Quantification and Characterization of Solid waste at Suryapet Municipality

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Abstract: Waste needs to be seen as a possible resource rather than as something undesirable and unwanted in order to stop the contaminating of land, water, and air resources as well as the spread of harmful substances. Environmental quality and public health can both be enhanced by properly managing household solid waste. The local inhabitants are primarily in charge of producing and managing traditional habitats, restoring family settings, developing new, more suitable technologies for building clean and healthy domestic environments, and taking care of and protecting domestic surroundings. The present study deals with the pre-planned schedules, in-person interviews, where most of survey participants are familiar with solid waste management (SWM) concepts and procedures. According to the survey's findings the results showed a strong understanding of Quantification and Characterization of Solid waste at Suryapet Municipality.

Keywords: Solid Waste Management, Central Pollution Control Board, Recycle, andMunicipality

1. INTRODUCTION

The process of gathering, regulating, and discarding solid garbage that has been consumed or is no longer required is known as trash management. Inadequate garbage disposal can lead to unsanitary conditions, which can also pollute the environment and threaten human health. Indiais primarily a rural country. Rural areas housed 68.8% of the country's population and 72.4% of its labor force, per the 2011 Census. The Central Pollution Control Board's 2020–21 report states that India produced 1,60,039.9 metric tonnes of waste each day. Additionally, the state of Telangana produced 10, 308 metric tonnes of rubbish daily. The country's population growth, technological improvements, and improved lifestyles of the populace have all led to an increasein the production of solid waste in both urban and rural areas of the country. Rural solid trash is biodegradable by nature, in contrast to urban solid waste, which contains more non- biodegradable components like plastic and packaging. The environment and public health maybe negatively impacted by inappropriate rubbish disposal. Due to the dumpsite's proximity to the villages, people developed cholera, malaria, chest pains, diarrhea, and other illnesses (Va et al., 2019). A significant environmental issue is the gas emissions from decomposing trash, which exacerbate the effect of greenhouse gases and "global warming." (Alam, 2013) Indian population growth makes waste management difficult.

2. DESCRIPTION OF THE STUDY AREA

Suryapet Urban Local Body was established in 1952 as Grade III Municipality, and as a result of population and area growth, this ULB has since been raised to Grade I Municipality. The first municipality in India to apply the MSW 2000 regulations was Suryapet.

The following are the points at glance:

- Total population is 105231 as per 2011 Census.
- Occupies 24 sq km geographical location.
- It is located at 17.14°′′N and 79.62°E.
- There are 466.5 kilometers of roadways in Suryapet town.
- The drainage system of Suryapet town spans 698 kilometers.

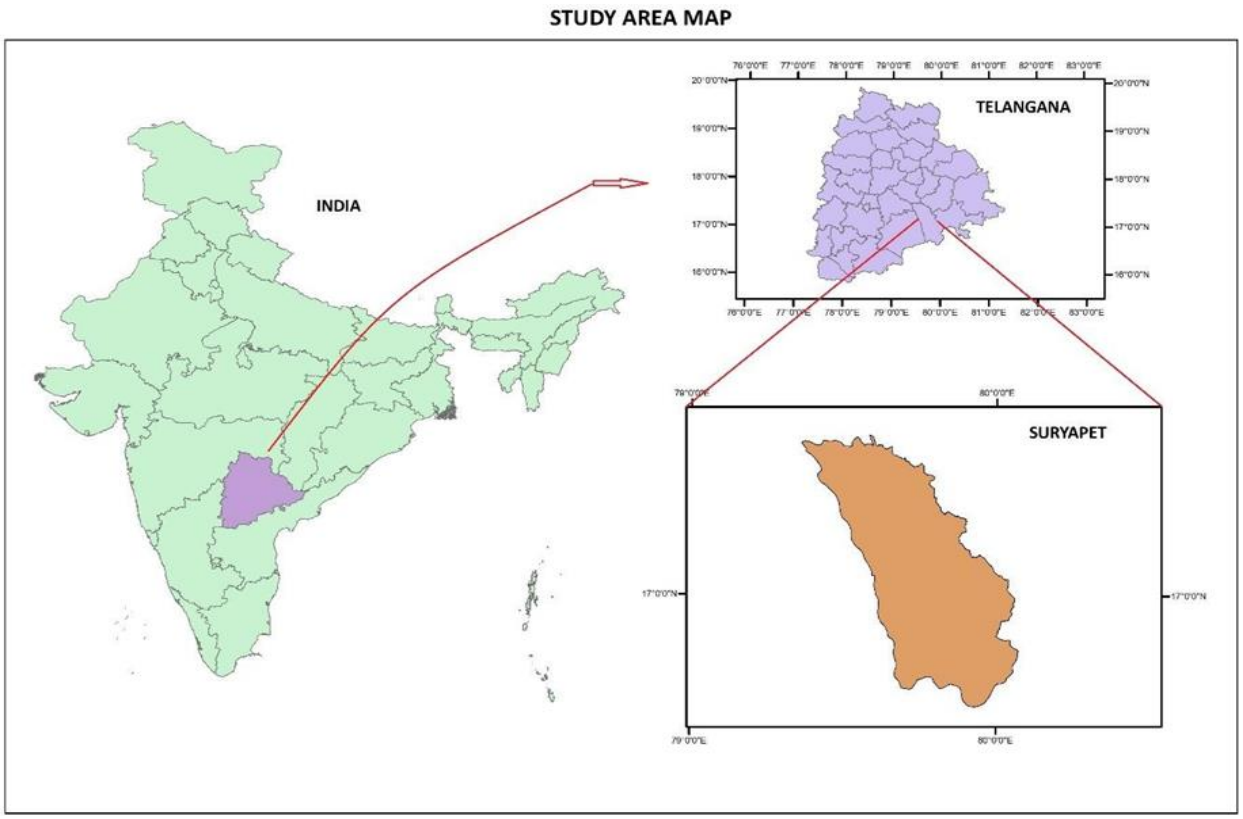

Fig- 1 Study Area

The town of Suryapet has excellent road access. Nalgonda Town, which is around 55 km away,is home to the closest railway station. Hyderabad, which is 150 km away is the closest city. The district has mean daily low temperatures of 17°C and mean daily maximum temperatures of roughly 42°C. Around 71% of the yearly rainfall occurs between June and September, duringthe rainy season. 842 mm of rain fall falls on average in the district each year. The well-known pilgrimage site, Temples Pillalamarri hamlet, is situated approximately 5 km from Suryapet town. The village is well-known in the area because of the Lord Shiva Temple, which draws tourists. Regional Relevance The town of Suryapet is known historically as the "Gate Way of Telangana." 34 election wards are used to partition the town's overall territory for administrative purposes.

Table-1

Particulars of Waste Generation		
S.No	Type of waste Waste Generation per ton	Percentage
1	Domestic source waste generated (in tons) 33.73	51
2	Commercial source waste generated (in tons) 12.71	19
3	Markets 3.4	5
4	Hotels 1.25	2
5	Hospital Waste Generated (non-hazardous) 0.92	1
6	Street Sweeping 5.5	8
7	Drain Silt 8.25	13
8	Total Waste Generated Per Day (in tons) 65.76	100

3. MANAGEMENT OF SOLID WASTE & POSSIBILITIES

According to the Indian Constitution, solid waste management is a state matter, and it is the primary duty of state governments to make sure that suitable solid waste management methodsare implemented in all of the cities and towns in the state. The general responsibility of the Indian government is to develop policy directives and, when needed, offer technical support tothe states and cities. Additionally, it aids in the development of human resources for municipaland state governments, and it serves as a conduit for securing outside funding for solid waste management programs.

SWM is a State subject, but it is primarily a municipal

task, therefore urban local governmentsare directly in charge of carrying out this significant activity. The urban local bodies are likewise expected to carry out this obligation under the 74th amendment to the constitution. The solid waste management system in each of the nation's cities and towns must therefore be planned, designed, operated, and maintained by the urban local bodies.

Municipal Solid Waste Management and Handling Rules, 2016, also list solid waste management as a required duty of urban local bodies, but in reality, SWM is given the lowestpriority and the duties are either not performed at all or are performed insufficiently as a result,the city is forced to deal with numerous issues relating to the environment and sanitation.

The sections that follow include descriptions of the system's main flaws:

Rapidly expanding Service Areas and Waste Quantities

The amount of solid garbage produced in metropolitan areas is growing as a result of populationgrowth and a rise in the rate of waste production per capita. The current SWM system is understress due to growing solid waste volumes and service regions.

Insufficient resources

SWM is given less priority when resources are allocated, which leads to the allocation ofinsufficient cash and human resources due to a lack of skilled people.

Unsuitable Technology

The apparatus and equipment that are currently used in the system are often either general- purpose creations or imports from other industries. As a result, the efficiency is decreased andthe available resources are not fully utilized.

An excessively high cost of labor

Around 90% of all expenses are accounted for by labor, the majority of which is used for collection. The roadsides are littered and there is more trash surrounding the bin than inside because of a lack of civic sensibility. This adds to the workload of the collection team, thereby affecting the cost of collection.

Apathy in Management and Society

The active involvement of the municipal agency and the residents is necessary for SWM to operate effectively. Due to SWM's low social standing, there is a considerable apathy towardsit, as evidenced by the widespread lack of trash collection efforts and the decline in the aestheticand environmental standards at unregulated disposal facilities.

System Efficiency is Low

Unplanned and not run in a scientific manner, the SWM system. Neither the job standards arestated nor is the collection staff's work properly overseen. The cars are not properly maintained, and there is no preventive maintenance routine followed. Due to a lack of funding, vehicles are frequently operated inefficiently since they are used past the end of their useful lives. Additionally, there is no coordination of operations among the system's many components. An ineffective SWM system is the result of all these elements acting together.

For various sources of generation, including residential, commercial, institutional, streetsweeping and drain cleaning, marketplaces, slaughterhouses, function halls, cinema halls, etc., quantification of municipal trash was done. Solid waste composition, characteristics, and volumes are crucial because:

- They give the management system the fundamental information it needs to be planned, developed, and run.
- It is possible to prepare for the future because it is known the composition and quantity oftrash have changed or trended through time.
- It offers guidance on choosing the right technology and equipment.
- It identifies the quantity and kind of material that can be processed, recovered, and recycled.
- The anticipated trends help manufacturers and designers create vehicles and equipment thatwill meet future demands.

On the basis of field surveys, waste sampling, and discussions with the various trash generators and Municipality officials, the waste generation rates have been calculated.

4. STUDY FINDINGS

Waste generation's quantitative analysis is highly influenced by the local economy, way of life, and infrastructure. Different site points for the generation

and collection of municipal solid waste samples that cover a greater population are determined. Depending on the sort of place,such as a slum, market, business, industrial, or residential neighbourhood. There are uniformly placed sampling points throughout the research region. According to the population's economiclevel, such as high, middle, and low-income groups, the sampling points are further divided.

Domestic

To better understand the features of garbage creation at the household level, primary surveys were carried out in the town of Suryapet. The surveys included households from the HIG, MIG,LIG, and EWS income groups. Based on the reconnaissance survey, the general areas to be covered in the survey were defined. 200 homes in the chosen areas provided samples of household garbage for the survey.

Table-2

Select Group	Weight (Kg)	Volume (Lts)
HIG	60	60
MIG	54	60
LIG	52	60
EWS	45	60

Table-3: Households' Total Garbage Generation

Description	Qty/No	UoM
Waste Generated /Household	1.034	kgs/household
Household as per ULB	32207	Number
Per Capita Waste Generation	283.0839	gms/capita/day
Pop as per 2016 (projected)	115073	Number
Waste Generated	32.73	MT /Day

Business

The garbage from commercial establishments, including stores, offices, markets, hotels, schools, temples, hospitals, and others has been included in this category. In the main businessregions, field visits and field assessment surveys were conducted to evaluate the trash produced by these establishments. The amount of waste produced by each shop and disposal methods were also discussed with the shop owners.

Shops/Office/Institutions

The trash produced by businesses, offices, and institutions is dry and largely recyclable. Thesegarbage are disposed of in the streets or put in plastic bins with coverings. According to trade licenses, there are 2470 shops overall in the municipality. Each day, 12.71 MT of garbage areproduced.

Accommodations & Dining

There are 47 hotels, motels, and restaurants in the town overall. Each day, these businesses produce around 1.24 MT of garbage. These locations produce a variety of wastes, including food waste. The wastes are kept in cans or other metal containers.

Vegetable and non-vegetable marketplaces are two different types of markets. There are two significant vegetable markets and nine more markets in Suryapet town. Each day, these businesses produce 3.40 MT of waste in total.

Clinics and Nursing Homes

Biomedical waste and non-bio medical waste are both included in hospital garbage. An outsideorganization that manages biomedical waste stores and collects biomedical trash. The sanitarypersonnel collects all created non-bio medical waste. Currently, 66 hospitals or clinics serve various areas of the city. This produces 0.92 MT of garbage every day. Total garbage generationfor commercial establishments is shown in:

Table 4

S. No	Type of Waste	Total waste generation in tonnes
1	Shops/Malls/Complexes	12.61
2	Markets	3.4
3	Hospital	0.82
4	Hotels	1.15
	Total	17.28

Street sweeping

In the town of Suryapet, there are roughly 466.5 kilometers of roads. Out of this, 18.2 kilometers are designated as major thoroughfares, 336.3 kilometers as internal streets, and 112 kilometers as periphery regions. 5.50 MT of garbage are produced daily overall as a result of street sweeping.

Table 5 provides information on the lengths and frequency of street sweeping.

Frequency of Sweeping	Sweeping length	Waste generated per day	% to Total Waste Generated
Daily	31.8	1.1	20%
Alternative day	43.05	1.41	27.46%
Thrice a week	52.75	1.65	33.64%
Weekly once	30	1.04	18.90%
	149.6	5.2	100

Remove garbage and sand

About 698 km total of drains are present. About 8.35 MT of garbage are produced dailyoverall as a result of drain cleaning.

5.WASTE GENERATION SUMMARY

65.66 tons of garbage are generated on average per day in the municipality. The gross per-capita creation of solid waste amounts to 554 gm/capita/day at current rate. The breakdown of waste generation from various sources is provided in Table 4.5 below, and Figure 4.1 displaysthe percentage of sources of waste generated.

Total Waste Generating

Table-6

S.No	Type of waste	Waste Generation per ton	Percentage
1	Domestic source waste generated (in tons)	33.73	51
2	Commercial source waste generated (in tons)	12.61	19
3	Markets	3.4	5
4	Hotels	1.15	2
5	Hospital Waste Generated (non-hazardous)	0.82	1
6	Street Sweeping	5.4	8
7	Drain Silt	8.15	13
	Total Waste Generated Per Day (in tons)	65.66	100

Collection Efficiency

There are 21 tractors available for the movement of trash. According to the time and trips taken by the vehicles, 65.7 tons of waste—or 99% of the collection efficiency—reach the dumpsite.

The waste quantification calculations for the year 2045 were done using geometric progressionprojections and the results of the per capita survey. Details on quantification, per capita growth,and waste production are shown in the table below.

Trends for the Next Generation

Table-7

S.No	Year	Populatio n by Geometric method	Waste Generation Rate (Kg/c/day)	Total waste for One day (in M.T.)
1	2016	117653	0.534	65.66
2	2017	122590	0.541	68.11
3	2018	123395	0.558	70.64
4	2019	117469	0.576	73.28
5	2020	130514	0.583	74.1
6	2021	132632	0.591	78.84
7	2022	136824	0.598	81.67
8	2023	140093	0.606	84.82
9	2024	143439	0.614	88.68
10	2025	146866	0.622	91.25
11	2026	152375	0.63	94.65
12	2027	154967	0.638	98.18
13	2028	157645	0.647	101.83
14	2029	161411	0.655	105.62
15	2030	163267	0.664	109.56
16	2031	166215	0.672	113.54
17	2032	172257	0.681	117.67
18	2033	177396	0.69	122.36
19	2034	181634	0.699	126.91
20	2035	185973	0.708	131.63
21	2036	190416	0.717	136.52
22	2037	194965	0.726	141.6
23	2038	199623	0.736	146.87
24	2039	204391	0.745	152.33
25	2040	209274	0.755	158
26	2041	214274	0.765	163.88
27	2042	219392	0.775	169.97
28	2043	224633	0.785	176.3
29	2044	230000	0.795	182.86
30	2045	235494	0.805	189.66

Characterization of Waste and Physical Makeup of Waste

The Municipal Solid rubbish (MSW) heap of mixed rubbish is gathered from 10 locations bothinside and outdoors, totaling around 10 kg. The total amount of waste that has been collected is thoroughly mixed, and the sample size is reduced by quartering until it can be handled by one person. The sample that was thus obtained is examined physically.

Calculations were made for the physical characteristics, such as moisture content, density, and the percentage of various components, including paper, plastic, glass, metal, organic matter, sand, dirt, bricks, and stones.

Chemical characteristics like pH, nitrogen, potassium, and phosphorus percentages, as well astotal carbon and the carbon-to-nitrogen ratio, were examined and reflected in the report. The report also assessed and listed the toxic features of the municipal solid waste and its calorific value (in Kcal). Municipal solid trash is typically described as having an organic, recyclables,combustible, and inert materials physical composition. The data is shown in the table below. Waste samples were gathered and examined for these three factors.

Table-8 Waste's physical composition

Item	Item wise Generation %
Organic Waste	51.39
Recyclables	15
Combustible	14.1
Inter Matter	17.4
Total	100

Percentage of waste composition

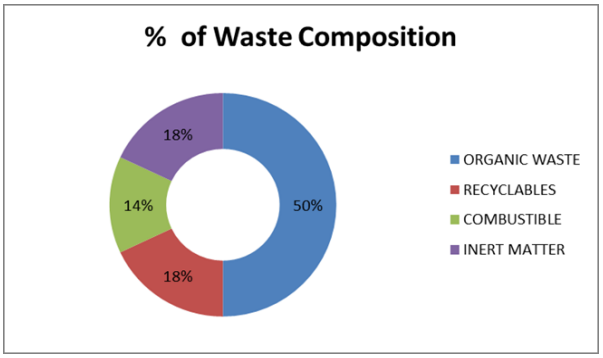

Fig-2

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