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Analysis of Physical Composition of Municipal Solid Waste of Agartala City

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***Abstract*—*With the increase in population and urban utilities, the quantity and composition of municipal solid waste goes on changing. The similar fact is true for Agartala also. In the present study the municipal solid waste segregation for the Agartala city is carried out to predict the trend of physical composition of municipal solid waste for the city. The study provides important data regarding the solid waste composition of Agartala city. It will surely help in developing appropriate management plan for municipal solid waste for Agartala city.*

Keywords*—*Municipal solid waste, segregation, physical composition, Agartala city.

I. INTRODUCTION

Tripura is a small state in the north-eastern part of India. Agartala is the capital city of Tripura. The geographical area of the city is about 62.02 sq.km. It is basically an administrative city. The geographical extend of the city has expanded enormously in 2004 incorporating 46 sq.km peripheral areas with core areas of 16.02 sq.km. With the increase in the size of the city the population of the city has also increased in a rapid pace. Commercial status of Agartala is enhanced after recent India-Bangladesh trade agreement. Due to sudden increase of city area and population solid waste generation is also increased proportionately. With the increase in the quantum of solid waste and with the change in socio economic status of the city, the composition and characteristics of the solid waste generated in the city is also changed a lot. The solid waste collection, transportation and disposal in the city is carried out as per the planning adopted in many years ago (almost 30 years). Very minor modifications have been made to the solid waste management system of the city in recent years. Thus the efficiency of the solid waste management framework of the city has not reached to its highest level.

Solid waste refers to the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper etc); or according to hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc). Solid Waste Management, can be defined as the discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid waste in a manner that is in accord with the best principles of public health, economics, engineering, conservation aesthetics and other environmental considerations and that is also responsive to public attitudes and State laws.

There are many categories of municipal solid waste, like food waste, rubbish, commercial waste, institutional waste, street sweeping waste, industrial waste, construction and demolition waste, sanitation waste etc. Municipal solid waste contains recyclables (paper, plastic, glass, metals, etc.), toxic substances (paints, pesticides, used batteries, medicines), compostable organic matter (fruit and vegetable peels, food waste) etc (Jha et al., 2003; Reddy and Galab, 1998; Khan, 1994). For effective management of solid waste four points are required to be accounted for. These are reduce, reuse, recycle and recovery. Now for effective utilization these points in the solid waste management framework, it is utmost important to incorporate the process of scientific segregation of solid waste. It will not only improve the efficiency of the waste management utilities but also will help to make the process more economical. In maximum of the developing countries the source segregation is the weakest point in the entire solid waste management framework. As a result of such lacuna, the entire system becomes inefficient resulting in numerous social and environmental problems. In the countries like India, where the open dumping for solid waste disposal is still in practice, the segregation of solid waste immerges out to be more important activity to performed (Kansal et al., 1998). For proper segregation of solid waste as well as for selecting the suitable method for its treatment, the knowledge of quality of solid waste generated by a locality is very essential (Mor et al., 2006). The present study aims to illustrate the physical composition of municipal solid waste of Agartala city collected from ten sampling stations selected at random basis.

II. METHODOLOGY

It is a well known fact that there are two approaches available for estimating the quality and quantity of municipal solid waste at the local, state, or national levels. These approaches are the site-specific approach and materials flow approach. In the present study the physical segregation is made for the solid waste generated in Agartala city for last three years, i.e. 2014, 2015 and 2016 respectively. Ten sampling stations were selected on random distribution basis and from each station 5 kg of samples were collected for analysis. The samples were collected twice in each month for all the twelve months in the year for mentioned three years of

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study. The analyses were made as per the standard procedure in triplicate and the average data is presented over here.

III. Result and Discussion

The results of the physical segregation of municipal solid waste of Agartala city for three recent years, i.e. 2014, 2015 and 2016 are depicted in table I, II and III respectively.

TABLE I. Physical composition of municipal solid waste in Agartala city (Sampling Year: 2014).

S. No.	Component	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Average
1	Glass & Metals	1.40%	1.40%	1.35%	1.40%	1.52%	1.55%	1.66%	1.43%	1.54%	1.45%	1.44%
2	Food Waste	54.50%	56%	54.70%	55%	54.10%	56.80%	54%	55.50%	56%	57.20%	55.42%
3	Combustible matters	16.70%	17%	17%	18.50%	16.80%	17.40%	17.70%	16.50%	16.80%	18%	17.28%
4	Plastics	7%	7.20%	7.50%	6.80%	8.10%	6.40%	7.30%	7.40%	6.90%	6.60%	7.12%
5	Recyclable matters	2.40%	2.60%	1.80%	1.80%	2%	1.70%	1.90%	2.30%	1.80%	2%	2.03%
6	Inert materials	15.30%	15.50%	14.70%	16.10%	15%	15.80%	14.60%	16.60%	15.20%	14.60%	15.34%
7	Moisture Content	36%	35.70%	34.60%	38%	37.70%	35.60%	36.20%	37.80%	36.10%	35.50%	36.32%
8	Density	453.5 kg/cum	454 kg/cum	451.4 kg/cum	455.6 kg/cum	454 kg/cum	454.8 kg/cum	453.1 kg/cum	456.4 kg/cum	455.5 kg/cum	451.8 kg/cum	454.01 kg/cum

TABLE II. Physical composition of municipal solid waste in Agartala city (Sampling Year: 2015).

S. No.	Component	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Average
1	Glass & Metals	1.40%	1.40%	1.35%	1.40%	1.52%	1.55%	1.66%	1.43%	1.54%	1.45%	1.44%
2	Food Waste	54.30%	56%	55.10%	55%	54.00%	57.00%	54%	55.50%	56%	57.40%	55.45%
3	Combustible matters	16.50%	17%	17%	18.30%	17.00%	17.50%	18.70%	16.80%	15.90%	18%	17.36%
4	Plastics	7%	7.35%	7.50%	7.00%	8.20%	6.60%	7.20%	7.50%	6.80%	6.70%	7.21%
5	Recyclable matters	2.30%	2.50%	1.90%	1.80%	2%	1.65%	1.90%	2.40%	1.80%	2%	2.04%
6	Inert materials	15.40%	15.40%	14.80%	16.10%	15%	15.70%	14.10%	16.80%	15.00%	14.50%	15.30%
7	Moisture Content	36%	35.60%	34.70%	38%	37.70%	35.50%	36.00%	37.40%	36.20%	35.50%	36.29%
8	Density	455.5 kg/cum	453.5 kg/cum	451.4 kg/cum	455 kg/cum	454.7 kg/cum	455 kg/cum	453.3 kg/cum	456 kg/cum	455.5 kg/cum	452 kg/cum	454.19 kg/cum

TABLE III. Physical composition of municipal solid waste in Agartala city (Sampling Year: 2016).

S. No.	Component	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Average
1	Glass & Metals	1.40%	1.40%	1.35%	1.40%	1.52%	1.55%	1.66%	1.43%	1.54%	1.45%	1.44%
2	Food Waste	54.50%	56%	54.70%	55%	54.10%	56.80%	54%	55.50%	56%	57.20%	55.42%
3	Combustible matters	16.70%	17%	17%	18.50%	16.80%	17.40%	17.70%	16.50%	16.80%	18%	17.28%
4	Plastics	7%	7.20%	7.50%	6.80%	8.10%	6.40%	7.30%	7.40%	6.90%	6.60%	7.12%
5	Recyclable matters	2.40%	2.60%	1.80%	1.80%	2%	1.70%	1.90%	2.30%	1.80%	2%	2.03%
6	Inert materials	15.30%	15.50%	14.70%	16.10%	15%	15.80%	14.60%	16.60%	15.20%	14.60%	15.34%
7	Moisture Content	36%	35.70%	34.60%	38%	37.70%	35.60%	36.20%	37.80%	36.10%	35.50%	36.32%
8	Density	453.5 kg/cum	454 kg/cum	451.4 kg/cum	455.6 kg/cum	454 kg/cum	454.8 kg/cum	453.1 kg/cum	456.4 kg/cum	455.5 kg/cum	451.8 kg/cum	454.19 kg/cum

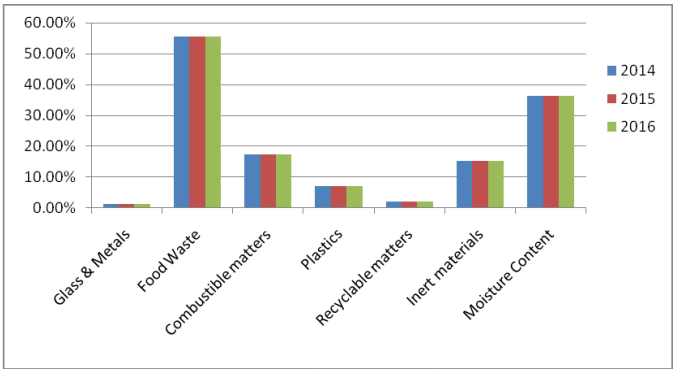

Fig. 1. Charecterization report of solid waste of Agartala City (Physical Parameters).

As it is already mentioned in the previous section that analysis for physical composition was carried out twice in a month for all the twelve months of a year and the average result for one complete year is presented in tabular form. From the present analysis the quality and characteristics of the municipal solid waste of this city can easily be estimated. The physical composition of solid waste as shown in figure 1 depicts that for last three years of study, the average composition of the waste in the city is more or less same which indicates a consistent trend of solid waste composition.

IV. Conclusion

The study will immensely assist the policy makers to chalk out broad revised strategy to effectively tackle the solid waste

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collection, transportation and disposal issue of the city with a paradigm shift from existing practices. The study shows the different compositions of municipal solid waste of the city. This information may be used to finalize the treatment and disposal alternatives for the city. Further this study results can serve as a baseline study for future research in the field of municipal solid waste management for the city of Agartala in a broader perspective.

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