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Municipal Solid Waste Management in India with Special Reference to Tirupati Town in Andhra Pradesh

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Abstract:- Protecting natural resources and environment is the basic requirement for a country like India. To address these two issues environmentally sustainable management programs are required. It is necessary to have a sustainable approach to waste management and to integrate strategies that will produce the best practicable option. This is a very challenging task since it involves taking into account economic, technical, regulatory and environmental issues. Rapid urbanisation, high density of population has becoming a challenging task to the municipalities to manage solid waste disposals. Tirupati has a population more than 3,50000 and receives more than 80,000 population per day. Rapid urbanisation is taking place at Tirupati. Our study focuses on the Municipal Solid Waste management of Tirupati town by estimating the per capita generation of solid waste at Tirupati and giving suggestions to convert solid waste in to energy.

I. INTRODUCTION

Protecting natural resources and environment is the basic requirement for a country like India. To address these two issues environmentally sustainable management programs are required. Rapid industrialisation and population explosion in India has led to generate tonnes of municipal solid waste daily. Under the Swatch Bharat mission 80% of the urban population has to be covered for Solid Waste Management (SWM). It was a a good policy of government of India to achieve sustainability in the long run.

Municipal Solid Waste Management involves various activities like collection storage, transfer, and transport, processing and disposal of solid wastes in an environmentally compatible manner adopting principles of economy. Being populated country, problem of solid waste Management is becoming severe day by day.

II. ANALYSIS OF SOLID WASTE MANAGEMENT IN INDIA

Solid waste consists of institutional waste ,food waste from hostels and hotels ,commercial wastes, markets, industrial waste, domestic waste, hospital waste, constructions , Sanitation waste ,etc., These categories are to be addressed properly in MSWM. With increasing urbanisation and increasing population Indian cities are generating MSW eight times more than they did in 1949. The quantity of solid waste generation depends on density of population, living standards of the people , industrial activities, commercial activities around the area. Places with high density of population requires more management of solid waste.

S.No	state	cities	population	solid waste(t/day)	Per capita generated(kg/day)
1.	Andhra Pradesh	32	10,844,917	3946	0.365
2.	Assam	4	848,311	198	0.224
3.	Bihar	17	5278362	1477	0.281
4.	Gujarat	21	8,444,963	3802	0.452
5.	Haryana	12	2,253,254	624	0.275
6.	Himachal Pradesh	1	83.055	37	0.246
7.	Karnataka	21	8,282,499	3116	0.375
8.	Kerala	146	3,106,359	1223	0.394
9.	Madhya Pradesh	23	7,224,834	2287	0317
10	Maharashtra	27	22,726,187	8587	0.376
11.	Manipur	1	197,534	42	0.201
12.	Meghalaya	1	222,368	36	0.155
13.	Mizoram	1	154,243	45	0.294
14.	Orissa	7	1,765,023	645	0.365
15.	Punjab	10	3,207,904	1002	0.313
16.	Rajasthan	14	4,978,302	1767	0.354

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17.	Tamil Nadu	25	10,744,774	5022	0.466
18.	Tripura	1	156,355	32	0.211
19.	U.P	41	14,481,478	5514	0.382
20.	West Bengal	23	13,943,444	4474	0.322
21.	Chandigarh	1	502,092	201	0.398
22.	Delhi	1	8,418,083	4002	0.476
23.	Pondicherry	1	2,03064	61	0.296

Table 1. Solid waste Municipal generation rates in different states in India.
Source: (CPCB,2000).

In the table that the per capita generation of municipal solid waste is very high in the states like Gujarat, Tamil Nadu Delhi. This may be due t to the high growth of population and urbanisation, and high living standards which requires more waste management. The per capita generation rate is low in other states Meghalaya, Assam, Manipur, and Tripura) and cities (Nagpur, Pune and Indore).

III. PRESENT STATUS OF SOLID WASTE MANAGEMENT IN TIRUPATI

Tirupati, the adobe of Lord Sri Venkateswara is approximately 18 square kilo metres. Tirupati has a residential population of around 3,20, 000 people and receives a floating population of around 80,000 per day.

Wastes are generated by hotels hospitals, markets, residential complexes etc., These wastes are collected and stored in community storage bins which are placed in specific place. Wastes are collected almost every day. wastes are collected manually by labourers by using tractors'. Each vehicle collects the wastes from the bins and when full, the wastes are transported to the site of disposal that is Ramapuram.

Ramapuram is 17 kilometres away from Tirupati. This solid waste is disposed at Ramapuram and the dumping yard presents ugly look with heaps of solid waste left rodents and pests.

IV. PRESENT STUDY

Estimating the value of solid waste by compiling the data from different secondary sources and conversion of these solid waste into natural gas by using bio gas plants for domestic as well as for institutions.

V. OBJECTIVES OF THE STUDY

- Estimating the present status of solid waste in Tirupati.
- Converting the solids wastes in to natural gas for domestic as well as for institutional purposes.

VI. SOLID WASTE CHARACTERISTICS

Quantity and quality of municipal solid waste in Tirupatidepends upon various factors depends upon various factors such as floating population , life stiles of the people , living standards and extent of commercial activities etc,.

Studies estimated by Prasad, Kartikeyan on quantity and characteristics of solid waste management generated in Tirupati shows the rate of per capita generation of municipal solid waste was determined as 0.337kg/day.

S.No	Component/Parameter	Value%
1.	Paper	11.62
2.	Plastics'	12.1
3.	Rags	3.58
4.	Metals	0.24
5.	Rubber	0.08
6.	Glass	o.26
7.	Silt, fines and others	4.37
8	Total compostable matter	67.63
9.	Moisture content	54.32
10	Carbon	13.77
11	Nitrogen	0.89
12	Phosphorous	0.576
13	Potassium	0.74

Table 2. Average physical components and chemical characteristics are given in the table
Source. j.Kartikeyan and Prasad(2008)

VII. MUNICIPAL SOLID WASTE DISPOSALS AND TREATMENT

The two leading innovative mechanisms of waste disposal being adopted in India include composing (aerobic composing and vermi composing) and waste- to - energy.

VIII. CONVERTING TO ENERGY

Several studies proved that the Organic content of Municipal Solid waste is much higher in residential areas and hostels of colleges of Tirupati. * Every day we produce lot of domestic solid waste. This can be treated properly by converting domestic waste and hostel waste into cooking gas.

IX. USING BIO-MECHANISATION

Using Bio-mechanisation technology all domestic bio wastes including organic waste water can be treated hygienically. The research wing of BIOTECH has developed different models of prefabricated domestic bio waste treatment plants.

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The space required for an one cum domestic is one is one square metre only. Time required for the installation is 4 hours. The gas generated from the waste of a 5member family is sufficient for 2 hours. cooking every day.

X. TECHNOLOGY

The easily degradable waste materials mixed with organic wastewater from the kitchen is fed into the plant through its inlet chamber. This waste is converted into bio gas and organic fertilizer with the help of special type of anaerobic microbes. The main component of this gas is methane which is a nonconventional source of energy- a very good cooking fuel. Generation of cooking gas at household level helps to overcome fuel crises to a great extent. This also prevents the tendency of throwing the wastes in public places.

XI. COST OF THIS PLANT

The cost of this plant for domestic use is around 12000 Rupees. Kerala government is giving subsidy to the domestic plants. They are giving at the rate of 6250 Rupees. If Tirupati Municipal corporation has given subsidy to encourage this plant, 40 to 50 % of people may afford to pay. Though it is expensive the cost and benefit point of view it is cheaper. Municipality will be relieved from the collection and transportation of solid waste. This may have an adverse effect on employment of class IV people. They can be used in gardening and beautifying Tirupati.

XII. INSTITUTIONAL BIO-GAS PLANT

➢ *Generation of electricity from biogas:*

We find regular waste disposals from institutions like hospitals hostels old age homes hotels etc., where many people are living together. Fuel consumption of these institutions is very high. Hollandia Biotech is keen to educate these institutions about the advantage of using non-conventional energy sources. Most of these institutions rear cattle the during of which can be utilised as feed material to the biogas plant. The biogas generated form wastes will decrease the consumption of cooking fuels. For the effective operation of bio waste treatment plant electricity is quite essential.

➢ *Advantages*

- No need of extra power is required for the operation of the plant.
- The generated power can meet the household requirements.

The cost this plant is around 2,50000 Rupees. If this is installed in Tirumala Tirupati Devastanams Institutions (educational institutions, Hospitals), we can reduce the environmental pollution in Tirupati. S.V.U College of Engineering installed this project for their hostels and they are successful in producing LPG for their requirement.

XIII. CONCLUSION

The involvement of NGOs is necessary to create public awareness and improving efficiency in MSWM. A group of people should take the responsibility of MSWM along with public especially in residential areas. House -to-house collection of MSW should be organised efficiently. Public should be informed timing and scheduling of collection.

Recently Tirupati is designated as one of the smart city. It is a big task to Tirumala Tirupati Devastanam and Tirupati Municipal corporation to manage municipal solid waste in a place like Tirupati and Tirumala where it receives a daily inflow of floating population of 80000 per day. Energy converting methods and vermi composting should be encouraged by the municipalities and TTD with house hold domestic waste, hospital waste, hotel waste hostels waste.

Storage facilities should be maintained properly and proper segregation of wet waste and dry waste will lead to scientific disposal of waste. Proper scientific approaches are available municipal corporations should come forward to adopt modern science and technology in solid waste management.

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