



## Solid Waste Management Practices in Mymensingh City Corporation Areas, North-Central Bangladesh

Al-Amin<sup>1\*\*</sup>, Ashraf Ali Seddique<sup>1</sup>, Nazmunnaher Nipa<sup>1\*</sup>, Mahabub Hossain<sup>1</sup>

<sup>1</sup>Department of Environmental Science and Engineering, Jatiya Kabi Kazi Nazrul Islam University, Trishal, Mymensingh 2224, Bangladesh

\*Corresponding author, Email address: [nipasheikh13@gmail.com](mailto:nipasheikh13@gmail.com)

\*\*Corresponding author, Email address: [alaminese@gmail.com](mailto:alaminese@gmail.com)

Received 03 Mar 2024,

Revised 02 Apr 2024,

Accepted 04 Apr 2024

### Keywords:

- ✓ Solid Waste;
- ✓ Hazardous Waste;
- ✓ Management Practices;
- ✓ Mymensingh City;

**Citation:** Al-Amin, Seddique A. A., Nipa N., Hossain M., (2024) Solid Waste Management Practices in Mymensingh City Corporation Areas, North-Central Bangladesh, *J. Mater. Environ. Sci.*, 15(4), 530-538

**Abstract:** Solid waste management is the discipline concerned with the control of solid waste generation, storage, collection, transfer, processing, and disposal. The major purpose of the study was to address the present solid waste composition and quantity as well as the solid waste management practices in Mymensingh City Corporation (MCC) areas. Both primary and secondary data sources were used to perform the study. Data have been collected from 27 locations of the city. Survey data showed that the respondent's number of 30% of people discharged 0.5kg of solid waste from their households per day. On the other hand, 50% of respondents discharged 1kg/day, 12% of respondents discharged 2 kg/day, and 8% discharged 3 kg of solid waste from their house in a single day. Total 541.27 tons of solid waste are produced per day in Mymensingh City Corporation. Where food waste is 65.1%, paper waste 3%, polythene and plastic 10.7%, metallic waste 0.33%, cloth waste 0.6%, wood waste 0.6%, glass waste 2.5%, Hazardous waste 0.3% and others waste 17%. Waste management department of MCC manages 300 tons of solid waste out of 541.27 tons. There has only one dumping site and it is situated in char Ishwardia outside of the city area. In many underdeveloped and developing countries still, it is a major problem due to the lack of proper management. This paper strongly recommended that sustainable solid waste management is much needed in Mymensingh City Corporation.

## 1. Introduction

An essential component of sanitation is waste management, which includes managing, storing, collecting, transporting, and disposing of garbage (both liquid and solid) (Dwivedi *et al.* (2019)). Solid waste is the useless, unwanted, and discarded material generated by day-to-day community activities (Mishra *et al.* (2014)). Solid waste management in a city is a complex activity that entails the collection, transportation, recycling, resource recovery, and disposal of solid waste (Atemni *et al.* 2022; Schubeler *et al.* 1996;). In both urban and rural areas of many industrialized and emerging nations, the problem of disposing of solid wastes is acute and pervasive (Shafy *et al.* 2018; Bouknana *et al.* 2014). People are growing rapidly in municipal areas and increase solid waste for their daily resource consumption. Both conservative and non-biodegradable components as well as non-conservative compounds may be present in human solid waste (Okeniyi *et al.* 2012). Wastes are of various types; generally, it is categorized as municipal wastes, industrial wastes, and hazardous wastes (EPA, 2023; Errami *et al.*,

2013). Solid wastes are also a kind of municipal waste. Mymensingh City Corporation generates a wide range of waste, including food waste, paper, cardboard, plastics, rubber, leather, wood, glass, ferrous metals, and so on. Solid waste becomes a serious problem in urban areas, especially in where the large and rapid population growth occurs. Mymensingh City Corporation (MCC) is very densely populated area in Bangladesh. There are around 4.87 lakhs of peoples live in here (Macrotrends, 2023). The study area is considered a major financial center and educational hub of north-central Bangladesh, and is the second-most densely populated (~44,458 inhabitants/km<sup>2</sup>) and rapidly growing modern cities of Bangladesh.

Noted that Mymensingh City corporation area produced 541.27 tons of solid waste per day (personal communication with city corporation authority). About 95% of the area of this dumping site is already being covered by solid waste but most of them are not managed properly. For unplanned solid waste management practice causes various problems in human life and environment (Mian *et al.* 2010). Inherent human desire in resources consumption governs the waste generation capacity. The quality of life in a city, including its ecological, cultural, political, institutional, social, and economic aspects, may be improved through more sustainable urban development and local waste management, and this improvement may also have an indirect impact on areas outside the city's boundaries (Taelman *et al.* 2018). The major purpose of the study was to address the present solid waste composition and quantity in Mymensingh City Corporation and identify the solid waste management practices. This study also identifying the lacking of waste management in Mymensingh City Corporation. Increasing solid waste generation, and inefficient collection and transportation infrastructure system, the ingredients of waste and climatic conditions were needed to be considered in waste management.

## 2. Methodology

### 2.1 Location of the study area

Mymensingh is the 8th city corporation of Bangladesh and it is situated behind the old Brahmaputra River. The study area (Figure 1) lies between 24°41' to 24°48'N latitudes and between 90°20' to 90°26'E longitudes. It is one of the largest municipal areas in Bangladesh with an area of 91.60km<sup>2</sup> (BBS, 2008).

### 2.2 Data collection and analysis

Primary data was collected from numerous categories of individuals and therefore the respondents were selected indiscriminately. Data was collected through survey from day labor, rickshaw and van- puller, businessman, student, job holder and homemaker to assess the precise state of affairs of waste management with direct field observation (Figure 2).

#### 2.2.1 Demographic and socio-economic data on the area

Fifty respondents were interviewed in the study area. Both male and female respondents were in interview, where 40% female and 60% male respondent (Figure 2). But we mostly collected data from male respondent because of their occupation which is related with our study.

#### 2.2.2 Respondents Qualifications

We discussed 50 different classes of respondents which showed below the Figure 2. We discussed five members of graduated person, eight members of under graduated person; we also discussed eleven

members of uneducated person for knowing about solid waste and their personal opinions, suggestions, problems etc. In this study, we grappled with all classes of people who are directly involved in waste management. All classes of people produced waste more or less.

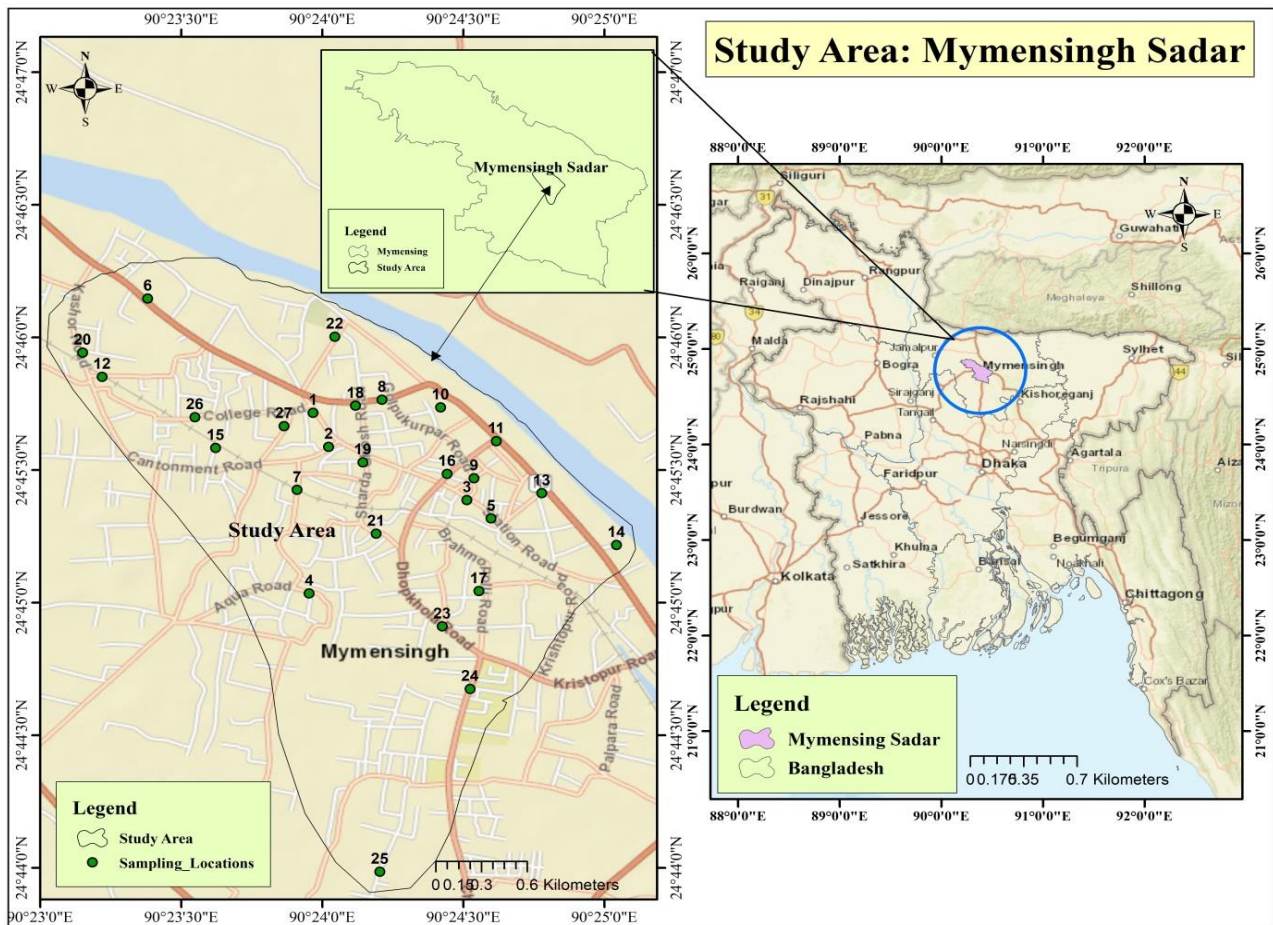


Figure 1. Location map of the study area

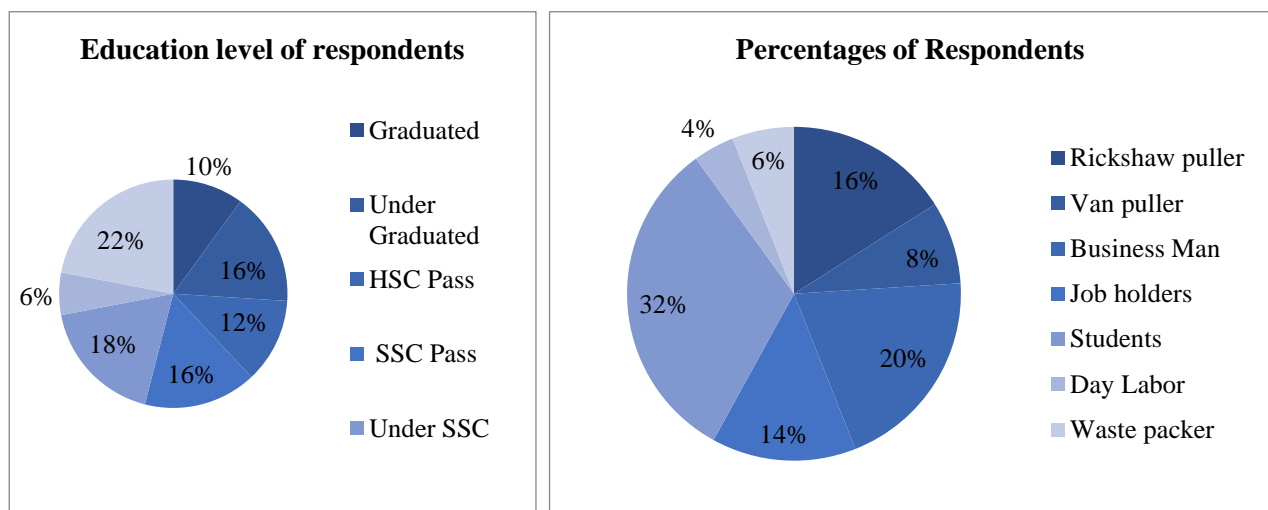


Figure 2. The percentages of respondents and their educational level.

So, we encompassed all classes of the respondent. We want to know about their personal opinion on waste and solid waste management; we also want to know how much waste they have been produced

per day as single holders. We randomly selected many van and rickshaw pullers, day labor, businessman, job holder, students, politicians etc.

Secondary data regarding the waste management department, population, volume of waste generation, activities exiting on solid waste management in elect study space were collected. It has been collected from Mymensingh City Corporation. In this study the data was collected from the municipality wards no. 2,3,4,7, 9,13,14,15 and 18. Data has been estimated approximately in 27th of different locations. However, questionnaires were surveyed with 50 different classes of respondents in the area studied. We were also collected the data from the different Community-Based organizations as well. Collected data were analyzed by MS Excel data analysis tools. Firstly, we calculate the average of solid waste generation by per capita in Mymensingh City Corporation. Approximately we calculate the total volume of solid waste generation per day in the Mymensingh City Corporation by a simple equation.

$$TW = PCW \times TP$$

Where, TW= Total waste

PCW= Per capita waste generation

TP= Total Populations

### 3. Results and Discussion

Waste is generally classified into broad list categories such as solid waste, liquid waste, gaseous waste, hazardous waste, radioactive waste, E-waste etc. This study only focuses on solid waste in Mymensingh City Corporation. Solid waste generates in Mymensingh city from different sectors such as household waste, medical waste, construction waste etc.

#### 3.1 Waste generation from households per day

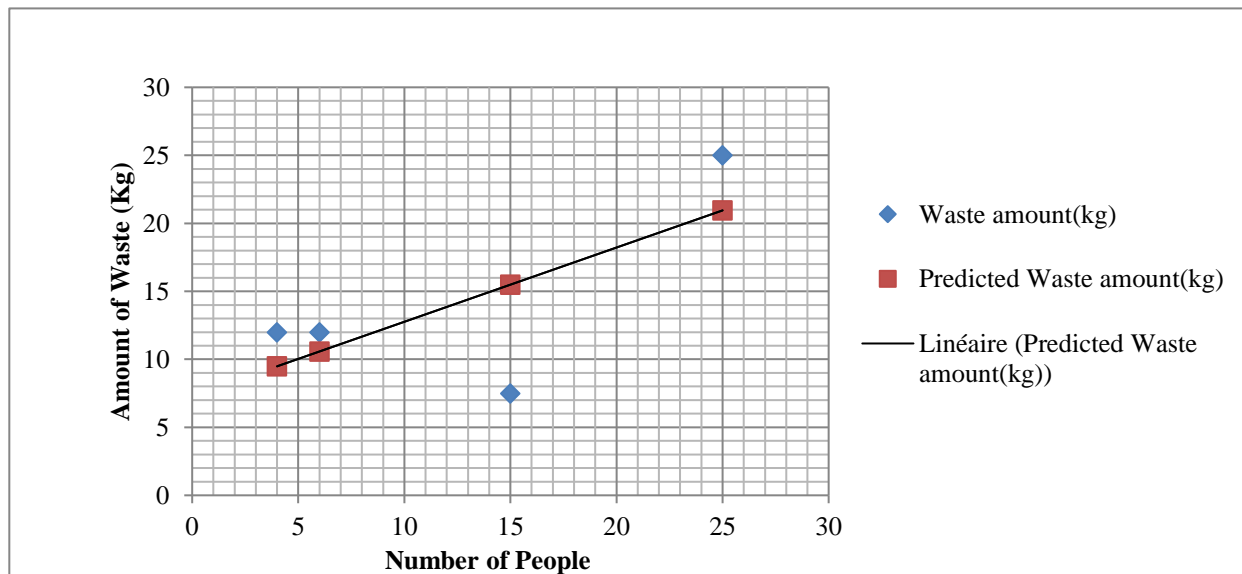
We asked fifty's respondent on those comes from fifteen families and knowing the amount of solid waste generation from each of them. Fifteen respondents told that they have generated 0.5 kg solid waste per day and twenty-five respondents are 1kg, six respondents are 2 kg and four respondents have produced 3 kg. The average of solid waste generated by fifty respondents is 1.13kg which shown in [Table 1](#).

**Table 1.** Waste generation (amount) from households per day

Waste amount (kg)	Number of respondents	Percent of the respondents	Average per capita solid waste generation in the study area
0.5	15	30	1.13kg
1	25	50	
2	6	12	
3	4	8	
	Total=50	100%	

**Figure 3** shown that number of respondents has strong positive correlation (Multiple R= 0.69) with amount of waste. That indicates waste production is rises with number of respondent people increasing.

In regression analysis, we found  $r^2=0.48$  that is indicate that half of the dependent variable variance is explained by the model's independent variables.



**Figure 3.** Number of people line fit plot predicted amount of waste

### 3.2 Waste quantity measurement by sampling

Two kilograms of solid garbage are measured three times in three distinct places. Then divide the waste into its many sorts. The average value for each category of trash from the 6kg sampling waste is then calculated. Finally, we determine the amount of garbage (Table 2) by its kinds from the total waste based on a 3kg sampling.

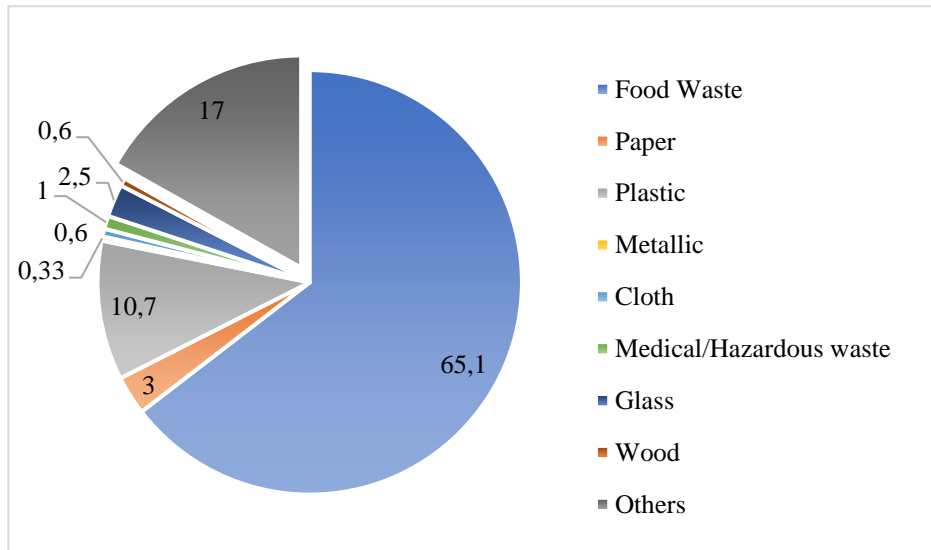
**Table 2.** Solid waste composition in study areas.

Sample	Food Waste	Paper	Plastic	Metal	Cloth	Wood	Glass	Medical waste/hazardous waste	Others waste
Sample-1 (2kg)	1.4	0.12	0.12	0	0.04	0.04	0.02	0	0.3
Sample-2 (2kg)	1.31	0.04	0.142	0.02	0	0	0.13	0.02	0.33
Sample-3 (2kg)	1.2	0.02	0.38	0	0	0	0	0	0.4
Average	1.30	0.066	0.22	0.006	0.013	0.013	0.05	0.006	0.34
Total	3.91	0.18	0.642	0.02	0.04	0.04	0.15	0.02	0.82
Percent	65.1	3	10.7	0.33	0.6	0.6	2.5	0.3	17

### 3.3 Solid wastes production per day in Mymensingh city Corporation:

Mymensingh City Corporation has 33 wards. Each of these wards produces a huge amount of waste. From the City corporation waste management department, we have to know that, every day 400 tons of solid waste produced in city areas. As a result, we calculate of waste amount according to its types by dint of percent. We find that there has 348.88 tons of food waste, 16.10 tons of paper waste, 57.33

tons of plastic waste, 1.77 tons metallic waste, 3.55 tons of cloth waste, 5.36 tons of medical/hazardous waste, 13.41 tons glass waste, 3.55 tons of wood waste and 91.24 tons others waste produced in Mymensingh City Corporation. About 95% of the area of this dumping site is already being covered by solid waste but most of them are not managed properly. City corporation waste management managed 300 tons of solid waste per day. As a result, remaining of solid waste found untenably everywhere in whole city (**Figure 4**).



**Figure 4.** Solid waste production scheme (%) per day by its type

### 3.4 Plastic waste in Mymensingh City Corporation

The need for plastics has grown dramatically in emerging nations including those in Asia, Africa, and South America over the past few decades (Hussein *et al.* (2021)). Plastics are low-cost materials that are strong, lightweight, corrosion-resistant, durable, and have a good level of thermal and electrical insulation (Andrade *et al.* (2016)). Large amounts of plastic bags that are discarded or slightly accumulated pollute the air, water, and land, harming the biosphere and adversely hurting the organisms that live there (Raghatate *et al.* (2012)). Plastic waste is non-degradable type of waste generated by every stockholder of Mymensingh City Corporation. In this study, about 10.7% of waste is plastic waste. According to total waste from Mymensingh City Corporation, this amount is 42.8 tons/day. Plastic waste is found from every location of this study area but on top of that Chorpara road, Naumahal, Kashor road and college road has found a relatively high amount of plastic waste. On the other hand, Gulkibari, Zila school road, Saroda Goash road and Brammapolly road has found relatively less amount of plastic waste.

### 3.5 Food waste in the Mymensingh City Corporation

Food waste is the degradable waste, mostly generated by every stockholder of Mymensingh City. In this study, about 65.1% of waste is food waste. Food waste is a very common type of waste which was found in every location of the study area. On top of that Chorpara road, Naumahal, Kashor road and college road has found a relatively high amount of food waste. On the other hand, Gulkibari, Zila school road, Saroda Goash road and Brammapolly road have found relatively less amount of food waste. The EU prioritizes the two highest levels, i.e. prevention and donation, as the top three layers

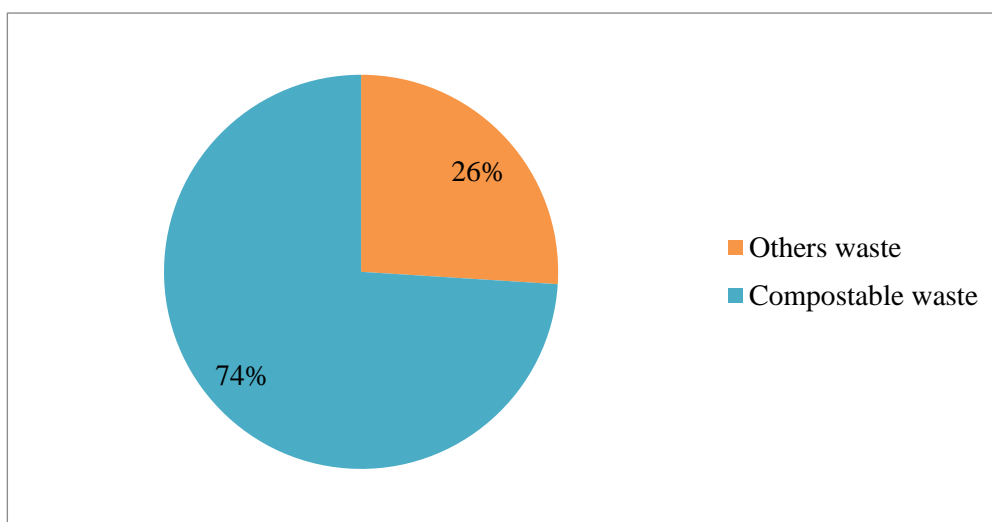
(prevention, donation, and animal feed) are activities that can be implemented before food becomes waste (ECA, (2017)). Legal mandates to prevent health issues may collide with the objective of reducing food waste when it comes to food safety (Priefer *et al.* (2016)).

### 3.6 Medical waste in the Mymensingh city corporation

Medical waste is the solid, liquid and gaseous types of waste generated from healthcare and its associated institution. About 214s healthcare and its associated institutions are found in the Mymensingh City Corporation. According to Mymensingh City Corporation authorities and waste peckers opinion approximately this amount is 292 tons/day. Hazardous waste is also found in the whole city corporation in Mymensingh. But especially Chorprara, Shehora road, Dhopakhal and Durgabari road is the major place for hazardous waste. On top of that Chorpara region is the main source of hazardous waste. Because about 90% of health care institutions are situated in Chorpara areas. Healthcare facilities continue to place less importance on MW management due to the competition for scarce resources in developing nations (Sujon *et al.* (2022)). Nine out of ten hospitals in Bangladesh and one out of three worldwide lack basic MW management services (WHO, (2019)).

### 3.7 Bio fertilizer from solid wastes

The intensive utilization of chemical fertilizers over the past few years has diode to serious environmental complications besides negatively influencing human and animal health. It's advised that this product area unit chargeable for up to 100% of world greenhouse emission emissions, additionally to severely worsening soil quality and crop productivity. In this sense, this project aims to deal with an outline of bio fertilizers through waste exercise, main sources, acceptable treatment processes, rising technologies, and applications. Mymensingh city corporation area produced 541.27 tons of solid waste per day, in which 348.88 (65.1% of 541.27) ton of waste is food waste. According to .Mymensingh city corporation authority, compostable waste has produced 74% (Figure 5). So there has a huge opportunity to make bio-fertilizer from waste.



**Figure 5.** Percentage of compostable solid waste in Mymensingh City Corporation (MCC).

Regarding application methods, the biofertilizer has the widest range of applications, with the fertilization of small and large crops standing out as particularly beneficial to the environment because

it contains the nutritional elements nitrogen (N), phosphorus (P), and potassium (K), which are soil enrichers and do not contain heavy materials that are detrimental to cultivation (Souza *et al.* (2010).

## Conclusion

Solid waste management in Mymensingh City Corporation is perceived to be inadequate and it ought to be improved. Every day 541.27 tons of solid waste are produced in MCC. But only 300 tons of solid waste is collected by municipal authorities through traditional management processes. In this study, about 65.1% of solid waste is food waste. So, it has huge potentiality to make bio-fertilizer from this solid waste. Total 214th health care institution situated in Mymensingh municipal areas and a huge amount of medical waste produced from these sectors. But there has no plant for managing hazardous waste. There has only one disposal site (Moilar moor) in Mymensingh city and it's situated behind the Brahmaputra River. These dumping sites are almost filled with waste. About 95% of the area of this dumping site is already being covered by solid waste. We have seen a lot of lacking in solid waste management practices by Mymensingh City Corporation. The authority has much needed to improve its waste management practices. Each respondent should separate their solid trash into bins that are yellow, red, green, and black.

**Acknowledgement:** We would like to thanks Md. Rased Hasan Sajib for his helpful and cordial cooperation. Special thanks are due to Authority, Mymensingh City Corporation for providing the essential data.

**Disclosure statement:** *Conflict of Interest:* The authors declare that there are no conflicts of interest.

*Compliance with Ethical Standards:* This article does not contain any studies involving human or animal subjects.

## References

- Andrade, A.J.M., Grande, S.W., Talsness, C.E., Grote, K., and Chahoud, I., (2016) Dose-response study following in utero and lactational exposure to di-(2-ethylhexy)-Phthalate (DEHP), non-monotonic dose-response and low dose effects on rat brain aromatase activity. *Toxicology*, 227(3), 185-192. <https://doi.org/10.1016/j.tox.2006.07.022>.
- Atemni I., Mehdaoui I., Ainane A., Gaga Y., Chetouani A., Hammouti B., Taleb M., Rais Z. (2022), Impact of composts prepared from olive waste on the growth and production parameters of some fruit trees, *Mor. J. Chem.* 10 N°2, 258-268
- BBS (2008), Statistical Pocket Book 2008, *Bangladesh Bureau of Statistics*, Dhaka.
- Bouknana D., Hammouti B., Salghi R., Jodeh S., Zarrouk A., Warad I., Aouniti A., Sbaa M. (2014), Physicochemical Characterization of Olive Oil Mill Wastewaters in the eastern region of Morocco, *J. Mater. Environ. Sci.* 5 (4), 1039-1058
- Dwivedi, A., Duvey, R., Singh, P.K., Ohri, A., (2019) Scientific Management of Municipal Solid Waste in an Academic Campus – A Case Study of IIT(BHU). *Journal of Materials and Environmental Sciences*, 10(10), 909-917.
- EPA, United States Environmental Protection Agency (2023). <https://www.epa.gov/report-environment/wastes>.
- European Court of Auditors Special report no 34/2016/combating food waste: an opportunity for the EU to improve the resource-efficiency of the food supply chain, 2017.
- Errami M., Salghi R., Zarrouk A., *et al.* (2013) Electrochemical Treatment of Wastewater Industrial Cartons, *Int. J. Electrochem. Sci.*, 8(12), 12672-12682



- Hussein, B.A., Tsegaya, A.A., Abdulahi, A., (2021) Assessment of the Environmental and Health Impacts of disposal Plastics in Gode town, Somali regional state, Eastern Ethiopia. *Journal of Materials and Environmental Sciences*, 12(3), 455-471.
- Macrotrends (2023) Mymensingh, Bangladesh Metro Area Population 1950-2023. Retrieved on March 4, 2024.
- Mian, M.M., Paul, A.K., Alam M.D., Rasheduzzaman, M., Saifullah A.S.M., (2010) Solid Waste Management practice in Mymensingh Municipal Area, Bangladesh. *Journal of Environmental Sciences and Natural Resources*, 5(2), 193-198. [10.3329/jesnr.v5i2.14813](https://doi.org/10.3329/jesnr.v5i2.14813).
- Mishra, A.R., Mishra, S.A., Tiwari, A.V., (2014) Solid waste management-case study. *International Journal of Research in Advent Technology*, 2(1), 396-399.
- Mymensingh City Corporation (MCC) (2023), Government of Bangladesh (GoB); URL: <http://www.mcc.gov.bd/>.
- Okeniyi., Olusegun, J., Anwan., Udonwan, E., (2012) Solid Wastes Generation in Covenant University, Ota, Nigeria: Characterisation and Implication for Sustainable Waste Management. *Journal of Materials and Environmental Sciences*, 3(2), 419-424.
- Priefer, C., Jorissen, J., Brautigam, K.R., (2016) Food waste prevention in Europe-A cause driven approach to identify the most relevant leverage points for action. *Resources, Conservation and Recycling*, 109, 155-163. [10.1016/j.resconrec.2016.03.004](https://doi.org/10.1016/j.resconrec.2016.03.004).
- Raghatate, M. A., (2012) Use of plastic in concrete to improve its properties. *International Journal of Advanced Engineering Research and Studies*, 1(3), 109-111.
- Schubeler, P., Wehrle, K., Christen, J., (1996) Conceptual framework for municipal solid waste management in low-income countries. In: Urban management and infrastructure working paper vol. 1. Washington: SKAT (Swiss Centre for Development Cooperation in Technology and Management).
- Shafy H.I.A., Mansour M.S.M., (2018) Solid waste issue: Sources, Composition, disposal, recycling, and valorization. *Egyptian Journal of Petroleum*, 27, 1275-1290.
- Souza, J.A.R., Moreira, D.A., Ferreira, P.A., Matos, A.T., (2010) Evaluation of tomato fruit table produced with effluent from primary treatment of swine wastewater. *Engineering in Agriculture*, 18(3), 198-207. <https://doi.org/10.13083/reveng.v18i3.77>.
- Sujon, H., Biswas, T.K., Chowdhury, A., Chowdhury, M.E., (2022) Medical Waste Management: An Assessment of District-Level Public Health Facilities in Bangladesh. *Cureus*, 14(5), 24830. doi:10.7759/cureus.24830.
- Taelman, S.E., Tonini, D., Wandl A., Dewulf J.O., (2018) A Holistic Sustainability Framework for Waste Management in European Cities: Concept Development. *Journal of Sustainability*, 10(7), 2184. <http://dx.doi.org/10.3390/su10072184>
- World Health Organization, (2019) United Nations Children's Fund: WASH in health care facilities: global baseline report 2019. WHO and UNICEF, Geneva.

---

(2024) ; <http://www.jmaterenvironsci.com>