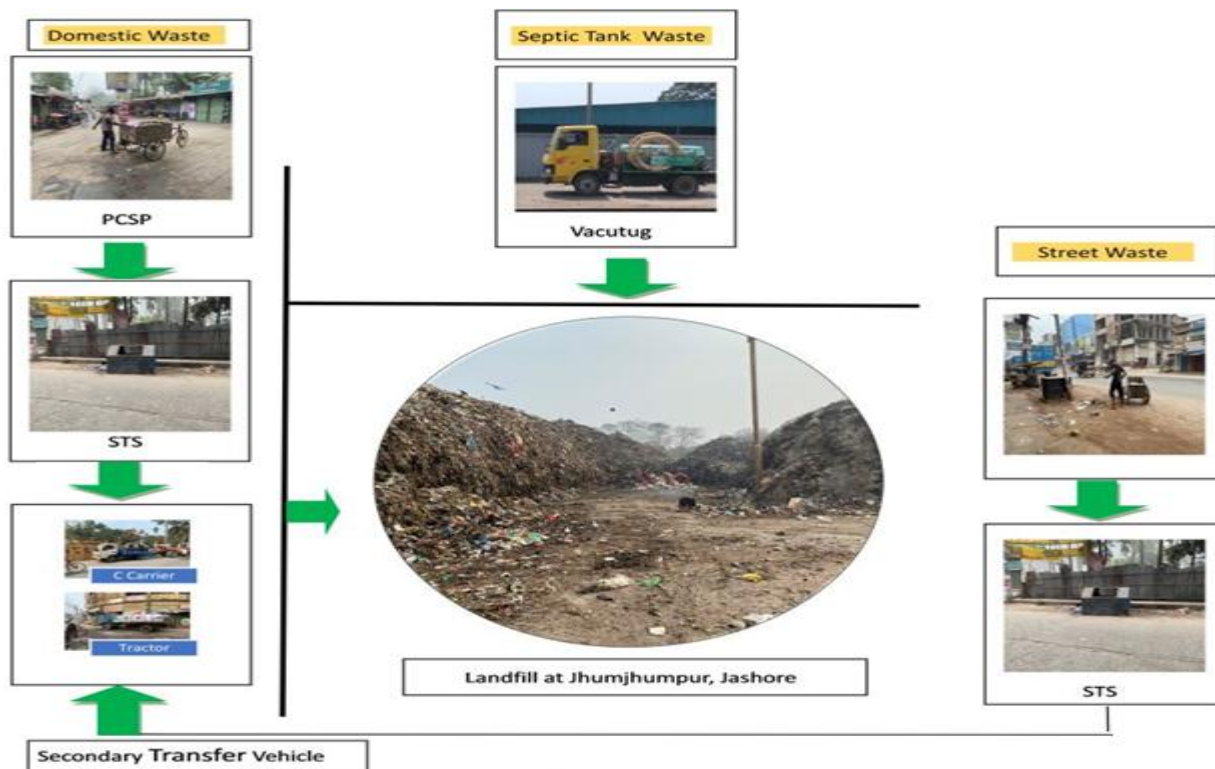
- Primary collection system
- Secondary collection system

Primary Waste Collection Service Providers has collected waste door to door and send to secondary transfer station. Here the secondary transfer station means the armed container has placed in the different location of different ward of Jashore municipality.

**Table 2: List of Vehicles**

Source: Jashore Municipality

Serial No	Name of Vehicle	Number of Vehicles
1	Hydraulic Container carrier	5
2	Garbage truck	5
3	Tractor	4
4	Vacutug	4
5	Excavator	4
6	Loader	3
7	Bulldozer	1
8	Hydraulic beam lifter	1
9	Trolley/Van	230

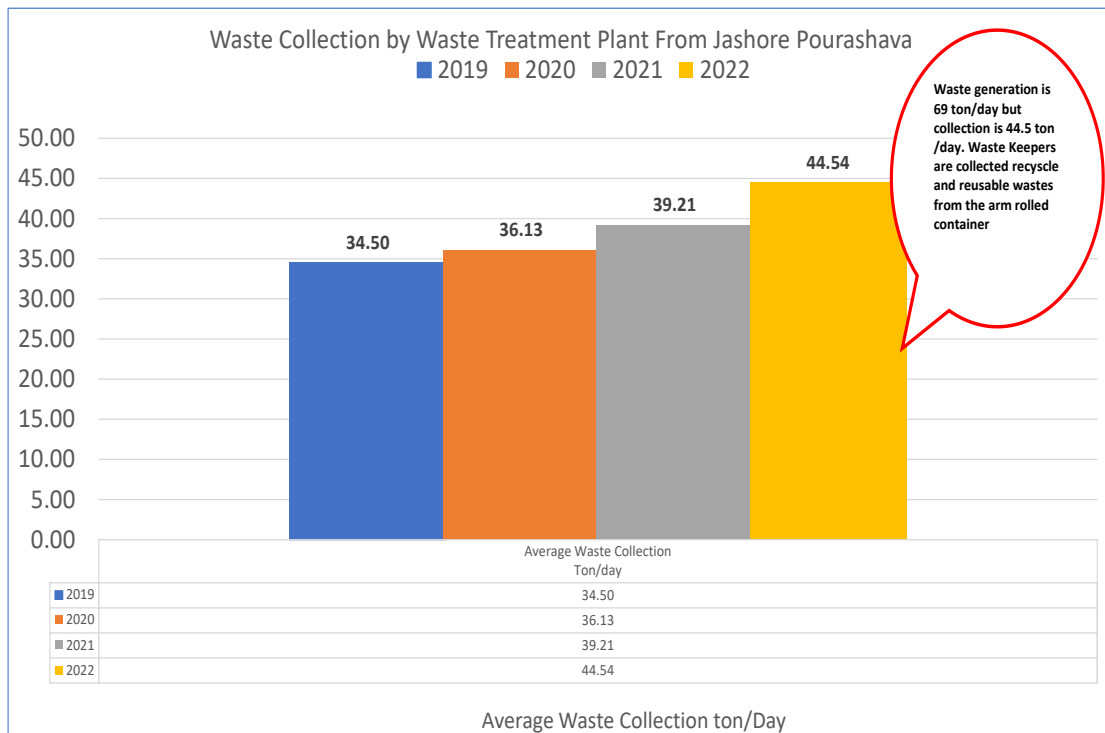


**Figure 4: Flow of Waste Collection and Transportation System**  
Source: Jashore Municipality



Within the 9 wards of Jashore Municipality, there are 132 arm-rolled containers used as Secondary Transfer Stations (STS) and 217 plastic dustbins for waste collection. After the STS and dustbins are emptied, the waste is transported to the landfill site for disposal.. Generation of Solid waste The

waste disposal site in Jessore is an open dump located in Jhumjhumpur, approximately 3.5 km away from the city center. The landfill site covers an area of roughly 13.97 acres and has been in use for over three decades.



**Figure 5:** Flow of Waste Received by the Waste Treatment Plant  
Source: Data Collected from Waste Treatment Plant

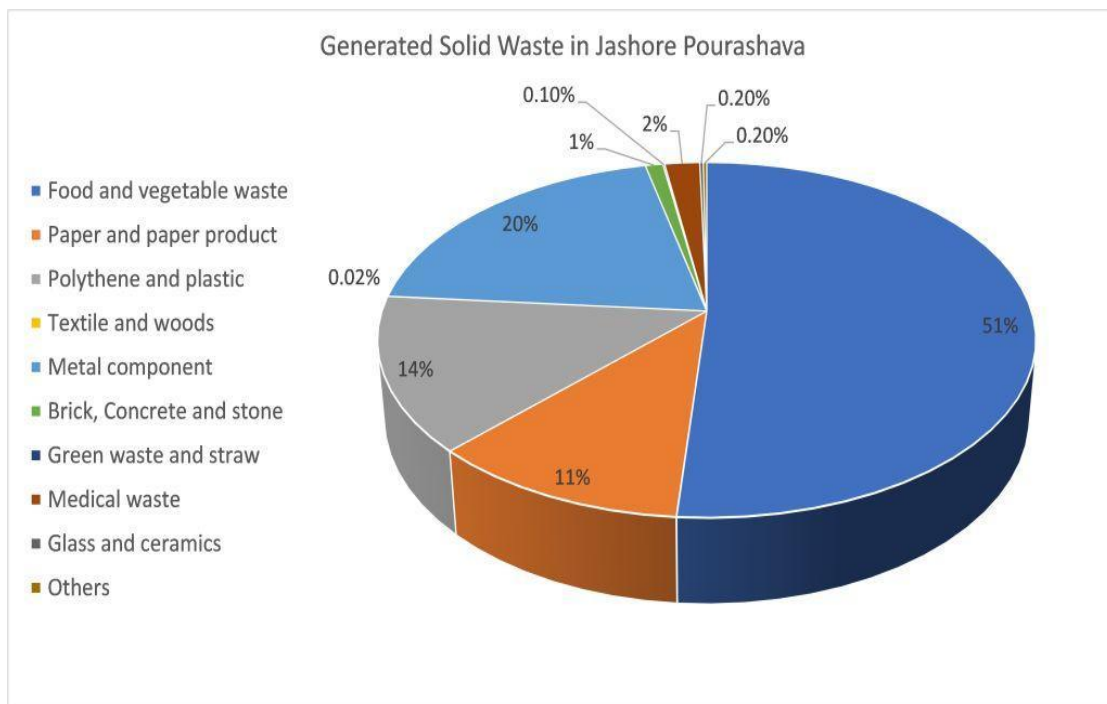
According to a field survey, the daily generation of solid waste in the Jashore Municipality is estimated to be around 69 tons, while the waste treatment plant that was received in 2022 has a capacity of only 44.54 tons/day. The amount of solid waste received by the treatment plant from 2019 to 2022 has been increasing year by year, likely due to the growth in population.



In a study conducted by Kabir in 2020, it was found that people of various ages were involved in waste picking, with the majority falling between 10 to 30 years old. There was a trend of poor individuals, who were unable to secure other jobs, to participate in waste picking as there was no financial investment required, and the money earned from selling the collected waste was their only source of income. The waste pickers typically went out to work in the morning and returned in the afternoon, collecting an estimated 11-20 kg of waste per day from different parts of the city. Majority of the waste pickers were found to be illiterate. Compared to waste pickers, the number of feriwala (waste collectors who use handcarts) was significantly lower, accounting for only one-third of the total primary waste collectors, as a financial investment was required to start this business.(Kabir, 2020)

**4) Composition of Solid Waste**

The composition of municipal solid waste (MSW) in Jashore is influenced by various factors such as cultural traditions, food habits, socio-economic conditions, and climate. A typical characterization of MSW in Jashore is as follows:



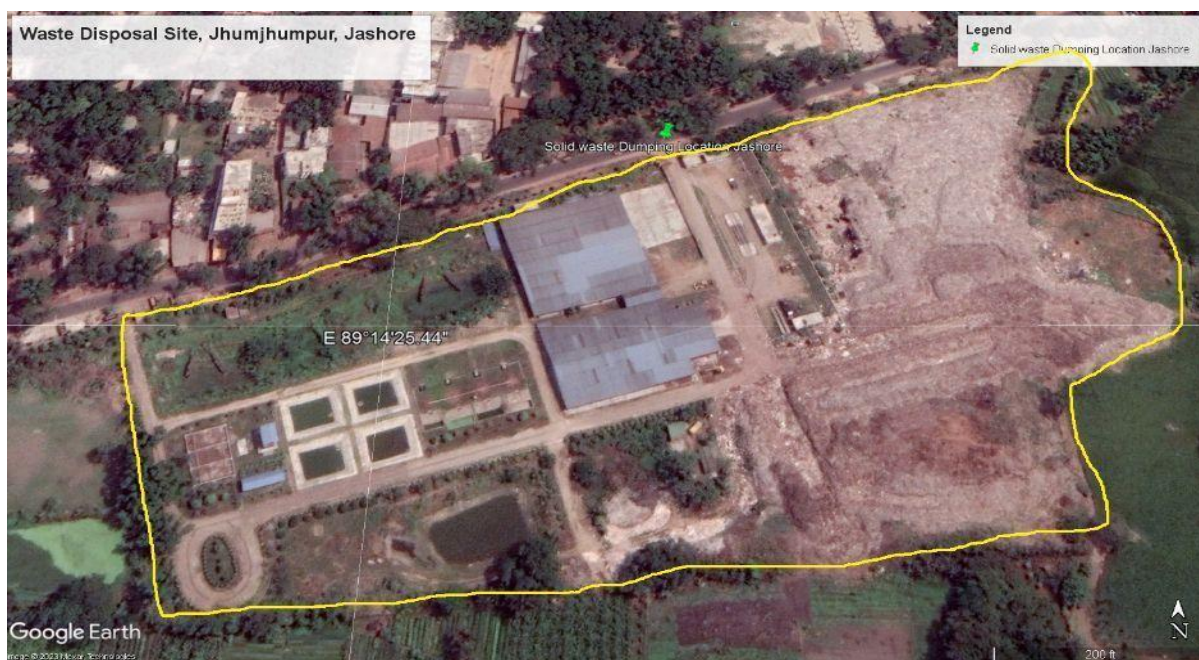
**Figure 6:** Composition of Solid Waste

Source: (Kabir, 2020)

The major portion of the waste in Jashore comprises vegetable waste, which is biodegradable and accounts for 51% of the total weight. Other waste materials include paper and paper products, polythene and plastic, textile and wood, metal components, bricks, concrete and stones, green waste and straw, medical waste, and glass and ceramics, which respectively constitute 11%, 14%, 0.02%, 20%, 1%, 0.10%, 2%, 0.20%, and 0.20% of the total waste.

### 5) Waste Disposal System

The waste disposal site in Jessore is an open dump located in Jhumjhumur, approximately 3.5 km away from the city center. It spans across an area of approximately 13.97 acres and has been in operation for over 30 years. However, the area has been utilized for waste disposal for more than a century. The northern part of the dumpsite is adjacent to a bustling



**Figure 1:** Waste Disposal Site, Jhumjhumur, Jashore

Source: Google Earth



## 6) Integrated Landfill and Resource Recovery Center (IL&amp;RRC) at Jessore



**Figure 8:** Layout Plan of IL & RRC, Jashore

Source: (Waste Concern, n.d.)

Under the City Regional Development Project of ADB, the first Regional Integrated Landfill and Resource Recovery Facility was constructed. The facility was designed by Waste Concern Consultants in 2016 and underwent a trial run in November 2019. It is composed of various units, which include:

- A capacity of 1/2 ton/hour Waste Sorting Unit (mechanized).
- Composting system using a box with forced aeration and mechanical dryer

- A facility that generates electricity using biogas is included in the waste management system.
- FSM (fecal sludge management) treatment with co-composting facility
- One of the waste management facilities includes a controlled landfill unit, equipped with systems for collecting and treating leachate.

## 7) Compost Plant



**Figure 9:** Compost Plant

Source: The Author

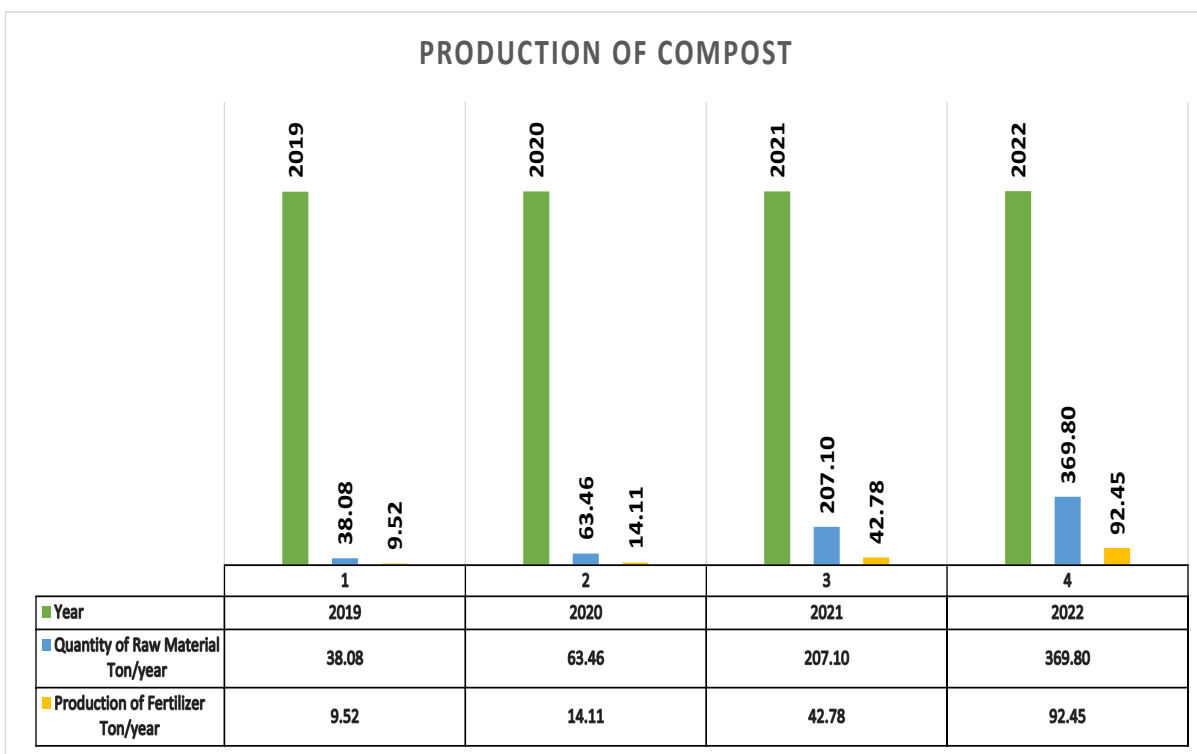
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The waste is first transported from the dumping site to a compost plant where it is segregated into digestible and indigestible waste. The indigestible waste is separated and sent to a different location while the digestible waste is put onto a conveyor belt for further segregation. The digestible waste is then separated into big and small pieces, with the larger pieces going through a cutter machine.

The segregated digestible waste is then placed in a compost box and left for 28 days to remove gas. After the 28-day period, the digestible waste is sent to a mechanical compactor machine where it is converted into organic fertilizer. It is possible to make 4 ton of compost every day.



**Figure10:** Status for Production of Compost  
**Source:** Jashore Waste Treatment Plant.

**8) Biogas Plant**



**Figure11:** Biogas Plant  
**Source:** The Author



There are four biogas plants that will be produced a total of 720 cubic meters of biogas. Out of this, 360 cubic meters of biogas is used to generate 432 kilowatts of electricity, while the remaining 360 cubic meters is supplied to nearby residents by pipe line. (JashoreMunicipality)

Currently, the plants produce 450 cubic meters of biogas and 100 kilowatts of electricity every day. (JashoreMunicipality)

9) Fecal Sludge Treatment Plant

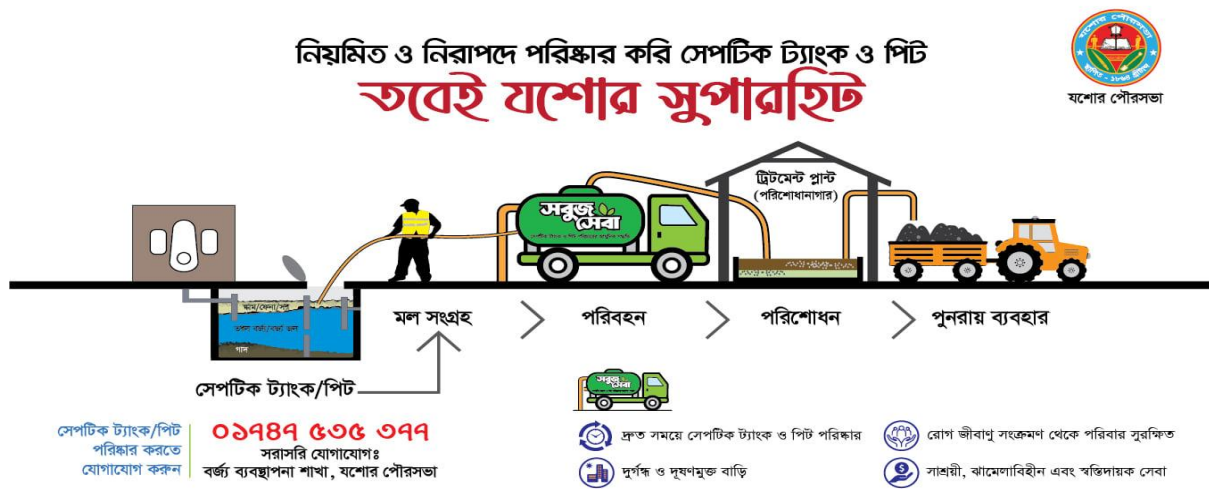


Figure12: Collection of Fecal Sludge  
Source: (Jashore, n.d.)

The town of JashorePourashava offers septic tank and pit latrine cleaning services through a hotline number (FSM hotline number 01747535377) on a demand basis. The service covers the entire town and is carried out using two

Vacutug trucks with a capacity of 2500 liters and 2000 liters respectively. The fecal sludge collected has been disposed of at a designated site since 2014, and as of 2020, it is being transported to a treatment plant (FSTP) for proper disposal.



Figure13: Fecal Sludge Treatment Plant  
Source: The Author

10) Integrated landfill



Figure14: Controlled Landfill

Source: The Author

Efficient management of waste is crucial to avoid environmental deterioration, contamination, and health risks. The breakdown of waste produces dangerous gases, such as methane and toxic leachate, which must be controlled and treated appropriately to prevent their escape into the atmosphere. The process of landfill mining can reduce the amount of waste in landfills and generate revenue by retrieving valuable resources.

Therefore, it is crucial to consider sustainable waste management practices that decrease the accumulation of waste in landfills and support resource recovery. This involves implementing the principles of the circular economy, such as reducing waste generation at the source, repurposing and reusing materials, and recycling. Proper management of non-organic and non-biodegradable waste is fundamental for environmental sustainability and public health.

11) Leachate Treatment Plant



Figure15: Leachate Treatment Plant

Source: The Author

The process for treating leachate water from a waste disposal site involves several steps. Initially, the leachate water is collected through underground pipelines and directed to a leachate collection pit. From there, the water is transferred to a coco pit filter before being directed to four ponds for further treatment. The final pond in this process

contains fresh water, which can then be used in the biogas plant.

12) Economic Benefit

Previously, the cost for waste management was 783 taka per ton of waste. However, it is now expected that the expense will be to 275.94 taka, while the income generated from



waste management will be 447.15 taka per ton. The difference between the cost and the income indicates that there will be a surplus of 171.22 taka per ton of waste managed. (Jashore Municipality) This is a significant development and demonstrates the potential for effective waste management to be financially beneficial. It also highlights the importance of investing in modern waste management technologies that are more efficient, sustainable, and cost-effective.

This surplus can be directed towards other areas that require funding, such as environmental initiatives or other waste management projects. It also indicates the potential for waste management to be a profitable business venture if managed properly. Overall, this is an encouraging development for waste management in the region, and it is hoped that this trend will continue.

**13) Analysis of Ground Water Test Result**



**Tube well Water (TW-1)**

**Tube well Water (TW-2)**

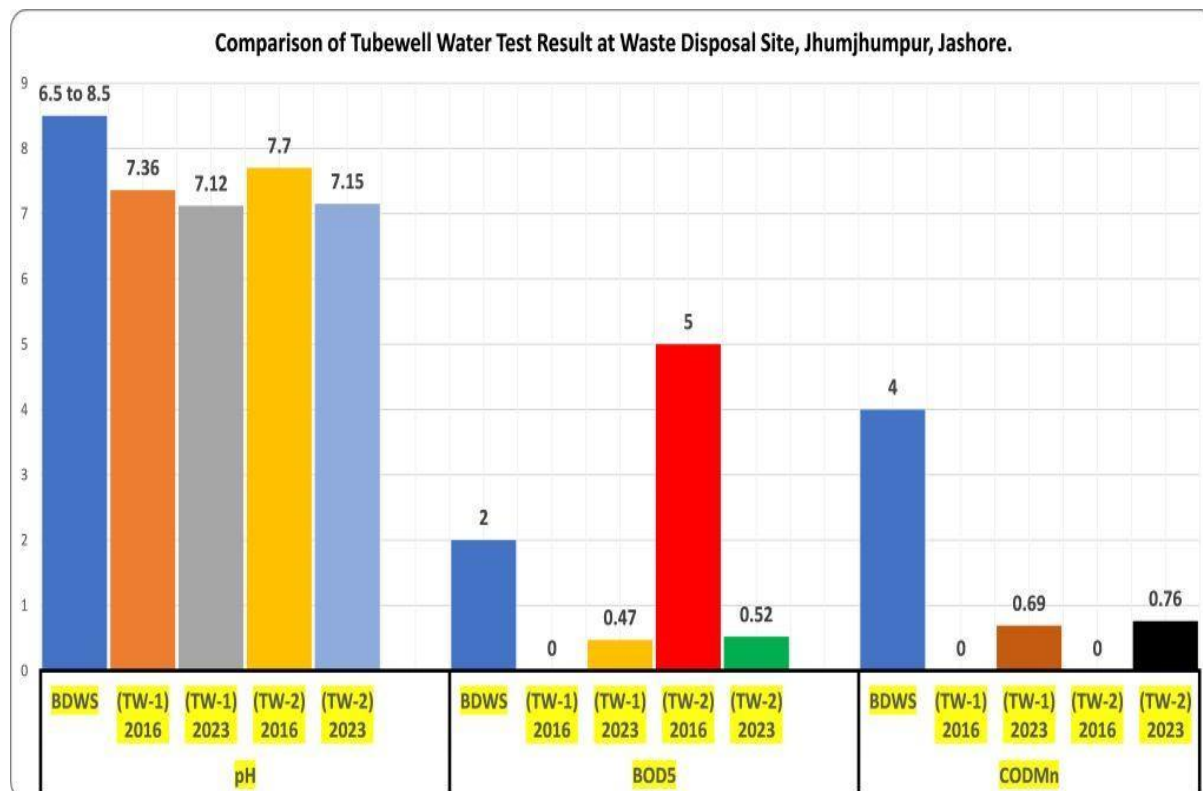
**Figure 16:** Location for Collection of Water Sample

**Source:** The Author

TW-1 was obtained from a tube well situated in the southern vicinity adjacent to the disposal site office. The tube well has a depth of 60 meters and was drilled within the waste disposal area. The personnel working in the office consume water from TW-1 as drinking water.(Montesino Malmberg & Olofsson, 2016)

In the southeast region of the site, a tube well was drilled to a depth of 79 meters, which is related to the medical waste facility. TW-2 was obtained from this tube well.(Montesino Malmberg & Olofsson, 2016)





**Figure 17:** Comparison of Tube Well Water Test Result

Source: (Montesino Malmberg & Olofsson, 2016) and the Author

In the 2016 report, shows that the pH values are within limit with Bangladesh drinking water standard.

In the 2016 report, shows that the BOD value of 5 mg/L and COD value of 0 mg/L suggest that the sample contains organic matter that can be degraded biologically, but not chemically. This could be due to the presence of refractory organic compounds that are resistant to chemical oxidation. The BOD value measures the amount of oxygen consumed by microorganisms in breaking down the organic matter over a specific period, while the COD value measures the amount of oxygen required to chemically oxidize the organic matter present in the sample.

In this case, the BOD value indicates that the sample contains a moderate amount of biodegradable organic matter, while the COD value suggests that there is little or no chemically oxidizable organic matter present. It is important to note that BOD and COD values are just two indicators of water quality and should be interpreted in conjunction with other physical, chemical, and biological parameters.

In the 2023 report shows that the BOD values and COD values are within limit with Bangladesh drinking water standard.

## 8. Conclusion

According to my analysis, Jashore Municipality, which comprises 9 wards, has an efficient solid waste collection system in place. However, there are instances of open space dumping of solid waste by users, which indicates a need for increased awareness among the local population. In 2018,

the Integrated Landfill and Resource Recovery Center (IL&RRC) was introduced in Jessore, Bangladesh under the City Regional Development Project by LGED. Since 2019, the IL&RRC has been operational, including facilities for fecal sludge treatment, leachate treatment, composting, and biogas production. As such, Jashore Municipality is considered to be ahead of other municipalities and city corporations in Bangladesh in terms of solid waste management.

Jashore Municipality has recently implemented two measures to enhance their solid waste management system. The first measure involves providing two dustbins to every household, one green in color for organic waste and another orange in color for non-biodegradable waste. The implementation of two dustbins, one for organic waste and another for non-biodegradable waste, is aimed at encouraging residents to segregate their waste properly. By segregating their waste at the source, residents can also contribute to the reduction of environmental pollution and the promotion of sustainable waste management practices. Secondly, the Municipality has entered into a 20-year lease agreement with a private company called The Skate Ltd. This partnership is expected to further develop the collection and disposal system of solid waste in the area. This move highlights the Municipality's commitment to improving their solid waste management practices and ensuring a cleaner and healthier environment for their citizens.

After testing and analyzing the tube well water, it has been determined that the test parameters are within the limits set by the Bangladesh Drinking Water Standard. Therefore, it can be concluded that there is no impact of leachate on the quality of the tube well water. This indicates that the

Integrated Landfill and Resource Recovery Center (IL&RRC) in Jessore, Bangladesh is effectively managing the leachate produced by the landfill, ensuring that it does not contaminate the surrounding groundwater.

## 9. Recommendation

- Day by day population is increasing. So it is required to increase secondary transfer station, manpower and vehicle.
- There is no facility yet to transfer produced electricity to the sub station. So it is required to proper initiative in this regards.
- It is required to safety training for the worker.
- Periodically air pollution and treatment leachate water test is required.
- Yearly waste report should be published in the website.

## 10. Further Research

Calculate the amount of air pollution generated by garbage disposal facilities. This will involve measuring and analyzing the concentration of pollutants in the air around the dumping station. Perform a detailed study and analysis of the water test that comes from leachate treatment. This will involve analyzing the composition of the water, checking for any contaminants, and ensuring that the water meets the standard set by the Bangladesh Drinking Water Standard. Study the detailed procedures involved in composting. This will involve analyzing the process of turning organic waste into compost, checking for the appropriate temperature and moisture levels, and ensuring that the end product is safe for use. Study the detailed procedures involved in producing biogas. This will involve analyzing the process of converting organic waste into biogas, checking for the appropriate temperature and pH levels, and ensuring that the end product is safe for use. Study the detailed procedures involved in fecal sludge treatment. This will involve analyzing the process of treating fecal sludge, checking for the appropriate treatment methods, and ensuring that the end product is safe for use.

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## Author Profile



**Animesh Kumar Mandol** received the B. Sc in Civil Engg. From Ahsanullah University of Science and Technology in 2008 and MS in Environmental Science from State University of Bangladesh in 2023. He is now working as a Quantity Engineer in the different construction Project in Bangladesh.



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