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Solid Waste Management: System and Approach in Agartala City

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Abstract: Solid waste is an important component of pollution load imparted by the development activities. Municipal solid waste is mainly results from the urbanization & modernization of towns & cities. A proper scientific management of municipal solid waste is essential for the health of the common people as well as for the proper maintenance of the ecological balance. In the present paper a brief study of solid waste management of the Agartala city of Tripura, India is presented. Some critical analysis of the problems associated with the present system is also incorporated in the paper.

Key words: Solid waste, Management, Agartala Municipal Council.

INTRODUCTION

In Northeast India, after Guwahati, Agartala is the second largest city, which lies on the bank of Howrah &located around 2km from neighboring country Bangladesh. Our Agartala is in municipal area & population of this city around 399,688 as per census record[1]. This city was founded in 1838 AD by Maharaja Krishna Kishore Manikya. Firstly, from 1901 to 1971, the development of this city is negligible, but after passing the time, the Agartala city started to expands& increase its connectivity in various fields. This city is saturated in lower dignity, then other surrounding area, of this city &makes it's look like a plate(i.e ,saucer)[2].After forming the municipal council, it is required to manage the solid waste which is liberate daily from the house ,industries& many other places under the municipal area. The term 'solid waste' this implies all those solids &semisolids materials which are liberated by our society[3]. The solid waste may be domestic &commercial. In general, solid waste is easily classified in two categories[4], namely-municipal solid waste& industrial solid waste. As per MSW Rules[5]-2000, municipal solid waste is a garbage, which

is liberated on day to day in a human settlement &also include industrial& residential waste which is generated in municipal or notified areas, it may be either solid or semisolid formed, but not industrial hazard waste, but including treated biomedical waste. If the solid waste may generat from industries which is known as industrial solid waste& if the solid waste generated by the agricultural activities, then a major portion, which become a part of municipal solid waste& another type of solid waste which is dangerous for human health& living agents, it does not manage properly .This type of solid waste which is liberated from the hospital, nursing home, primary health centre, etc. which are known as biomedical waste[6].

STUDY AREA

The Agartala Municipality was founded in 1871 AD during the rule of Maharaja Chandra Manikya.The first British agent MR.A.W.B POWER, who was nominated for hill Tipprah in 1871 AD,was offered the chairman of Agartala municipality,during the reign of Maharaja BIK BIKRAM MANIKYA BAHADUR, in 1940 as the city became well planned& before that in 1874 AD,the municipal administration in Agartala was established. Now in 2013,the Agartala Municipal Council(A.M.C) was converted into municipal corporation& the municipal area of this city is 58.84 sq.km. The Agartala municipal area is divided into four zones, such as-north, south, east& central. The number of the wards of A.M.C is 35& 90000 households are living in A.M.C areas. The present &first mayor of A.M.C is DR.PRAFULLAJIT SINHA. A.M.C takes different project in hand to make the city clean& green.To do successfully of this project, A.M.C manages solid waste properly in everyday even in morning & evening of a day.The map of the Agartala Municipal council is shown in fig.1

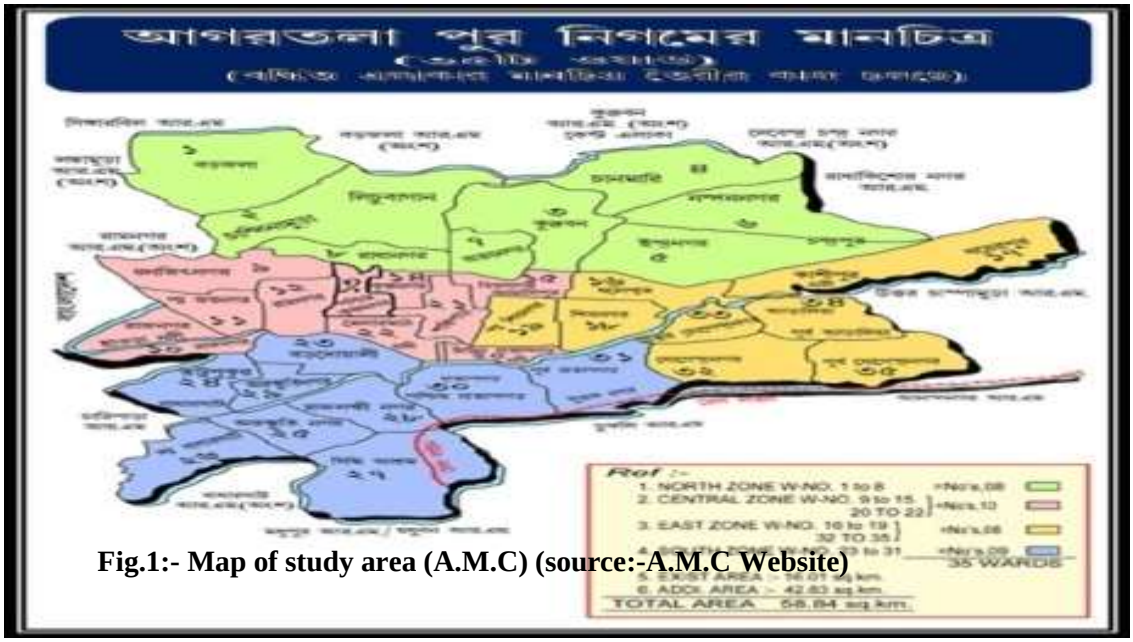

Fig.1:- Map of study area (A.M.C) (source:-A.M.C Website)

Daily, a large quantity of solid waste is generated from different sources in Agartala city. The approximate quantity of solid waste generated from different sources is given in table 1**.**

Table 1: Estimated waste generation of Agartala city (Source: A.M.C Website)

Sources of Solid Waste Generation	Quantity(Tentative)
Waste Generated by household waste/kitchen waste(door to door collection)	20 MT/Days
Waste Generated by vegetable markets ,fish markets, Minds etc	60 MT/Days
Waste Generated by workshop/garages/electronic waste	4.5 MT/Days
Commercial waste(hotels ,shop, Institution)15%	30 MT
Dead animals/carcasses	0.5MT
Waste has thrown on road collected by sweeping	125 MT
Drain silt	10 MT
Total Solid Waste Generation	250 MT/Day

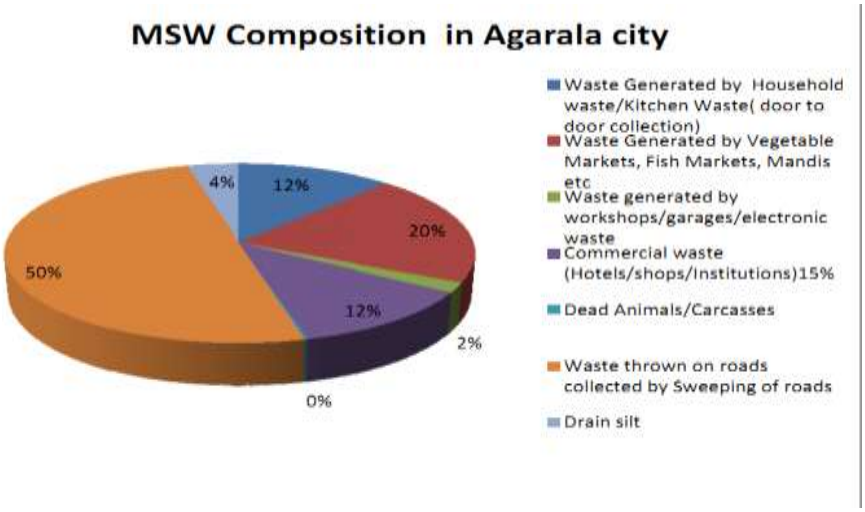

Fig 2: Percentage ratio of waste generation with respect to source,(Source:-A.M.C Website)

From pie chart given in Fig. 2, it is found that, the extend of primary collection of M.S.W in Agartala city is less than secondary collection. The secondary collection system means garbage that's generated on roads by sweeping & cleaning activities. In fact, this garbage is nothing but the same garbage that are thrown by the people on the roads & inside the open drains due to lack of proper & regular collection of primary garbage under A.M.C. Also quantity of solid waste which is liberated from markets, institutions etc comprise of 20% of the total liberated garbage. As, there is no major industries in Agartala city, the quantity of industrial is almost negligible. However the collection and management of e-waste is very poor in Agartala city and mostly it is collected along with the MSW.

METHODOLOGY OF SOLID WASTE MANAGEMENT

The municipal solid waste management system which is studied in the present paper comprised of different

steps of solid waste management. The steps are described in the following sections.

a) Collection: Sometimes, the house garbage & also street garbage which is found in scattered manner here & there for long times, results in the decomposition & generates obnoxious gasses & causing health hazard. So, it must be collected by the appropriate authority at proper way & proper time. Generally solid waste collection process is classified in 2 categories.

i) Primary collection process:in Agartala city, the storage bins or centers are placed at different locations which are used for dumping the solid waste by nearby localities. NGOS are appointed to collect the waste in this storage bin or centers in every day or after 2-3days, even morning or evening of a day, if the locality is overcrowd. It has been reported that, 40% of all municipal solid waste remains uncollected & hence lays garbage in urban areas, which causes choking of the drains & pollution of surface water bodies. Fig 3 shows the primary collection process of Agartala city.

Fig 3: Primary collection process

ii) ***Secondary collection system:*** In this process, the solid waste is directly collected from the places or centers, where these collection containers are placed. Around, 500 numbers of bins or containers are placed at different side &corners of commercial places, market, residential areas in the city. These weights are farther collected by the vehicles to dump or disposal site. As the weights are collected again from the collection point to disposal point, so it is called secondary collection process. Fig 4 shows the secondary collection bins. Here a provision for segregation of biodegradable and non biodegradable waste is made.

Fig 4: secondary collection process.

b)Transportation process: In this process, the collected municipal solid wastes from different storage containers placed at different locations of this city are transported or carried by the vehicles of municipal authority for dumping these wastes at dumping station. In Agartala city, average 50 vehicles move daily,

twice or trice from one place to another place to collect solid waste. From mechanical section of A.M.C, about 280-300 numbers of labors are engaged for shifting the garbage from roadsides, drains& dustbins. But now a days, to heavy De-silting machine with high power suctions are also applied to clean the drains & for transportation also. The vehicles involved in the collection and transportation in Agartala city are described in table 2 and are pictorially presented in fig. 4.

Table 2: Vehicle involved in the complete M.S.W process, (Source:A.M.C website)

Types of vehicles	Number of vehicles
14 Meter Refuge Compactors	3
8 Meter refuge compact power de-silting machines ors	10
Skid steer loaders	4
Powerful de-silting machines	2
Sweeping machines	1
Auto trucks for biomedical waste collection	5
Total	25

(i) Refuse Compactor 8 cum (ii)Refuge compactor 14 cum (iii)Sweeping machine

(iv) Skid steers, loaders v) Auto truck (biomedical waste) (vi) De-silting machine

Fig 4: Various types of vehicles involved in the transportation process

Disposal Process: In this process, the collected garbage's are carried out by vehicles &dumped into low lying areas under scientific process in an environmentally sound manner. The main method of disposal of solid waste in land is a sanitary land filling process. A scientific landfill site is under the construction phase at Debendrachandra Nagar near Agartala city for the disposal of solid waste of the city.

Sanitary Landfill: Sanitary land filling is the most commonly used technique in the solid waste disposal system adopted in developing countries. In this method the solid waste after proper segregation, i.e. after separating the recyclable components as well as the non biodegradable parts are dumped in a scientific manner in well designed land filling stations.

The total sanitary landfill site is divided into a number of cells. To protect the ground water from being contaminated by the leachate percolating from the disposed waste, lining system is required to be provided in each cell of the landfill. Generally HDP liners are used in this purpose.

After each days work primary soil cover is given upon the disposed materials by mechanical means. The materials disposed are degraded by the microorganisms and during the anaerobic degradation gases like methane are produced, which may be used in various purposes.

Provision of material recycling as well as plant for producing manures are also often found to be present in landfill site for producing economically important byproducts.

DISCUSSION

Solid waste management, especially municipal solid waste management, now a day becomes an essential activity of all the city &township authorities due to the increasing load of solid waste imparted due to the rapid urbanization. Thus for the public health as well as for the environmental pollution control, there is the accurate need for adopting scientific management practice of solid waste.

Agartala is as mentioned in the ear lies sections, one of the rapid developing cities of the country &thus proper management of solid waste is an essential part of the city development .In the earlier section &in the table 1, the infrastructure available with Agartala Municipal Council for solid waste management is given .However ,more resources are is required for appropriate management of solid waste, but still the efficiency in the solid waste management in Agartala city ,is quite advantages compacted to many of the recently growing cities of country.

The following key points have been evolved from the study of the municipal solid waste management system of Agartala city:

- Awareness among the general people regarding the adverse impact of solid waste &it's scientific management is quite less& these exists the concept of NIMBY among general people ,which to be rectified using awareness programs & so on.
- However the process of conversion of solid waste management system from manual to mechanical method, but still in many cases the manual method is practiced, specially in the face of secondary &primary collection & segregation at disposal side. This aspect is needed to be rectified.
- Proper segregation of Municipal Solid Waste &facilities for recycling & energy recovery is needed to be implemented in the process of solid waste management.

CONCLUSION

In the paper a brief study of the currently available solid waste management facility of Agartala Municipal Council is made. Also, some important points regarding the management process is incorporated in the paper. This study may be used for further research regarding the solid waste management system of the city &also serves as a useful resource for the solid waste management plan of other developing small towns.

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