



**Commissionerate of College Education  
Hyderabad, Government of Telangana**

**JIGNASA 2020**

**Student Study Project on**

**SOLID WASTE MANAGEMENT  
IN GREATER WARANGAL MUNICIPAL CORPORATION:  
A CASE STUDY**

**Submitted By**

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*Under the Supervision of*

- A. SOMANARSAIAH, Asst. Prof. of Public Admn.**  
**B. MURALIDHAR, Asst. Prof. of Public Admn.**



**DEPARTMENT OF PUBLIC ADMINISTRATION & HRM  
KAKATIYA GOVERNMENT COLLEGE HANAMKOND**



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## DECLARATION

Date: 24/01/2020

We hereby declare that the Student Study Project work entitled **SOLID WASTE MANAGEMENT IN GREATER WARANGAL MUNICIPAL CORPORATION: A CASE STUDY** submitted to Kakatiya Government College, Hanamkonda as part of the partial fulfilments of the requirements towards participating in **JIGNASA 2020**. Equal contribution has been made by each group member in completing the study project placed on record. The end result is of our own work and due acknowledgements are solicited in the references for the sources of information be they printed, electronic, or personal. This is a bonafide record of the original 'project work' done by us under the guidance and supervision of B.SOMANARSAIAH, *Asst. Prof. of Public Admn.* MURALIDHAR, *Asst. Prof. of Public Admn.* This work has not been submitted anywhere else for any other purpose except for the JIGNASA 2020.

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## CERTIFICATE

Date: 24/01/2020

I hereby certify that the Student Study Project entitled **SOLID WASTE MANAGEMENT IN GREATER WARANGAL MUNICIPAL CORPORATION: A CASE STUDY** is a record of the original work submitted by the student researchers namely **S.Tulasi** , B.A. (EPJMC) III Year; **V.Mounika** , B.A. (EPJMC) III Year; **B.Kaveri B.A.** (EPJMC) III Year; **Gulam Sarwar Ali Ansari** , B.A. (HPP) II Year and **L.Saikumar B.A.** (HPP) II Year **B.Rakesh (EPJMC)**, carried out by research under my guidance towards participating in **JIGNASA 2020** which is believed to draw out the inventive talent, inquisitiveness creating an urge for prospective research in the students.

### PROJECT SUPERVISORS

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**PRINCIPAL**

## **ACKNOWLEDGEMENTS**

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We are humbled to thank each and every helping hand extended to us during the course of performing this project work.

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**SOLID WASTE MANAGEMENT IN GREATER WARANGAL  
MUNICIPAL CORPORATION:**

**A CASE STUDY**

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## **1. INTRODUCTION:**

The problem of solid waste has been notified as far back as in the days of the industrial revolution throughout the 1700's and 1800's European and American streets were clogged with waste due to rapid industrialization and urbanization coupled with growth of slums after the world war II the marketing experts set to work trying new tactics to get consumers to buy and stimulate consumption. While the marketing strategy focused to increase purchasing capacity of the consumer with the nature of product being use and throw, animal wastes, and the waste from fuel in homes and industrial furnaces, added to the existing trash. Thus, it is a by-product of the industrialization and urbanization. Solid wastes are all wastes arising from human activities which are discarded as unwanted and useless, is there by mean any garbage, refuse or sludge from a treatment plant or throw away material of a particular nature coming from community activities, especially in urban areas.

### **CONCEPT OF SOLID WASTE MANAGEMENT:**

Solid waste management is defined to include household waste, commercial and market area waste, slaughter house waste, (e.g., from schools, community halls), horticultural waste (from parks and gardens), waste from road sweeping, silt from drainage, and treated biomedical waste. Solid waste management is one of the most essential functions of the local government authorities in India to achieve a sustainable development in the country. Nevertheless, it has also been one of the least prioritized services during the last decades. Solid waste management is major challenge in Urban areas throughout the world. Without an effective and efficient solid waste management programme, the waste generated from various human activities, both industrial and domestic can result health hazards and also have a negative impact on the environment. Understanding waste generated, the availability of resources, and the environmental conditions of a particular society or important in developing and appropriate waste management system.

## **2. STATEMENT OF THE PROBLEM**

The nature and character of solid waste have a direct bearing on the socio-economic status of the population generating it. The huge amount of solid waste being generated in cities has become a major problem not only in developed countries but also in developing too. Current global Municipal solid waste generation levels are approximately 1.3 billion per year, and are expected to increase 2.2 billion tonnes per year by 2025. Municipal solid waste generation rates are

influenced by economic development, the degree of industrialization, public habits, and local climate. Generally, the higher the economic development and rate of urbanisation, the greater amount of solid waste produced. Income level and urbanization are highly correlated and as disposable incomes and living standards increase, consumption of goods and services correspondingly increases, as does the amount of waste generated. Urban residents produce about twice as much waste as their rural counterparts. In South Asia, approximately 70 million tonnes of waste generated per year, with per capita values ranging from 0.12 to 5.1kg per person per day and average of 0.45kg/capita/day. In India presently, no systematic and authentic data on Municipal Solid Waste generation at National level and subsequently at State, District and at city/town level is available. It is to state that quantification of Municipal solid waste and assessing its composition is systematic study with laid down procedure as prescribed in the manual of CPHEEO, MoUD, 2000. Based on the information collected by CPCB from time to time, the reported /estimated waste generation in the country is 1,41,064 tons/day and out of which, 1,27,531 tons/day (90%) is collected and 34,752 tons/day (27%) processed. According to Central Pollution Control Board Report on February 2016 the Telangana state urban areas are generating 6,740 tonnes per day. In this waste 6,369 tonnes solid waste is collected, 3,016 tonnes waste is treated and remaining 3,353 tonnes waste is land filled. As per this report Greater Warangal Municipal Corporation is generating 500 tonnes per day. The lack of proper mechanism and the lack of will on the part of municipal authorities to collect all the waste and dispose of properly are major concern today. Therefore in public interest there should be a universal approach and agreement amongst the government of all the nations for the proper disposal of solid waste **the betterment for of human society**. This study focuses on how the solid waste is being disposed of and to suggest the measures for more effective disposal of solid waste in general and in Warangal Municipal Corporation in particular.

### **SOLID WASTE MANAGEMENT POLICY IN INDIA**

The SWM policy in India specifies the duties and responsibilities for Hygienic waste management for towns and cities in India. This policy was framed in September, 2000 based on March 1999 Report of the committee for SWM in class 1 cities of India to the Supreme Court. Then after manual or sum proposed by CPHEEO, Ministry of Urban Development, 2000. After that honourable National Green Tribunal CPCB drafted an indicative National Action Plan waste on MSW rules, 2000 and posted in website for reference of drawing state action plans. MSW rules, 2000 have been revamped and modified the SWM rules, 2016. The National action plan is also re-drafted accordingly the SWM rule, 2016.



## STATE WISE GENERATION, COLLECTION AND TREATMENT

(February, 2016)

S. No.	States	Generated (TPD)	Collected (TPD)	Treated (TPD)	Landfilled (TPD)
1	Andaman&Nicobar	70	70	05	
2	Andhra Pradesh	4760	4287	3402	
3	Arunachal Pradesh	116	70.5	0	
4	Assam	650	350	0	
5	Bihar	1670	-	-	
6	Chandigarh	370	360	250	
7	Daman Diu & Dadra	85	85	Nil	
8	Delhi	8370	8300	3240	
9	Goa	450	400	182	
10	Gujarat	9988	9882	2644	
11	Haryana	3103	3103	188	
12	Himachal Pradesh	276	207	125	150
13	Jammu & Kashmir	1792	1322	320	375
14	Jharkhand	3570	3570	65	
15	Karnataka	8697	7288	3000	
16	Kerala	1339	655	390	
17	Lakshadweep	21	-	-	
18	Madhya pradesh	6678	4351	-	
19	Maharashtra	22,570	22,570	5,927	
20	Manipur	176	125	-	
21	Meghalaya	208	175	55	122
22	Mizoram	552	276	Nil	
23	Nagaland	344	193	-	
24	Orissa	2374	2167	30	
25	Puducherry	495	485	Nil	
26	Punjab	4105	3853	350	
27	Rajasthan	5037	2491	490	
28	Sikkim	49	49	0.3	
29	Tamilnadu	14,500	14,234	1607	
30	Tripura	415	368	250	
31	Telangana	<b>6740</b>	<b>6369</b>	<b>3016</b>	<b>3353</b>
32	Uttar Pradesh	19180	19180	5197	
33	Uttarakhand	918	918	Nil	
34	West Bengal	9500	8075	851	515
35	Chattisgarh	1896	1704	168	
	<b>Total</b>	<b>1,41,064</b>	<b>1,27,531— 90%</b>	<b>34,752— 27%</b>	<b>4,515</b>

Data of Annual Report 2013-14 and 2014-15 by Central Pollution Control Board

CITIES GENERATING WASTES IN BETWEEN 200 – 1000 TPD

(Illustrated/ Indicative)

S. No.	Cities	Estimated Waste Generation (T/D)
1	Vishakapatnam	350
2	Patna	450
3	Vadodara	1150
4	Hubli-Dharwar	300
5	Kochi	360
6	Thiruvananthapuram	360
7	Indore	850
8	Bhuvaneshwar	600
9	Ludhiana	850
10	Coimbatore	850
11	Madurai	450
12	Allahabad	450
13	Varanasi	500
14	Guntur	250
15	Elluru	200
16	Kakinada	200
17	Kurnool	220
18	Nellore	250
19	Nizamabad	200
20	Rajamandry	300
21	Vijayawada	550
22	Warangal	500
23	Gowhathi	600
24	Dhanbad	180
25	Jamshedpur	300
26	Ranchi	150
27	Bhavanagar	300
28	Jamnagar	320
29	Rajkot	450
30	Faridabad	400
31	Behalgam	200
32	Mysore	350
33	Kunnore	350
34	Kozikode	250
35	Durgh	300

Data of Annual Report 2013-14 and 2014-15 by Central Pollution Control Board

### **3. OBJECTIVES OF THE STUDY:**

1. To analyse the Solid Waste Management Policies 2000 and 2016 in India.
2. To analyse and study the Solid Waste practices in Indian Municipal Corporations in general and Greater Warangal Municipal Corporation - Warangal in particular.
3. To study organisational and management practices to ensure the protection of the environment and to protect the health and well society of people.
4. To study the opportunities for facilitating the effective people participation in Solid Waste Management.
5. To ensure the protection of the environment through effective waste management measure  
Grow the contribution of the waste sector to GDP
6. Increase number of jobs within waste services, recycling and recovery sectors.
7. Private sector capacity mobilized to support waste service delivery and community based Collection models.
8. To implement systematic monitory of key performance indicators by each sphere of Government.
9. Discourage waste generation through cost reflective and volume based tariffs.
10. Promote waste minimization and recycling through education system .
11. To ensure the protection of the environment through effective municipal solid waste management measures.
12. To develop national and local awareness companies on the social importance of waste Management.
13. Increase reuse and recycling rates of products and reduce the percentage of recyclable material to landfill
14. Ensure separation at source in all types municipalities and metropolitan cities
15. Encourage waste to energy options and support the diversion of high calorific waste from landfill to recovery options
16. Promote the regionalisation of waste management services in all municipalities'

### **4. RIVIEW OF LITERATURE:**

According to United Nations Development Programme (1997), the uncollected waste in the urban areas is **the second most important problems** faced by the residents after unemployment. From one- to two- thirds of the solid waste is either not collected or not disposed

off properly, which is lying strewn on the roads, entering into the drain, causing choked sewer and stagnant sewer water on the roads, urban flooding during rains, breeding of insects and rodent vectors and spread of diseases. Thus, the ultimate aim of solid waste management is to include all activities that can minimize impact of solid waste on health, environment and aesthetic.

The organic and biodegradable component of municipal solid waste is important since in densely populated parts the cities, it causes adverse impact on public health and environment quality. Apart from the stray animals and rodent, insects; it also leads to foul odors and unpleasantness. These impacts are not limited and to only garbage disposal site but also garbage generation sites which suffer from accumulated waste. The other constituents of waste including hazardous chemical pollutants and sharps are sources of diseases and injuries especially among children r, rag pickers and employees among waste management sector. The domestic waste from industrial cities consist of a high content of paper plastic, glass. In developing countries the domestic waste contains a proportion of inert materials as sand, ash, dust, and stones in addition to high moisture level. In the scenario of solid waste management, most significant is the problem found at house hold level solid waste generation. In face of unavailability and inaccessibility to municipal bins and waste collection system, most of the households, shops and establishment throw their waste just outside their premises on the streets or any dumping site available nearby. Although, partial segregation of recyclables like paper, plastic glass and metals which formed around 15 to 20% of the solid waste in India is conveniently segregated at source. Another 35 to 55% of waste material is organic waste which can be converted in to compost, living only 30 to 50% as residue going in to the land fill sites.

In India waste material like paper plastic, metal, glass, rubber leather and rags are recycled through private initiative and informal workers. The more dangerous is the practise by rag pickers which collect discarded recyclables from the streets, bins and dump yards, segregate them to be sold to the dealer for a small price for sustaining themselves. These recyclables are dirty and solid with bio- chemicals, bio medical, food waste and excreta from human and animals. Thus, urban India produces 42 metric tonnes of waste annually. Out of this around 4 million metric tonnes are retrieved for recycling while another 4 million tonnes is disposed off in uncontrolled dumps. It is this part which needs special care for its health impact. According to World Bank (2001), Statistics have shown an increase in organic component of waste with per capita rise of income level. Since in India, income levels are low, organic component of waste is

much higher than industrial countries. In this connection the current practices in India for solid waste management through recycling is significant.

The nature and character of solid waste have a direct bearing on the socio-economic status of the population generating it. The huge amount of solid waste being generated in cities has become a major problem not only in developed countries but also in developing too. The inefficiency at part of municipal authorities to collect all the waste and dispose off properly is a major concern today. Therefore in public interest there should be a universal approach and agreement amongst the government of all the nations for the proper disposal of solid waste for the betterment of human society.

Greater Warangal Municipal Corporation is one of the oldest municipalities in Telangana state and declared as Municipal Corporation on August 18, 1994. The city is included in Amrut project and smart city by Central government. The city known for its heritage and in late 2014 was included in the Government of India's proposed HRIDAY (Heritage City Development and Augmentation Yojana) along with 11 other Indian cities. Warangal is the second fastest growing city in Telangana state, after Hyderabad. Warangal City is known for its beautiful lakes, temples and Wildlife. It is very rich in antiques and relics.

## **5. METHODOLOGY:**

The methodology is based on combination of primary and secondary data collection. The structured questionnaire methods, informal discussions and participatory observation methods are to be adopted for the study of Greater Warangal Municipal Corporation area. Primary data collecting distributing questionnaire, the sample size is 200 randomly will be taken for the research. The secondary data collecting from various journals, books, government published manuals, other publications.

## **SOLID WASTE MANAGEMENT IN GREATER WARANGAL MUNICIPAL CORPORATION**

Warangal Municipality is one of the oldest municipalities in India and after Hyderabad second largest Municipal Corporation in newly formed Telangana State (02-06-2014).It was constituted as major municipality in 1344 Fasli. The first election was held on adult franchisees in 1952 under Hyderabad Municipal Town Committee Act, 1951 and a committee was constituted. It was upgraded as Special Grade Municipality in July 1959 and into Selection Grade Municipalities in July 1960 and declared as Municipal Corporation on August 18, 1994. On 19

March 2013, G.O.Ms.No.99 was issued and merged and inclusion of areas covered in the surrounding forty two (42) Gram Panchayats into the limits of Warangal Municipal Corporation. On 28 Jan 2015, G.O. Ms. No. 40 issued and Declared Greater Warangal Municipal Corporation (GWMC).



**Fig 1: Visit to Greater Warangal Municipal Corporation**

## **QUESTIONNAIRE**

- SOLID WASTE MANAGEMENT IN GREATER WARANGAL MUNICIPAL CORPORATION
- A CASE STUDY OF THE STUDENTS FROM THE DEPARTMENT OF PUBLIC ADMINISTRATION AND HRM. **KAKATIYA GOVERNMENT COLLEGE HANAMKONDA ,WGL.**

Dear Respondent,

Good

morning sir/madam

This questionnaire is designed to obtain information on the above study project research title and the questionnaire is for a purely academic purpose. You are

requested to cooperate by responding to the items contained in the questionnaire. Please be assured that all information supplied shall be kept confidential . It would be our privilege to have you as an astute sample of the population on this study project to contribute something constructive for the benefit of the student community at home and abroad in this digital era. Thank you for your cooperation.

## QUESTIONS

1. Age of the respondent? A. under 20    B. 20-30    C. 31-40    D. 41-50    E. 51-60  
F. 61 and above
2. Gender of the respondent?  
A. male    B. Female
3. Education level ?  
A. illiterate    B. Elementary school    C. middle school    D. High school  
E. Intermediate(NO DEGREE)    F. Associate degree(two year degree college)  
G. Bachelors degree    H. masters degree    I. Doctarate degree
4. Have you received any information regarding the environment during your education year (ex: pollution, global warming, water sanitation, solid and wet waste etc...,) ?  
A. YES    B.NO
5. Marital status?  
A. Single    B. married    C. divorce    D. Widowed
6. How many people living in your household ?  
A. 1-2    B.3-4    C.5-6    D. more than 6
7. Are you a resident of greater Warangal city ?  
A. Yes    B. No
8. What percentage of waste producing in your house ?  
A. Less than 30%    B. 30%-50%    c. More than 50%
9. How often do you take out the waste ?  
A. Once in a day    B. Once in two days    C. Once in three days    D. Once in five days.
10. Monthly income?  
A. 5000-10,000    B.11,000-20,000    C.21,000-30,000  
D.31,000-40,000    E. 41,000-50,000    F.51,000-1 Lakh    G. More than one lakh

11. Where do you take the waste ?
- A. Personal containers outside the house    B. Municipal containers within short walking distance    C. Dump it in fields    D. Burn it
12. How often is your waste collected in your street ?
- A. Everyday    B. Once in two days    C. once in three days    D. Once in weekly
13. who collects the waste from home /shop/both?
- A. Local municipal government    B. Negighbourhood group    c. Private group    D. NGOs
14. What is your opinion or the service that you are receiving for collection of waste from your household ?
- A. satisfied    B. Reasonably satisfied    C. Not satisfied at all    D. Do not know
15. Do you pay for the collection of waste from your home /shop?
- A. Yes    B. No (if yes how much amount you are paying?)
16. How do you discard the waste that is no value to your household?
- A. Burn it    B. Leave it on the street    C. Throw it in the river /water  
D. Discard it in the communal containers    E. Bring it to the dump site  
F. Leave it to be collected from the house    G. Do not know
17. How many times per week is your solid waste collected from your house?
- A. Daily    B. Twice a week    C. Once a week    D. Now and then  
E. There is no collection    F. Do not know
18. Who is handling your solid waste?
- A. Father    B. Mother    C. Children    D. Other relatives
19. What is your opinion about the current situation of the disposal of solid waste in your neighbourhood?
- A. I am doing it because everyone else is doing it    B. There will be problems in the end  
C. Nothing is wrong with what I am doing now    D. No opinion /don't know
20. What do you consider the most urgent problem related to the disposal of solid waste in your neighbourhood?
- A. Personal health    B. Pollution of living area and playgrounds for children  
C. Littering of solid waste in the neighbourhood  
D. It will endanger the fish catch    E. Nothing is wrong  
F. no opinion /any other
21. What is your opinion about the current green communal containers in your neighbourhood?
- A. They are too far a way from the house    B. They are too small to contain all solid waste  
C. They produce un pleasant odours    D. They size is sufficient  
E. Noting is wrong with the communal container    F. No opinion
22. What is your opinion about the present size where you dispose your waste?
- A. Any one can throw his waste there    B. Anything can be thrown there



PC. The site produces foul odours  
E. No opinion / don't know

D. Nothing is wrong with the site

23. Would you be willing to separate compostable goods?

A. Yes B. No

24. Do you think that the quality of a society is based on the quality of its solid waste management? A. Yes B. No

25. Do you think that the public's approach towards rag pickers is not cordial?

A. Yes B. No

## 6. ANALYSIS OF DATA :

### Solid Waste Management

Municipal Solid Waste refers to solid waste from houses, streets, and public places, shops, offices, and hospitals. Management of these types of waste is most often the responsibility of municipal or other governmental authorities. Although solid waste from industrial processes is generally not considered municipal waste, it nevertheless needs to be taken into account when dealing with solid waste because it often ends up in MSW stream.

SL. NO		Unit	GWMC
1	Service area	Sq.km	471.7
2	Population served(2001)	Number	688614
3	Population served(2010)	Number	957000
4	Households served(2001)	Number	147073
5	Households served(2010)	Number	191000
6	Waste generated	Tons/Day	403.8
7	Waste collected	Tons/ Day	320
8	Collection efficiency	Percentage	81.2
9	Door to door coverage	Percentage	48.4

10	Extent of Segregation	%	0
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**Waste Generation:**

The waste generated in Greater Warangal Municipal Corporation is estimated to be 360 tons per day (See table 40), which includes the waste from households, street sweeping, hotels and restaurants, markets, commercial establishments and horticulture debris. Typically the domestic waste generation in Indian cities ranges between 0.3-0.6 kg and for Warangal it works out to 480 grams per capita per day. In surrounding 42 villages the total estimated waste generated is 43.8 tons/day, calculated based on the empirical formula for per capita waste generation i.e., waste generated = population \* 0.21 kg. per capita per day. Therefore Greater Warangal generates a waste of 403.8 MT every day at 400 grams per capita per day. Based on the data available from some of the similar Indian cities, the density of waste in Warangal is

assumed to be 0.3 Kg In terms of the composition of waste, it is assumed that 40 percent of the waste generated is bio-degradable and the remaining 60 percent is bio-degradable.

1	Waste Generation –GWMC		Tons /day
2	Waste Generation Households	180	Tons /day
3	Waste Generation by street sweeping	170	Tons /day
4	Waste Generation by hotels and restaurants	1	Tons /day
5	Waste Generation markets	0.9	Tons /day
6	Waste Generation commercial establishments(institutions)	5	Tons /day
7	By other sources (eg, debris, horticulture waste..etc)	3	Tons /day
8	Total Waste Generation in WMC	360	Tons /day

### **Primary collection**

Primary collection is the most essential component of SWM service and in Warangal it comprises door to door collection, street sweeping, collection from bins and open dumping, drain silt etc. While the objective of primary collection of municipal solid waste is to prevent littering

and to facilitate compliance with MSW 2000 rules, organized collection of MSW at household level is being undertaken through door-to-door, house-to-house or community bin service, at regular pre-informed schedules.

### **Street Sweeping:**

The WMC carries out street sweeping on a daily basis. WMC is divided into 20 sanitary circles, for administrative purposes, there are 16 sanitary inspectors and 33 sanitary maistries/safai karmacharis, who are primarily responsible for regular monitoring of sanitation in their respective circles. The Sanitary Inspectors report to Municipal Health Officer, who heads the SWM service in WMC. In addition, 465 workers are deployed by WMC to undertake street sweeping activities and door to door garbage collection.



**Fig 2: Door to Door collection of Dry and Wet Garbage in Municipal vehicles**

### **Door to Door Coverage:**

The total number of households residing within municipal limits of WMC is estimated to be 150000 (2010) and the number of establishments as per municipal records is 11546. Of these,

96000 households and 485 commercial establishments are estimated to be covered by Door to Door Collection every alternate day. The household level coverage of SWM service is only 59.7 percent in WMC. In case of surrounding 42 villages, it is estimated that only 3484 households out of the total 41000 households have door step collection, which is about 7.7 percent. Therefore, the coverage of Door to Door collection in the CDP area (Greater Warangal) is only 48.4 percent.

### **Collection Vehicles and Transportation of waste:**

The garbage from household is collected through tricycles/handcarts and then transferred to community bins/dumper bins. The garbage from community bins/dumper bins across all the wards is collected through tractors/dumper placers and dumped at the dumping yard. Currently, the garbage is being dumped at two designated sites, one at R eddypuram and other at Ammavaripet. The Corporation has one JCB, 16 dumper placers, 26 tractor trailers, 277 tricycles and 3 tippers. The table 41 gives the details of the vehicle capacities and the number of trips made by these collection vehicles each day.

Sl .No	Type of vehicles	No. of vehicles	Capacity	No. of trips
1	Dumper placers	16	3MT	3
2	Tricycles	277	50KG	-
3	Tippers	3	5MT	3
4	Tractors trailers	26	3MT	3
5	Mini tippers	4	1MT	3

Table: Collection vehicles used for transportation of waste in GWMC



A common practice observed in Warangal is that both the household and commercial waste are often dumped in nearby open spaces, which is later collected by tricycles. Even in surrounding 42 villages, the waste is collected through vehicles such as bullock carts, hand driven carts, tractors etc. The hand driven carts are mostly used to collect the waste dumped in open places and gather them at one place. The bullock carts are used to collect the waste from open spaces and dumper bins (about 221 in surrounding 42 villages) and dispose the waste outside the village which is done once in 15-30 days. The tractors (private) are only used in rainy seasons or when the waste is over bundled.

#### **Efficiency of Collection of Municipal Solid Waste:**

Of the total waste of 360 MT generated each day, about 320 MT (91 percent) is being collected and transported to disposal facilities with the help of various solid waste collection vehicles mentioned above. The collection efficiency of solid waste in surrounding villages is understood to be very less as there is no formal mechanism for daily waste collection. A reconnaissance survey undertaken across 10 surrounding villages reveals that waste is commonly dumped at open places and burnt, which is an unacceptable SWM practice prevalent in the surrounding villages of Warangal city.

#### **Segregation of waste:**

Waste segregation practice is not being followed in WMC. The municipal solid waste, which is collected on a daily basis by WMC workers, is being dumped at Rampur open dump yard cum disposal site and also in the low lying areas, and similar is the case with surrounding 42 villages. The waste is neither segregated at source nor at the disposal sites.

**Scientific Disposal:**

The waste collected at household level and from community bins is transported and dumped at Shahimpet disposal site, of area 23 acres and three kilometers from city limits. There is no scientific land fill site constructed and the waste is not disposed in scientific manner.

**Hospital Waste Disposal:**

The Auto Clavable waste is stabilized (1.2Kg/Sq.cm) and is sold to ssssthe private party, authorized by Andhra Pradesh Pollution Control Board, once in a year. The incinerable waste is burnt in two chambers with 50 degree celcius and 100 degree celcius respectively. The left out waste from Autoclavable and Inceinerable waste is disposed scientifically at Sy.No.240, Ammavaripeta Thimmapur , Kothapalli, Warangal.

**Complaint Redressal:**

There is a grievance cell (Written Complaints), Call center and online facilities available for customers to register their complaint. All the complaints are documented and are reported daily to Medical and Health Officer, who orders the respective ward sanitary inspectors who are responsible to attend the complaints and solve the problem. It takes about 3 to 4 days to attend each complaint and rectify it. After the problem is set right signature is taken from the respective HH and people who registered complaints through call centers are given a message. There is no proper maintenance of the number of complaints readdressed in Warangal Municipal Corporation.



### **Cost Recovery of SWM Services:**

The total annual operation and maintenance expenditure for SWM services at WMC is estimated to be Rs. 14.68/- crores. This includes, the staff costs, fuel cost for vehicles, repairs and maintenance costs, contract labour cost, chemical costs etc. There is no mechanism of cost recovery through user charges.

### **Revenue Generation to GWMC through Swatcha Bharath Scheme :**

As a part of National Policy “Swatcha Bharath Programme” is being implemented in GWMC. But the programme has not progressed to the satisfaction citizens. Hence the students from Department of Public Administration, KGC Wgl, decided to propagate this programme to create more awareness about it and responsibility towards it. It has to be encouraged in view of the Revenue generation capacity because an unemployed person can earn 60/- per house per month where in one has to collect garbage from 500-600 households. Under this scheme the people can get loan facility to buy vehicle for garbage collection.

### **Demand Assessment:**

The population of greater Warangal is 9,57,000, and number of households are 1,41,000, only. In the Warangal city the average waste generates 450gm the average households waste generation



is 2.4 Kgs. We need about 1900 tricycles of capacity 250 litres for entire greater Warangal as on date. The number of vehicles may further be reduced with the increase in vehicle capacity.

**Norms for Sanitation Workers:**

The Manual on Solid Waste Management by Ministry of Urban Development and Poverty Alleviation 2000, recommends the following norms, which are compared against the existing staff strength in WMC.

Sl. No.	Designation	Population	Normative Strength	Existing Strength	
	Municipal Health Officer	1000			
	Sanitary Officer	1000			
	Sanitary Inspector	100			
	Sanitary Sub-Inspector	100			
	Sanitary Supervisor	100			
	Sanitary Worker(part time)	100			
	Sanitary worker(street cleaning sweeping)				

**Working Norms for Street Sweepers:**

CPHEEO estimates that a sweeper can cover 30000sqft of open space per day. Sweeping norms in running meters of road are as follows:

- High density area – 300-350 meters
- Medium density area – 500-600 meters
- Low density area – 650-750 meters

Considering the variations in core city and the peri-urban areas of Warangal, an average figure of 600 metres is used to estimate the requirement for Warangal and compare with the current staff. With a total pucca road length of about 1800 km, Greater Warangal needs about 3000 street sweepers.

### **Secondary Storage:**

A waste collector with handcart/tricycle is not expected to walk more than 250 metres and therefore waste containers for secondary storage should be available within a radius of 250m. In high density areas, one container should be placed for every 5000-10000 residents depending upon the size of the container ranging from 3 cu.m. to 7 cu.m. Greater Warangal requires either 95 vehicle containers of 7 cubic meter capacity or about 190 smaller containers of 3 cubic meter capacity.

### **Transfer Stations:**

As it would be uneconomical to transport smaller quantities of waste to landfill sites located at longer distances, it is appropriate to transfer the waste from small vehicles/containers into larger containers trucks so that waste can be transported more effectively over long distances. With an assumption that a large container vehicle with a capacity to carry 15 MT can make five trips from transfer station to disposal site each day, 4-5 transfer stations would be required for Greater Warangal

### **Transportation of Waste:**

If a mechanized system of lifting the containers is used, one driver and one sanitation worker per vehicle per shift should be enough to operate the waste transportation system. one worker should be able to connect the containers to the vehicles and to facilitate the unloading of the vehicle at transfer station or disposal site. Norms prescribe that a tractor may make six to eight trips to the disposal site in one shift if the distance is less than 5km, but it may make fewer trips if the distance if the city is congested.

### **Treatment of Organic Waste:**

Household waste contains about 40-50 percent organic waste. With an estimated 40 percent (150 MT) biodegradable waste in Greater Warangal, MSW 2000 rules mandate improved management and treatment of this fraction of waste before final disposal.

□ Composting is defined as a controlled process involving microbial decomposition of organic matter under aerobic conditions. Biodegradable waste is converted to a soil like substance (compost), which is a valuable soil amendment and fertilizer. Composting schemes vary in terms of scope, technology and management.

□ Anaerobic digestion is a process that produces bio-gas from decomposed waste. The biogas can be used to power electricity generators or to produce heat. The anaerobic digestion process reduces the volume of organic matter from the waste stream, therefore reducing the amount of waste that needs to be put in a landfill or incinerated.

### **Findings of Observations:**

The following issues and challenges in the SWM system are observed in Warangal:

1. Primary collection is grossly inadequate with low levels of household coverage.
2. Partial or negligible segregation of recyclable waste at source.
3. Inappropriate systems of secondary storage of waste.
4. Irregular transport of waste in open vehicles
5. No treatment of waste.
6. Inappropriate disposal of waste at open dumping grounds.
7. Involving local governments in system planning and development and encouraging private sector participation in waste management.
8. Institutional strengthening and human resources development.
9. Effective public participation in segregation of recyclable waste and storage of waste at source.
10. Effectiveness of awareness building or direct community involvement.
11. In sufficient staff of Maintenance.
12. Less Disciplinary action on concerned staff.
13. Inadequate vehicles for dumping and Poor Maintenance of vehicles.
14. Lack of Time, Training and Encouragement.
15. Cost benefits analysis and Inadequate Funds.

## 16. Corruption and lack of Control on Capital Expenditure.

### **Conclusion:**

The problem of solid waste management is due to the rapid industrialization and urbanization. According to UNDP report 1997, the uncollected waste is the second most important problem. In India the population residing in urban areas increased from 18 percent to 31.2 percent from 1961 to 2011 respectively. Solid waste management is one of the obligatory functions of Municipal Corporations in Telangana State. The Municipal Solid Waste (Management and Handling) Rules, 2000 and 2016 lay down the steps to be taken by all the municipal authorities to ensure management of solid waste according to best practice. As per the rules, they must provide the infrastructure and services with regard to collection, storage, segregation, transport, treatment and disposal of MSW. In practice the solid waste is generating high and collecting disposal is low. It requires the ecological awareness and citizen participation to segregate waste at source, door to door collection and disposal in appropriate is imperative.

With the above finding in view, it is clear that waste, litter, garbage leads Greater Warangal Municipal Corporation urbanism line is a gloomy environmental condition. Since most of citizen in the unsanitary areas, almost all of them do not have any access to basic urban service of water supply, sanitation and waste disposal. The unhygienic, foul smell conditions make their life measurable. The study findings suggest that the Greater Warangal Municipal Corporation as a local government authority is failing to be accountable and responsive to local urban concerns.

Waste management is a crucial issue that needs governmental attention immediately, the practices used in this area to generate waste are too dangerous nations for our services but they could be disasters for children.

At present very little awareness exist amongst the stakeholders. It is crucial to educate people and commence them to adjust practices for reduce, reuse and recycle rather than generating crap. Waste generation and waste reductions reflect many careless economic and social factors. No city or town can adopt recommendations in a vacuum each must services its area wastes and the potential for extending waste reduction.

There are many possible ways to implement the general dictum that waste reduction should be the first principle of solid waste management. Humans concern for waste workers must temper the drive to street effectuating. During the period of technical change there are winners and losers and with field of materials recovery there should be attention to there who involved in this regard.

The above discussions, therefore allows to conclude that institutional limitations is a major banner to remove waste in service delivery to the people of GWMC. It demonstrates that a good intervention to create local responsiveness on the part of slum areas is essential. Building capacity of the community through raising awareness, giving training, providing incentives, involving all citizens for the services provision in the GWMC could be instrumental.



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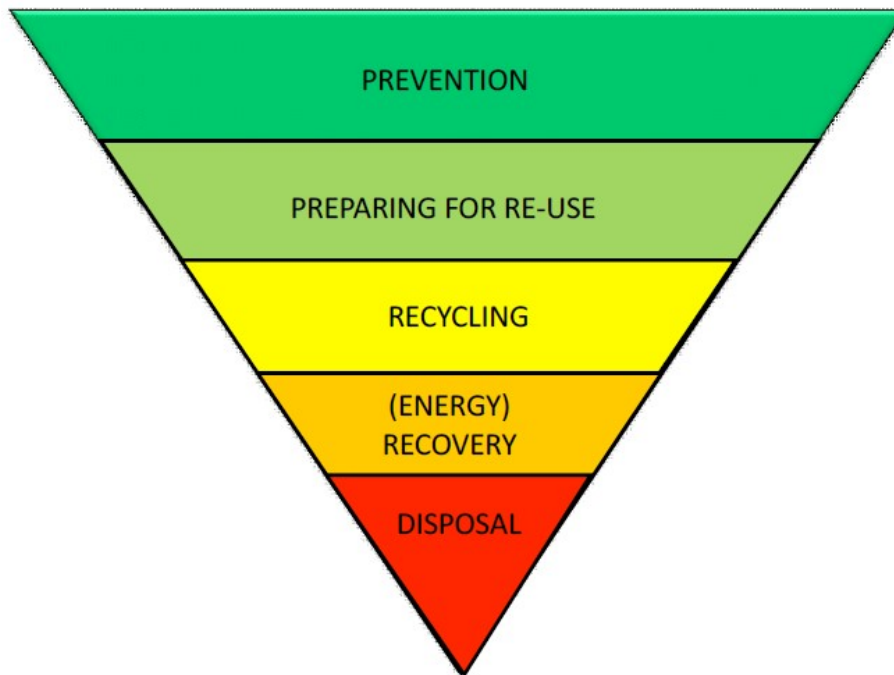
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## **SUGGESTIONS :**

1. Information, Education and Communication ( IEC ) and Public awareness on waste management is an extremely important component for any successful SWM programme in addition proper legislation, technical support and funding. This has also been a key strategy under the Swachh Bharath Mission of Govt of India. This targets the “ Behavioural change communication ”, to ensure the waste management is mainstreamed with general public at large.
2. Identification and orientation of residents welfare committee.
3. Identification and Mobilisation of NGOs or social welfare groups.
4. Orientation of key personalities, social activists and policy makers involvement of professional communicators.
5. Conduct sanitation campaigns.
6. Media campaigning and environmental awareness
  - Information Hotline
  - Use of cable TVs and cable channels
  - Use of Hoardings or Banners
  - Advertisements in news papers
  - Issue of Hand Bills
7. Success stories Communication / Radio /Web based Public grievance system in GWMC

**Figure 3 – Waste hierarchy**



Source: [European Commission](#).

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# THANK YOU

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