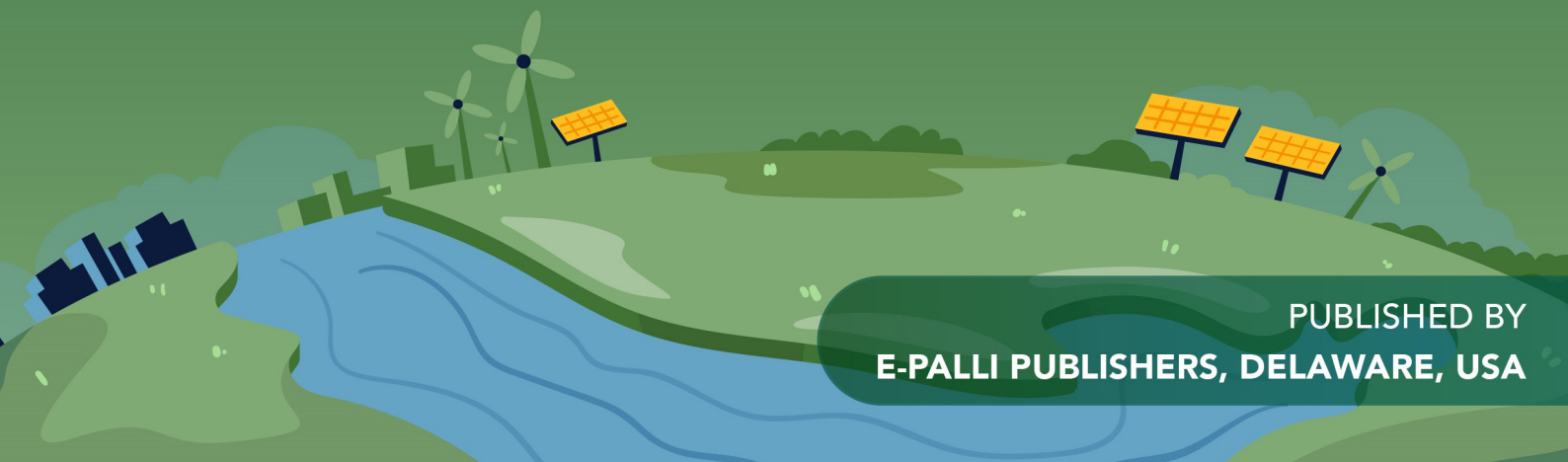




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Solid Waste Management System through 3R Strategy with Energy Analysis and Possibility of Electricity Generation in Dhaka City of Bangladesh

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ABSTRACT

Solid waste management is considered as one of the serious environmental problems in developing Asian countries like Bangladesh. Although municipal authorities in the city of Dhaka recognize the importance of adequate solid waste collection as well as resource recovery and recycling, it is beyond their resources to effectively deal with the growing volume of solid waste. As a result, solid waste is dumped indiscriminately on streets and open drains causing serious health risks and degradation of the living environment for millions of urban people. In the last decade, the importance of community involvement in solid waste management and the use of adaptive technologies to improve solid waste management systems have been recognized but waste is a material that no longer serves a purpose and is therefore discarded. All wastes are particularly hazardous if not disposed of carefully, they will have an impact on the environment, be it unsightly litter on urban streets or polluted air, soil, or water. Solid waste management practices are not very satisfactory in the recent world and adequate policies and awareness about various aspects of waste management are needed to help reduce waste generation and improve waste management processes. This research paper has worked on Dhaka city, the capital city of Bangladesh and it has tried to find out the current status of solid waste through 3R strategy including energy analysis. Moreover, this paper has discussed the potential of power generation from solid waste.

INTRODUCTION

Solid waste is generated through various human activities like industrialization, urbanization, improvement of the standard of living, etc. In Bangladesh, industrialization is growing rapidly and it is putting severe pressure on our natural resources, which is a major challenge for sustainable development. A noticeable cause of environmental degradation in most cities is unorganized waste management and dumping. A municipal corporation of Dhaka city is trying to manage this problem but they are unable to control the waste management effectively. "In 2022, more than 7,500 tons of solid waste is produced daily in two Dhaka city corporations." (Prothomalo.2022) "Dhaka city generates a lot of waste in various ways, such as in hospitals, small-scale industries, tanneries, and other heavy industries." (Course Hero. 2021) "Bangladesh is the ninth most populous country and the twelfth most densely populated country in the world. Dhaka is one of the most polluted cities in the world and one of the related problems is solid waste management." (Wikipedia. March 2022)

A clean city and a good environment are logical demands for city dwellers. Due to limited financial and organizational capacity, it has become really difficult for municipalities to ensure efficient and appropriate delivery of solid waste collection and disposal services to the entire population. Most people are not concerned about solid waste management.

This is an important cause of waste mismanagement. Household waste in Dhaka city is dumped on roadsides and open spaces. Sources of solid waste are garbage, waste,

sludge, and discarded materials and wastes produced by industries, hospitals, or household social activities. Waste management is a technique used primarily to collect waste from various sources, including recycling and reused materials.

Objectives

1. To discuss the sources and composition of solid waste in Dhaka city.
2. To identify the type of solid waste available in Dhaka city.
3. To discuss the education level of solid waste workers in Dhaka city.
4. Discussing public participation in recycling, employment, and financial benefits.
5. To discuss organic, inorganic, and hazardous solid waste items.
6. To evaluate the effectiveness of 3R principles, i.e. recycle, reuse, and reduce as an improved solid waste management system for Dhaka city.
7. Showing energy analysis from the collected solid waste of Dhaka city.

METHODOLOGY

This research paper uses both primary and secondary data which was conducted from 2nd January 2023 to 15th June 2023. This study mainly focused on the present status of the solid waste management system in the capital Dhaka city of Bangladesh, and a flow chart of the work process in given below.

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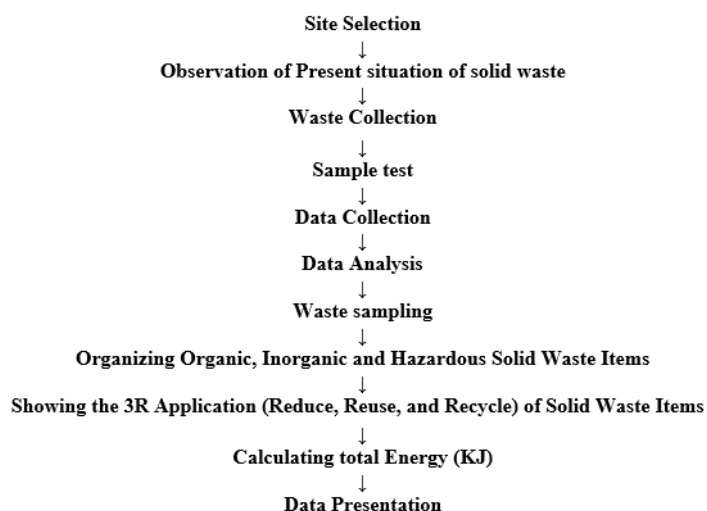


Figure 1: Flow Chart of Work Process

Primary data collection through questionnaire survey

To find out the solid waste management system of Dhaka city, primary data was collected from different categories of people and through a questionnaire survey from households to assess the actual status of solid waste management. Primary data was also collected by visiting the waste collection process and selected dumping areas. To assess expert opinion, key informant interviews were conducted with various stakeholders who were experts and associated with solid waste management practices in Dhaka city.

Secondary data collection

Secondary data was collected about the volume of waste generation and solid waste management activities in Dhaka City, Bangladesh.

Data analysis

Although the information was collected from various sources it was transcribed and the information was categorized according to content. The organized data was then overviewed to get a general idea of emerging trends, patterns, and solid waste concepts. The data were grouped into broad categories such as waste generation, public involvement in the decision-making process of waste collection, etc.

LIMITATIONS

It may be mentioned that this study is completely self-financed work by the author of this paper. The author faced some limitations while completing the research work including collection of primary and secondary data and information about the problem under research investigation. There were some budget constraints and a lack of time for this research work. Due to this limitation, the sample size for the study was small and it was not sufficient and very difficult to generalize the output of the study. This limitation of budget and time was the foremost limitation for gathering data and information about the problem under research investigation. Despite

some limitations, the author has been able to collect all relevant information about the problem under research investigation.

Solid Waste Management in Dhaka City

A well-planned waste management process will not only help in ensuring a clean environment but will also be cost-effective for the citizens and Dhaka City Corporation is mainly fulfilling this responsibility.

According to the previous study of the author of this paper, Dhaka City Corporation has divided its area into 10 zones to monitor solid waste generation. Total solid waste management involves 3 categories: mechanical engineering, storage, and transportation. The Conservation Department of Dhaka City Corporation currently operates around 370 trucks and container carriers, 300 handcarts and 4,920 bins/containers and is supported by 190 supervisory officers and 7,156 cleaners and only 1 officer to supervise transport for all activities. (Islam, F. S. 2016)

Impact of Inappropriate Solid Waste on Climate Change

Bangladesh is a region vulnerable to climate change. (Akteer H. 2022) When organic waste decomposes, methane and carbon dioxide gases are produced. Methane is produced in the absence of air, on the other hand, carbon dioxide is a natural product and produces when something decomposes in the air. Incineration of inorganic waste uses natural resources such as metals, fuel, and wood in their production and thereby releases greenhouse gases, especially carbon dioxide.

Plastic waste emits greenhouse gases at every stage, as the extraction and transportation of plastics are dependent on oil, gas, and coal. The production and disposal of plastic also emit tons of carbon. Extreme climate conditions significantly affect agricultural production and water insecurity nationally. (Kwame. D. 2022) Solid Waste management is a major contributor to greenhouse gas emissions and thus contributes to climate change. (University of Colorado. 2020) Moreover, used plastic

products are ending up in the ocean, thus deteriorating the overall marine ecosystem, thereby reducing oxygen production in the ocean, which has a direct impact on climate change.

Composition of Solid Waste



Figure 2: Flow Chart: Composition of Solid Waste

Solid Waste Management by Dhaka City Corporation
Dhaka North City Corporation and Dhaka South City Corporation do the following for solid waste management in Dhaka city

1. Dhaka North City Corporation and Dhaka South City Corporation sweeps highways, roads, and drains daily.
2. They collect waste from houses and roadsides
3. The cleaners of Dhaka North City Corporation and Dhaka South City Corporation collect the waste and transfer it to the nearest dustbin or container.
4. Trucks of Dhaka North City Corporation and Dhaka South City Corporation dump solid waste at the dumping depot.
5. Finally, solid waste is dressed by bulldozers, tire-dozers, pay-loaders, and excavators.

Impact of Solid Waste Disposal on Environment

1. Open-air dumping creates an unsanitary environment

and poses a great threat to human beings and causes environmental problems and nuisance due to the nauseating strong smell.

2. The situation is worsened by the indiscriminate disposal of hospital and clinical waste, which encourages the spread of disease.

3. Due to solid waste disposal in the environment, there are very high levels of total and faecal coliforms. Moreover, it pollutes water bodies.

4. Solid waste produces carbon dioxide and methane gas, and these gases are produced in landfills through aerobic and anaerobic decomposition of organic compounds, which pose a threat to the environment.

Education Level of the Solid Waste Workers

By the questionnaire survey of this work, the education level of solid waste workers in Dhaka City, Bangladesh is given in the table below:

Table 1: Education Level of the Respondent (Found from Questionnaire Survey)

Education Level of the Workers	Percentage(%)
Uneducated	15%
Primary School Pass	40%
Under SSC Pass	35%
SSC Pass	06%
HSC Pass	02%
HSC Pass to Under Graduate	02%
Total	100%

The table shows that the percentage of uneducated people is about 15%, primary school pass is about 40%, under SSC pass is about 35%, SSC pass 06%, HSC pass 02%, and HSC pass to undergraduate is about 02%.

We can understand the condition from the figure below:

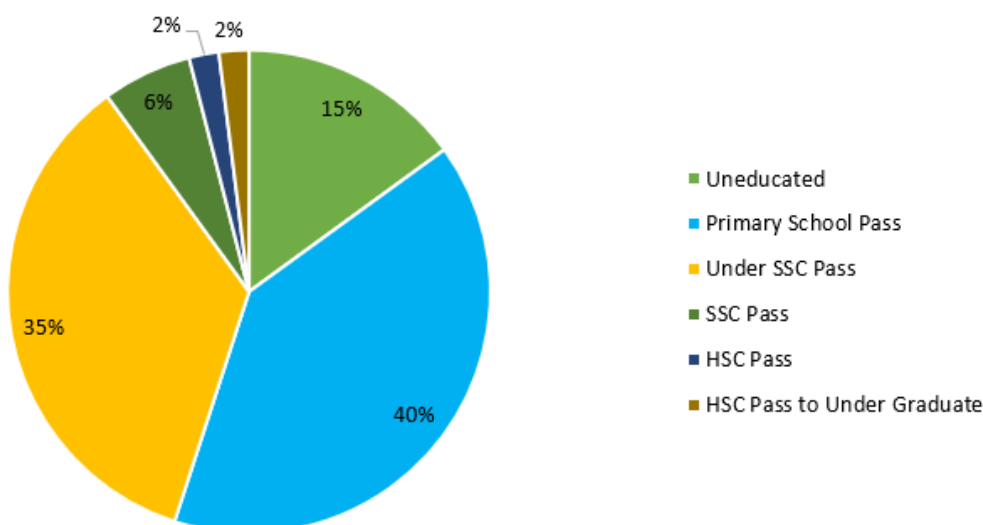


Figure 3: Education Level of the Respondent

Process of Household Waste Management

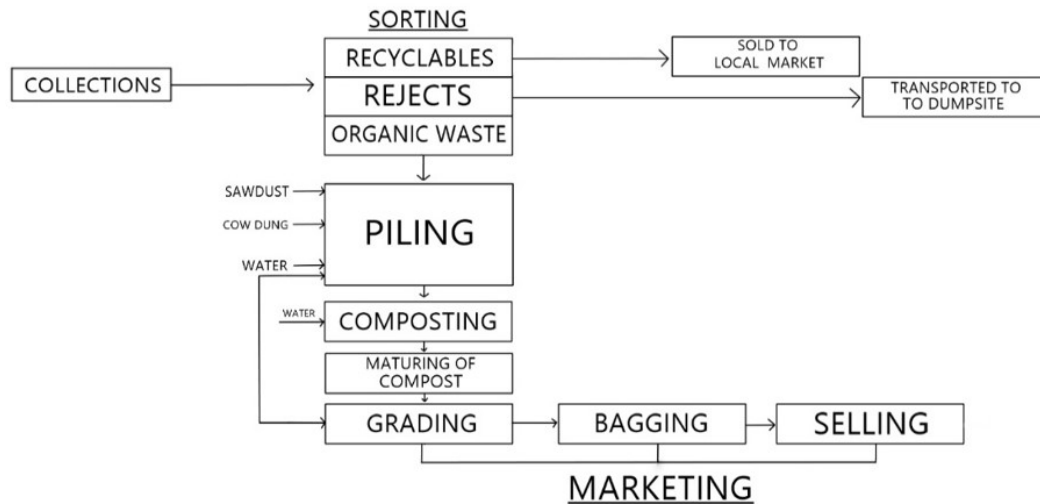


Figure 4: Process of Household Waste Management

Evaluation of Household Waste Collection System

The household waste collection involves many aspects. The perception of what is important depends on stakeholders, such as waste management companies, local

authorities, national environmental protection agencies, waste researchers, environmentalists, and the public; And they all have different perspectives. There are several reasons for evaluating waste collection systems.



Figure 5: Reasons for evaluating the function of waste collection systems

Assessment of collection systems depends on system boundaries and will always be site-specific to some degree. However, it is possible to significantly improve comparability through stratified investigations and the use of simple, consistent indicators.

Solid Waste Generation in Dhaka City of Bangladesh

2023: 7500 tons/day (Prothomalo.2022)

2032: 8500 tons/day (Prothomalo.2022)

2040: 10000 tons/day (estimated)

2050: 12000 tons/day (estimated)

Potential Sources of Waste

There are many possible sources of waste generation and some of them are explained here-

Commercial Sources

Commercial sources are a huge source of waste generation. Commercial sources refer to various industries such as garments, pharmaceutical companies, hospitals and other industries. Mainly used by various industries as massive chimeric sulfuric acid, chromium, ammonium sulfate, ammonium chloride and calcium oxide. The waste may contain chromium salts and/or tannic acid. Manufacturers also use pesticides and fungicides. Metallurgical and non-metallic industries can generate solid waste containing some types of heavy metals. The odors from those factories or dust emitted from furnaces can often contain some amount of heavy metals so if the dust is not disposed of properly, the dust will also be a source of soil pollution.

Pharmaceutical industries and hospitals generate three types of waste-

1. Infectious Waste- (Organs, blood and blood products, body parts, pathological tissues, human excreta, placenta, body fluids, culture materials from laboratories, and other infectious materials.)
2. Sharp Waste- (Intravenous set, saw, scalpel, syringes, needles, broken glass, blades, nails, and sharps generated from support service, etc.)
3. Non-Infectious Waste- (Radioactive waste, waste contaminated with Cytotoxic drugs, leftover cytotoxic drugs, and expired medicines.)

Domestic Waste

Domestic waste is another major source of solid waste which includes paper, vegetable peels, onion seed casings, broken plastics, cobwebs, soil and dust, yarn scraps, animal mouths, grass, used shoes, cloth scraps, bottles, glass, used items, fused bulbs, blades, razors, tooth paste tubes, car parts, etc.

Hospitals and Clinical Waste

There are probably more than 800 clinics and hospitals in Dhaka city and they are generating massive amounts of waste every day. Since clinic and hospital wastes contain toxic and infectious substances, they are more unsafe than other types of waste. All types of medical waste are dumped in Dhaka city municipal dustbins, resulting in the easy spread of diseases.

Tanning Waste

Tanning waste is another type of industrial waste, which is dangerously polluting the environment of Dhaka city. There are probably more than 200 tanning industries in the Hazaribagh area of Dhaka City, Bangladesh. Tannery waste contains chromium, sulfate, ammonium, calcium, ammonium chloride, and sulfuric acid which have a negative impact on the ecosystem, groundwater, and surface water of Dhaka city.

Environmental Benefits of Waste Recycling

A healthy environment is an essential condition for all living things and waste management is essential for a healthy environment. Waste management is a process that includes collection, transportation, processing, recycling or disposal and monitoring of waste materials. Waste management practices involve the processing of waste materials for the purpose of producing new products. Recycling waste reduces air, water, and land pollution, it also limits the need for new natural resources such as wood, petroleum, fiber, and other materials. Reducing waste is one way to reduce greenhouse gas emissions, which are a contributing factor to global warming. Recycling waste will help reduce greenhouse gas emissions by reducing the energy required to make products from raw materials. Reducing emissions from incinerators and landfills. Recycling solid waste can eliminate air, water, and land pollution.

Recycling, Employment, and Financial Benefit

Wastes are not only a great source of investment but they

can also play a huge role in employment by creating huge employment opportunities. Waste recycling will help us reach a sustainable solution and develop our entrepreneurial activism but we need to start the waste management process at the micro level, i.e. at the community level. The unemployment problem is a crucial issue for Dhaka city and waste recycling is the best solution for it because it will provide us with three major details, financial benefits, employment, and recycled products.

Elimination of Environmental Problem

The following measures should be taken to eliminate environmental problems:

1. Increasing door-to-door collection facilities in all areas and ensuring regularity in the collection and transportation of solid waste from households, bins, and primary dumping stations.
2. Raising awareness to collect waste from households and reduce solid waste generation.
3. Apply appropriate environmental laws in Bangladesh.
4. Transport solid waste at night instead of during the day. If it is transported during the day, use a cover on the waste transport vehicle to reduce odor pollution and other related problems.
5. Increase wages and safety of workers working in solid waste management systems.

Collected Solid Waste Items from Dhaka City of Bangladesh

It is impossible for the author of this paper to collect all the solid waste items of Dhaka city, but a total sample of 25.21 kg of solid waste items was collected to get an idea of the current situation of this city.

Table 2: Collected Solid Waste Items

Item Name	Weight(kg)	Percentage of total weight
Coin	0.035	0.14%
Rope	0.045	0.18%
Paper	4.5	17.85%
Cloth	3.7	14.68%
Foam	0.03	0.12%
Food	8.5	33.72%
Plastic	1.2	4.76%
Tissue	0.9	3.57%
Rubber	0.03	0.12%
Cast Iron(Metal)	0.5	1.98%
Polythene	3.5	13.88%
Head Phone	0.015	0.06%
Glass	0.19	0.75%
Packet	0.5	1.98%
Hangers	0.015	0.06%
Plastic Rope	0.8	3.17%
Coffee Cup	0.75	2.98%
Total	25.21	100%

Table 2 shows that,

The total weight of the coin is 0.035 kg and its percentage of the total weight is 0.14%. The total weight of the rope is 0.045 kg and its percentage of the total weight is 0.18%. The total weight of the paper is 4.5 kg and its percentage of the total weight is 17.85%. The total weight of the cloth is 3.7 kg and its percentage of the total weight is 14.68%. The total weight of the foam is 0.03 kg and its percentage of the total weight is 0.12%. The total weight of the food is 8.5 kg and its percentage of the total weight is 33.72%. The total weight of the plastic is 1.2 kg and its percentage of the total weight is 4.76%. The total weight of the tissue is 0.9 kg and its percentage of the total weight is 3.57%. The total weight of the rubber is 0.03 kg and its percentage of the total weight is 0.12%.

The total weight of the cast iron(metal) is 0.5 kg and its percentage of the total weight is 1.98%. The total weight of the polythene is 3.5 kg and its percentage of the total weight is 13.88%. The total weight of the head phone is 0.015 kg and its percentage of the total weight is 0.06%. The total weight of the glass is 0.19 kg and its percentage of the total weight is 0.75%. The total weight of the packet is 0.5 kg and its percentage of the total weight is 1.98%. The total weight of the hangers is 0.015 kg and its percentage of the total weight is 0.06%. The total weight of the plastic rope is 0.8 kg and its percentage of the total weight is 3.17%. The total weight of the coffee cup is 0.75 kg and its percentage of the total weight is 2.98%. We can understand the status of Table 2 from the figure below:

Collected Solid Waste Items with Percentages

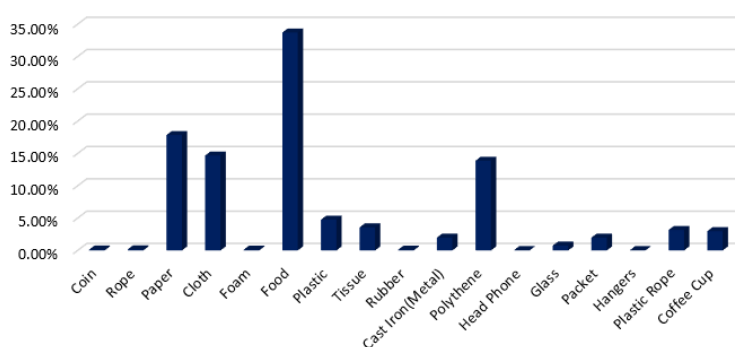


Figure 6: Collected Solid Waste Items with Percentages

Discussion of Organic, Inorganic and Hazardous Items

A discussion of organic, inorganic, and hazardous items is given in the table below.

From the collected solid waste items, Table 3 shows the total weight and percentage of the total weight of organic, inorganic, and hazardous items.

Table 3 shows that the total weight of organic items is

13.94 kg, the total weight of inorganic items is 10.75 kg, and the total weight of hazardous items is 0.545 kg.

This table also shows that the total percentage of the weight of organic items is 55.3%, the total percentage of the weight of inorganic items is 42.5%, and the total percentage of the weight of hazardous items is 2.2%.

We can understand the status of Table 3 from the figure below:

Table 3: Organic, Inorganic and Hazardous Items

Organic		Inorganic		Hazardous	
Weight(kg)	Item	Weight(kg)	Item	Weight(kg)	
8.5	Plastic	1.2	Head Phone	0.015	
4.5	Rubber	0.03	Cast Iron(Metal)	0.5	
0.9	Coin	0.035	Foam	0.03	
0.045	Cloth	3.7	-	-	
-	Polythene	3.5	-	-	
-	Glass	0.19	-	-	
-	Packet	0.5	-	-	
-	Hangers	0.015	-	-	
-	Plastic Rope	0.8	-	-	
-	Coffee Cup	0.75	-	-	
Total Weight	13.94		10.72		0.545
% of Weight	55.3%		42.5%		2.2%

Percentage of Weight of Organic, Inorganic and Hazardous Items.

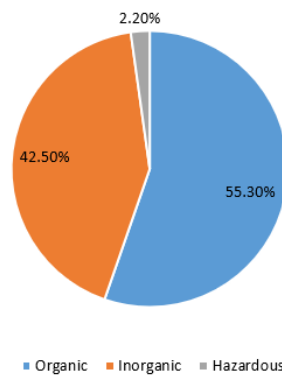


Figure 7: Percentage of Weight of Organic, Inorganic and Hazardous Items

DISCUSSION OF 3R APPLICATION

A discussion of the 3R Application is given in the table below.

Table 4: 3R Application

Reducible		Reusable		Recyclable	
Item	Weight(kg)	Item	Weight(kg)	Item	Weight(kg)
Coin	0.035	Paper	4.5	Food	8.5
Rope	0.045	Cloth	3.7	Plastic	1.2
-	-	Foam	0.03	Tissue	0.9
-	-	-	-	Rubber	0.03
-	-	-	-	Cast Iron(Metal)	0.5
-	-	-	-	Polythene	3.5
-	-	-	-	Head Phone	0.015

Table 4 shows the discussion of the 3R application. Here it shows that the total weight of Reducible items is 0.08 kg and its percentage of weight is 0.31%. Again it shows that the total weight of Reusable items is 8.23 kg and its percentage of weight is 32.65%.

Moreover, it also shows that the total weight of Recyclable items is 16.9 kg and its percentage of weight is 67.04%. We can understand the status of Table 4 of the 3R Application from the figure below:

3R Application

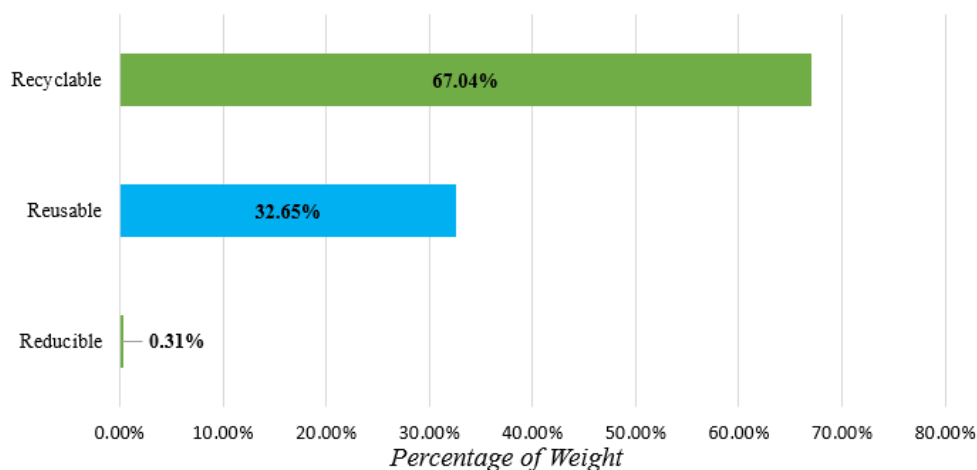


Figure 8: Bar Chart of 3R Application.

Discussion of Energy Analysis

A discussion of the Energy Analysis is given in the table below. According to energy content, Table 5 shows that food

energy is 4652 Kj/Kg and energy available from food is 39542 kilojoules. Plastic energy is 32564 Kj/Kg and energy available from plastic is 39077 kilojoules. Paper energy is 16747.2 Kj/Kg and energy available from paper is 75362

Table 5: Energy Analysis

Energy Analysis		
Material types according to energy content	Energy (Kj/Kg)	Total Energy (Kilojoules)
Food	4652	39542 [Calculation: $4652 \times 8.5 = 39542$]
Plastic	32564	39077
Paper	16747.2	75362
Rubber	23260	698
Cloth	17445	64547
Cast Iron(Metal)	697.8	349
Glass	139.56	27
Dirt's (e.g. Foam, Tissue, Polythene, Head Phone, Packet, Hangers, Plastic Rope, Coffee Cup)	6978	45426.78
Total		265029

kilojoules. Rubber energy is 23260 Kj/Kg and energy available from rubber is 698 kilojoules. Cloth energy is 17445 Kj/Kg and energy available from cloth is 64547 kilojoules. Cast Iron(Metal) energy is 697.8 Kj/Kg and energy available from cast iron(metal) is 349 kilojoules. Glass energy is 139.56 Kj/Kg and energy available from glass is 27 kilojoules. Dirt's energy is 6978 Kj/Kg and

energy available from dirt is 45426.78 kilojoules.

Finally, the total energy obtained from 25.21 kg solid waste items of Dhaka city is 265029 kilojoules.

Discussion of Energy Content in Percentage

A discussion of the Energy Content in percentage is given in the table below.

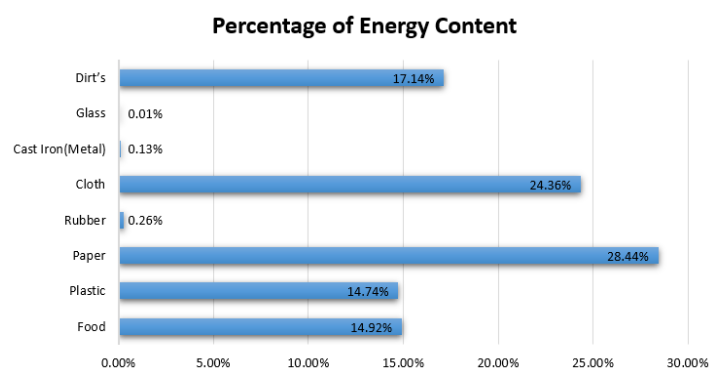
Table 6: Percentage of Energy Content

Percentage of Energy Content		
Material types according to energy content	Total Energy (Kilojoules)	Percentage of Energy Content
Energy Content		
Food	39542	14.92%
Plastic	39077	14.74%
Paper	75362	28.44%
Rubber	698	0.26%
Cloth	64547	24.36%
Cast Iron(Metal)	349	0.13%
Glass	27	0.01%
Dirt's	45426.78	17.14%
Total	265029	100%

In terms of energy content, Table 6 shows that the energy content of food is 14.92%. The energy content of plastic is 14.74%. The energy content of the paper is 28.44%. The energy content of rubber is 0.26%. The energy content of cloth is 24.36%. The energy content of

cast iron(metal) is 0.13%. The energy content of the glass is 0.01%. The energy content of dirt is 17.14%.

We can understand the status of Table 6 of the Percentage of Energy Content from the figure below:


Figure 9: Bar Chart of the percentage of energy content

Electricity Generation from Solid Waste

By generating electricity from solid waste, we will be able to simultaneously meet the demand for electricity, as well as accelerate the speed of proper solid waste management in Dhaka city of Bangladesh. This paper believes that it is possible to establish this power plant through the combined efforts of engineers.

This paper proposes below the main methods of electricity/Power generation from solid waste.

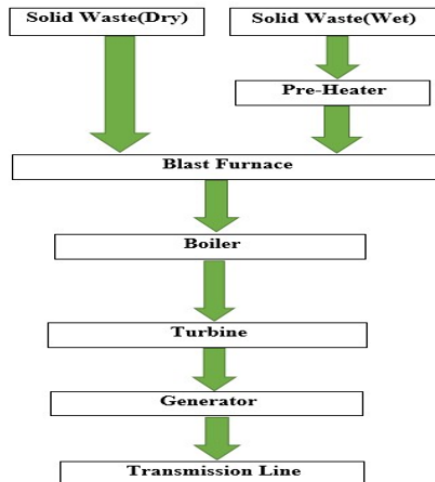


Figure 8: A flow process for electricity generation

All the waste materials that are collected should be brought to the waste department. Then there are mainly two types of waste to be classified; Solid Waste (Dry) and Solid Waste (Wet).

a) Solid Waste(Dry): The dry solid waste will go directly to the blast furnace.

b) Solid Waste(Wet): Wet-type solid waste will pass through a pre-heater section and reduce its moisture content. Thus most of the daily dumped waste will be used to reduce its moisture content.

c) Pre-Heater: A pre-heater is a device used to heat the waste material before entering the blast furnace. It will basically dry the wet solid waste.

d) Blast Furnace: The blast furnace will essentially act as the heating part of the process and in this part, the waste materials will be burned to produce a temperature that will heat the boiler and generate steam.

e) Boiler: Normal-temperature water in the boiler section will be heated by the temperature generated by the blast furnace and then steam will be produced. This steam will be used to rotate the turbine.

f) Turbine: A turbine is a continuous power generation machine in which a wheel, usually mounted on a vane, is made to rotate by a high-speed flow of water, steam, gas, or air. The turbine must be connected to a generator to produce electricity.

g) Generator: Usually, the speed of the turbine is used in a generator to generate electricity. Hence, a generator is mainly a machine for converting mechanical energy into electricity. Mainly electricity will be generated in this part. (Abdur, Jannati, Jannatun. 2019)

h) Transmission Line: Finally, this electricity generated from solid waste can be delivered directly to consumers through transmission lines.

Advantages of Electricity Generation from Solid Waste

There are several advantages of generating electricity from solid waste and some of them are discussed below.

i. It will reduce the amount of waste: Incinerators can reduce the amount of waste by up to 95% and can reduce the solid content of the original waste by 80-85% depending on the composition of the solid waste. (Conserve Energy Future. 2023) In this way, generating electricity from solid waste will reduce the amount of waste in Dhaka city.

ii. It will create an efficient waste management: Power generation from solid waste will create an efficient waste management in Dhaka city.

iii. It will reduce groundwater pollution: Usually, solid waste from Dhaka city is dumped on land, and the land releases toxic chemicals into the water table below, thus contaminating the groundwater system. If this solid waste is used for power generation in Dhaka city, land pollution and groundwater pollution will definitely be reduced.

iv. The functional material is recyclable after generating electricity: Metals will remain intact when incinerators burn solid waste to generate electricity because they have high melting points. After the waste incineration process is completed, power plant workers will remove the remaining metal and recycle it. The remaining ash can be used for construction or other purposes.

v. It will create a beautiful waste-free city: If we use solid waste for power generation in Dhaka city, most of the solid waste will be used for power generation. This will reduce the solid waste of this city and create a beautiful waste-free Dhaka city.

There are many other benefits of generating electricity from solid waste which cannot be summarized.

Disadvantages of Electricity Generation from Solid Waste

There are several disadvantages of generating electricity from solid waste and some of them are discussed below:

i. It is wasteful to burn waste: Solid waste is made up of materials such as glass, paper, and plastic, and burning these valuable materials to generate electricity discourages resource conservation efforts. After incineration of solid waste, it will generate waste again.

ii. Waste is not a viable fuel: To generate only a small amount of energy to produce electricity would waste a large amount of recyclable materials. So it is more profitable to produce recycle product than to produce electricity from solid waste.

iii. If we burn waste to generate electricity, the waste will produce toxic emissions: If waste is burned to generate electricity, it will be very dangerous for the environment of Dhaka City because even the most advanced technology will pollute the environment.

iv. Burning waste will contribute to climate change in Dhaka city: Incinerators actually emit more CO₂ than natural gas-fired, oil-fired, or even coal-fired power plants. (Zero Waste Europe. 2018) Excess CO₂ gas will lead to climate change in Dhaka city.

v. The power plant will generate ash, flue gas and excess heat: Converting waste materials to power generation will generate ash, flue gas, and excess heat in Dhaka city and will worsen the overall environmental condition of the city.

There are many other disadvantages of generating electricity from solid waste and specific new research is needed to elaborate the disadvantages.

CONCLUSION

In Dhaka city of Bangladesh, we dream of a clean and tidy city and the waste recycling process can make these dreams come true. But not only in Bangladesh, it is not possible for the government of any country to shoulder all the responsibilities alone. We, the people of this city, must work together to share this responsibility. Dhaka North City Corporation and Dhaka South City Corporation have started organizing their own waste collection services to keep their areas clean. Both City Corporations started their work based on their Community Planning System. Waste is collected from households and taken to municipal roadside containers. Community-run door-to-door waste collection services are gaining momentum in the capital Dhaka City and are gradually expanding into a larger environmental movement. We can save our environment and ultimately benefit through concerted efforts. Recycling waste also reduces greenhouse gas emissions. Recycled waste helps reduce energy requirements for new products and reduces carbon dioxide emissions into the atmosphere. That's why we need to be more proactive in recycling waste and help increase environmental benefits for future generations. There are both advantages and disadvantages of generating electricity from solid waste. So Dhaka city or any other city in the world should do proper research before generating electricity from solid waste, then proceed to generate electricity. It is true that we need electricity, but our environment and our planet Earth are the first priority. Waste management is a matter of new attention because this problem is very evident in Dhaka city of our country. Further research is needed in the future to find ways to overcome the problems arising from improper solid waste management in Dhaka City, Bangladesh.

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