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# Study of Municipal Solid Waste Management at Thanjavur City: Present Practice and Challenges

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***Abstract*** **- Thanjavur is one of the oldest and fast developing cities in Tamilnadu with population of 2.16 lakhs in 2012, registering a growth of 5.3% over the last decade. Due to rapid growth of population in Thanjavur municipal corporation area and changing life styles has resulted in increased waste generation. This city generates about 105 tons of municipal solid waste per day. The present method of practicing for solid waste does not follow any scientific processing techniques and disposal of solid waste. The solid waste collected is being transported to the Srinivasapuram (5km away from the city) disposal site where is being disposed off indiscriminately. This causes health hazards and urban environmental degradation. The present study critically characterizes the composition of solid waste and also provides the measures to deal with this waste in healthy environment so that it must prove a waste is wealth, refuse is resource and trash is cash.**
***Keywords:*** **Solidwaste, Management, Collection, Percapita, Characteristics, Disposal, Goundwater, Contamination**

## I. INTRODUCTION

is city, situated at 315Km towards south from Chennai. This city has grown significantly both in population and density, which has resulted in increase of solid waste generation and keeps tremendous pressure over the municipal authorities in terms of the best solid waste management practices. This city generates about 105 tons municipal solid waste per day. Increasing the amount of solid waste generation, especially Municipal Solid Waste (MSW), is a matter of serious concern especially in urban areas and this problem has worsen due to the improper disposal plans. Urban Local Bodies should be responsible for proper solid waste collection and disposal methods (Aruna et al 2013). The quantity of solid waste produced in the Thanjavur city is mainly consists of residential and commercial area waste products. Disposal of increasing quantities of urban solid waste is a major challenge for Thanjavur Municipal Corporation (TMC). The present method of solid waste disposal in the city has not follow the scientific way of disposal and thereby posing threat to environment and sanitation.

## II. MANAGEMENT OF MUNICIPAL SOLID WASTE IN THANJAVUR CITY

The proper collection, segregation, treatment and disposal of solid waste without causing any harm to the environment are collectively termed as the solid waste management. The management of solid waste involves four steps (Schubeler et al, 1996).

These are:

1. Generation and Composition of Waste
2. Collection of Waste
3. Transportation of Waste
4. Disposal of Waste

### *A. Generation of waste*

The average per capita waste generation in India is 370 grams/day. The per capita waste generation is increasing by about 1.3% per year in India. Generation of MSW has an apparent relation to the population of the city.(Aruna et al 2013).The quantity of MSW generated depends on a number of factors such as food habits, standard of living, degree of commercial activities and seasons. Data on quantity variation and generation are useful in planning for collection and disposal systems (Rajendra Kumar Kaushal, et al, 2011). In Thanjavur, there are 14 zones within which 51 wards are located. The waste generation, facilities available are referred by each zonal office for the convenience of management of municipal solid waste. Table 1 below depicts the zone wise waste generation in tones per day. It is based on the assumption that 240 gram per person per day of MSW generation (Buenrostro et al, 2001).

TABLE I ZONE WISE TOTAL SOLID WASTE GENERATED

| **Zone Number / Name** | **Waste generation (Kg per day)** |
|---|---|
| Zone-1 | 10615 |
| Zone- 2 | 4577 |
| Zone-3 | 4087 |
| Zone- 4 | 11211 |
| Zone-5 | 11059 |
| Zone-6 | 3052 |
| Zone-7 | 8744 |
| Zone-8 | 9498 |
| Zone-9 | 3861 |
| Zone-10 | 10980 |
| Zone-11 | 5316 |
| Zone-12 | 3693 |
| Zone-13 | 3051 |
| Zone-14 | 4217 |

### *B. Composition of Waste*

A typical municipal solid waste comprises of biogradable and non-biodegradable and debris matter as given in Table 2 for Thanjavur city.

TABLE II CLASSIFICATION OF WASTE

| S.No. | Type of waste | %(Ton) |
|---|---|---|
| 1 | Biodegradable | 37.32 |
| 2 | Non-biodegradable/Recyclable | 34.11 |
| 3 | Debris and Silt | 28.57 |

The laboratory results of physical and chemical characteristics of the municipal solid waste (MSW) are depicted in Table 3 and Table 4 respectively.

TABLE III PHYSICAL CHARACTERISTICS OF MSW

| **S.No.** | **Characteristics of waste** | **Value (%)** |
|---|---|---|
| 1 | Fruit /Vegetable waste | 44.88 |
| 2 | Paper | 5.59 |
| 3 | Plastic | 5.79 |
| 4 | Cloth | 0.06 |
| 5 | Wood | 0.89 |
| 6 | Metals | 0.06 |
| 7 | Glass | 0.01 |
| 8 | Leather | 0.05 |
| 9 | Rags | 0.41 |
| 10 | Rubber | 0.02 |
| 11 | Pebbles | 11.45 |
| 12 | Fine Sand | 15.21 |
| 13 | Ash and fine earth | 5.86 |
| 14 | Moisture | 9.72 |
| 15 | Density | 560 $Kg/m^3$ |

TABLE IV CHEMICAL CHARACTERISTICS OF MSW

| S.No. | Characteristics of waste | Value |
|---|---|---|
| 1 | pH | 7.91 |
| 2 | ECE | 3.11 Ms/cm |
| 3 | Organic carbon | 10.45 % |
| 4 | Nitrogen as N | 0.97 % |
| 5 | Phosphorus as $P_2O_5$ | 0.81 % |
| 6 | Calcium as Ca | 0.69 % |
| 7 | Magnesium as Mg | 0.33 % |
| 8 | C:N Ratio | 12.95% |
| 9 | Zinc as Zn | 489 Mg/kg |
| 10 | Iron as Fe | 10820 Mg/kg |
| 11 | Manganese as Mn | 219Mg/kg |
| 12 | Copper as Cu | 158 Mg/kg |
| 13 | Lignin | 8.25 % |
| 14 | Cellulose | 11.37 % |

### *C. Collection of waste*

Collection of MSW is the responsibility of corporations/municipalities. In India most of the urban areas are lacking in MSW storage at the source, significantly. Biodegradable and non-biodegradable wastes are collected in common bins without any segregation, and disposed off at a co mmunity disposal centre. Two types of storage bins are used one is movable bins and another is fixed bins. The fixed bins are more durable but their positions cannot be changed once they have been constructed, while the movable bins are flexible in transportation but lacking in durability (Rajendra Kumar Kaushal, et al, 2011). The collections of waste from various locations in Thanjavur city is given in the Table 5. In addition to the above scheme of waste collection, there is provision of door–to-door collection of waste from approximately 95,000 nos of houses weighing approx 110MT.

TABLE V COLLECTION OF WASTE FROM VARIOUS LOCATIONS

| | | |
|---|---|---|
| 1 | Total existing places from where waste should be collected | Hotel: **497** Beer bar:**252**<br>Slaughter house:**03** Community halls:**49** |
| 2 | Places from where places from where waste is actually collected | Hotel:**221** Beer bar:**103**<br>Slaughter house:**03** Community halls:**40**<br>Vegetable market: **04** Open spot:**165**<br>No of containers placed in city:**431** |

### *D. Transportation of Waste*

Transportation of solid waste in Thanjavur city is done in two shifts. In the first shift that starts at around 5.30 am early in the morning, the workers are allotted for cleaning sweep the streets and collects the waste from small open points and transports the waste by push carts and tricycles to nearest dumper bin or secondary open collection point. The transportation of waste up to dumping site at Srinivasapuram is done through push carts and tricycles are done, but not through decentralized technique. The total length of roads is approx 754 kms out of which 276 kms of tar roads and 35kms of cement road is swept on da ily.The entire Municipal Corporation is divided into 51 wards. Each ward is managed by the sanitary supervisor and sanitary inspectors and is maintained by conservancy staff. The garbage is being transported to the dumping site located in the city. The infrastructure for the transportation of MSW in Thanjavur Municipal Corporation (TMC) is given in Table 6.

TABLE VI SOLID WASTE COLLECTION AND TRANSPORTATION INFRASTRUCTURE WITH TMC

| S.No. | Type of vehicle | No. of Vehicles |
|---|---|---|
| 1 | Auto | 25 |
| 2 | Lorry | 2 |
| 3 | Tractor | 1 |
| 4 | Mini Lorry | 3 |
| 5 | Tipper | 5 |
| 6 | Dumper Placer | 3 |

### *E. Processing and Disposal of MSW*

In Thanjavur the solid waste disposal site Srinivasapuram is in the western side of the city with an average distance of 5km from the city. The waste is dumped at compost yard and processing is done. They are not practicing any scientific processing and disposal of solid waste. The segregation of wet and dry waste is not carried out at the site and contract has been allotted for generation of manure and electricity. In addition to waste management at landfill

site, the landfill site itself needs management as there is no provision of plantation, fencing, water and electricity. Presently it is practicing open crude (Rajput et al, 2009**)** indiscriminate disposal of solid waste.

## III. GROUND WATER CONTAMINATION

In Thanjavur city, ground water is a very essential source for drinking and other domestic purposes. Tube wells are situated nearly 65 to 248 m away from the disposal sites and people of adjacent houses are drinking the water regularly, which is not recommended due to the high probability of ground water contamination. At the dumping site generation of leachate, gas, odour, noise, dust, potential fire hazards etc. are the common environmental problems that cause threats to human health and environment (Ramachandra and Shruthi Bachamanda et al, 2007 & Aruna et al 2013). The Table 7 shows quality of groundwater collected from tube wells near the disposal site and revealed how the quality of water has been adversely affected by leachate percolation.

TABLE VII QUALITY OF GROUND WATER

| S.No. | Year | pH | Electrical conductivity | Total Dissolved solids (mg/lit) | Hardness (mg/lit) | Chlorides (mg/lit) | Zinc (mg/lit) | Copper (mg/lit) | Lead (mg/lit) | Iron (mg/lit) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2011 | 6.78 | 3654 | 2342 | 567 | 456 | 0.416 | 0.056 | 0.024 | 0.154 |
| 2 | 2012 | 7.5 | 2959 | 2098 | 352 | 287 | 0.029 | 0.022 | 0.017 | 0.044 |
| 3 | 2013 | 8.7 | 3568 | 2321 | 368 | 279 | 0.052 | 0.019 | 0.044 | 0.023 |

## IV. CONCLUSION

Solid-waste management (SWM) has so far been the most ignored and least studied area in environmental sanitation. But it is a vital, ongoing and large public service system, which needs to be efficiently provided to the community to maintain aesthetic and public health standards. Municipal agencies will have to plan and execute the system in keeping with the increasing in population. This study revealed that the solid waste disposal methods at Srinivasapuram dumping yard generate many environmental degradation as well as health hazards within the surrounding area. It is observed that present facilities for management of solid waste for Thanjavur city is lacking in to cope with increasing population and increased waste generation. The segregation of waste with respect to biodegradable and non-biodegradable at the site should be improved in order to minimize waste load on compost yard. The existing facilities for collection, segregation and transportation of solid waste should be improved with new techniques. It is also clear that that major impediments to appropriate solid-waste management are deficiencies in awareness, technical knowledge and executing the legal framework for an integrated SWM system.

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