

# Study on Solid Waste Management in TKR Educational Society -Hyderabad

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**Abstract:** India being an agricultural country has a present population of approximately 1,405.2 million with 29 states and 7 union territories. The hassle of SWM in India is growing noticeably because of rapid urbanization and population boom. Out of the total waste generated from the industrial, residential, commercial, and agricultural areas a massive amount of waste is generated from residential areas comprising municipal waste. Solid-waste management is the collection, handling, and disposal of solid waste that is thrown away after serving its purpose or becoming unusable. We collected all the information on the solid waste generation rate at the TKR Educational Society. We have studied information on solid waste generation in different months (December, January, and February). TKR Campus. The food waste is 15%, paper waste is 12%, plastic is 13%, concrete waste is 2.17%, vegetable waste is 35%, electric waste is 3.04% and wood waste is 4.3%. The highest percentage of food waste is more. The physio-chemical parameter like moisture content, bulk density, PH value, carbon, nitrogen, and carbon and nitrogen content find in different blocks K9 block, R9 block, boy hostel, pharmacy, and canteen. We find that the mean value of moisture content is 51.2, bulk density is 297.9, PH value is 6.4, Carbon is 52.58, Nitrogen is 6.5, and C/N is 8.

**Keywords:** Solid waste, industrial, residential, commercial, and agricultural

## I. INTRODUCTION

Solid-waste management is the collection, handling, and disposal of solid waste that is thrown away after serving its purpose or becoming unusable. Unsanitary circumstances brought on by improper municipal solid waste disposal can result in environmental contamination and epidemics of vector-borne diseases, which are illnesses spread by rodents and insects. The handling of solid waste involves intricate technical issues. They also present a wide range of management and solution challenges in the areas of administration, economy, and society

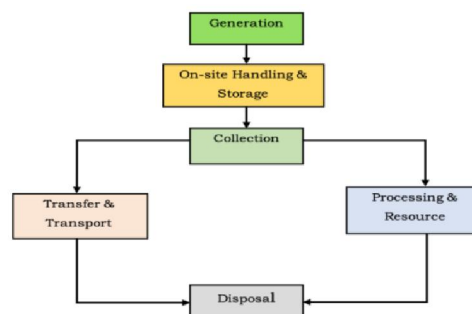


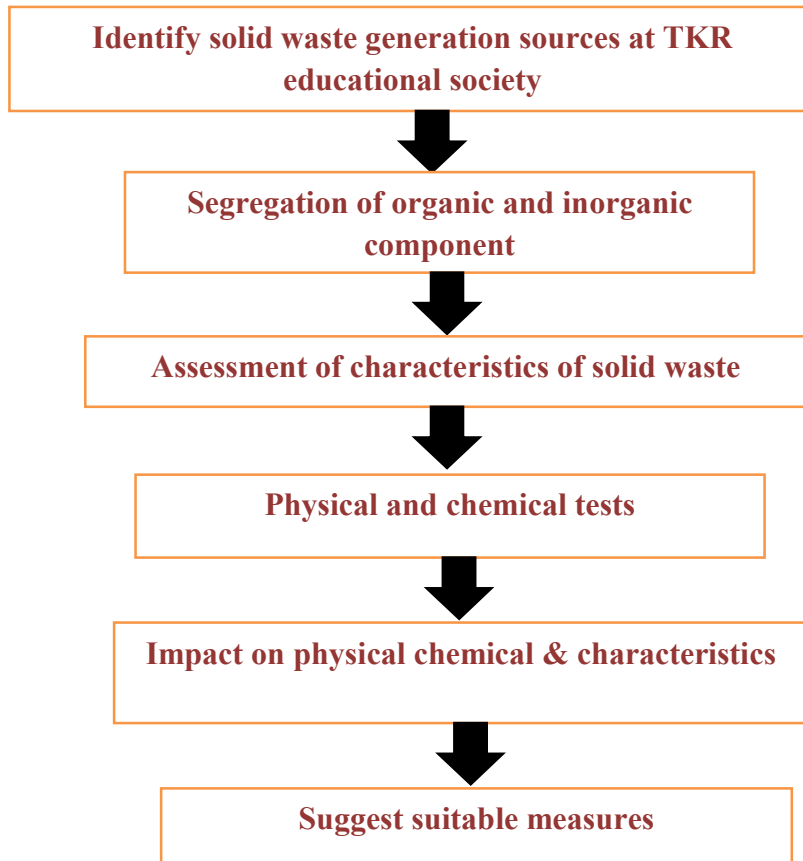
Fig 1.: Solid waste management system

### Objective of the study:

1. To Collect data about solid waste generation sources inside TKR educational campus.
2. To Segregate the organic and inorganic components.
3. To Assess of characteristics of solid waste
4. To present the SWM TKR educational campus.

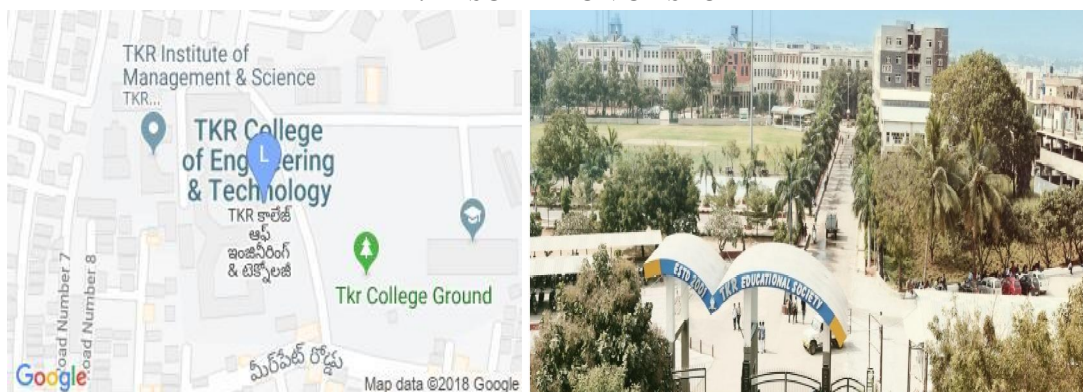
**Methodology**

- Step-1 – Detailed Study on Sources of Solidwaste Generation location inside TKR campus
- Step-2- Assess the quantity of solid waste daily, monthly from jan to mar 2023
- Step-3 Segregation of organic and inorganic components
- Step-4 Analyse the Characteristics of solidwaste as per standard methods
- Step-5 comparison of solid waste generation rate based on working days
- Step-6 Presentation of solidwaste management (SWM) in TKR educational campus. Solid waste management adopted for the study is shown in Fig:3.1



**Fig 2:** Flow Chart of Solid waste management

**II. DESCRIPTION OF STUDY AREA**



**Fig 3:** Location Of TKR Educational Society

**TKR College of Engineering and Technology (TKRCET)** covering more than 20 acres of land. This college is an autonomous college located in Meerpet, near LB Nagar, Hyderabad, Telangana, India. The college is affiliated with Jawaharlal Nehru Technological University (JNTU) in Hyderabad. It received its autonomous status in 2017. TKR College of Engineering and Technology is located amidst the semi-urban locality of Meerpet in southern Hyderabad.

A sample population of 9000 (approximately) people in a 25-acre college campus had been considered. In such a populous community, the generation of large amounts of waste is not surprising. Waste generated here varies from paper, plastic, cloth, and glass to food, construction and sanitary products. Their sources include hostels, offices, mess, canteens, kitchens, staff quarters, dispensaries, and construction sites. In such a scenario, the huge quantity that is generated from all these sources, if not handled properly may pose a serious health and environmental hazard. The TKR educational institute divided into 10 blocks. They are K9 Block Civil Block MBA Block, R9 Block, Pharmacy Block, T-Block, K-Block, Girls hostel, Boys hostel, Canteen. The K9 block mainly divided into north, south, central, civil, T-block, MBA blocks. K9 block have the number labs are 62, staff room are 230, class room are 102, wash room are 18 girls and 18 boys wash room. The R9 campus is divided into a front block, a back block, and a K block. On this campus majority of solid waste comes from the 44 labs, 25 staff rooms, 69 classrooms and 20 washrooms. at pharmacy block. In pharmacy block majority solid waste comes from the 19 labs, 7 staff rooms, 32 class rooms and 6 wash rooms.

**Table 1:** Collection of solid waste generation rate

Campus	block	Total waste generation (in kg)		
		Daily	Weekly	Monthly
K9	Civil block	4	25	108
	MBA	6.5	40	169
	T-block	4.5	28	118
	Central	2.5	15	70
	south	1.25	7.5	33
	North	3.75	23	98
R9	Front	2.5	15	65
	Back	2	13	50
	K	9	54	235
Pharmacy	-	6	40	150
Garden	-	-	-	20
Total	-	42	260.5	1116
Boys hostel		46	355	1450
Girls hostel		57	502	2110
Canteen		50	300	1300

This study was completed in December month, from the table K9 block gives 596 Kg, the R9 block gives 350 kg, the pharmacy block gives 150 kg, and the garden gives 20 kg of solid waste. This study was completed in December month, from the table boys' hostel generated the 1450Kg, the girl's hostel generates 2110 kg, the canteen generates 1300 Kg, and roads & dust bins generated 150 kg in a month

**21. Segregation of Organic and Inorganic Component**

The table represents the solid waste management in college. Table 3.6 shows of daily, weekly and monthly of organic and inorganic waste generated.

**Table 2 Segregation of organic and inorganic waste**

campus	Block	Daily (in kgs)		Weekly (in kgs)		Monthly (in kgs)	
		Organic	Inorganic	Organic	Inorganic	Organic	Inorganic
K9	Civil	1	3	19	6	80	28
	MBA	4.5	2	28	12	118	51
	T- block	4	0.5	24	4	104	14
	Central	2	0.5	12	3	53	17
	South	1	0.25	6	1.5	26	7
	North	3	0.75	18	5	77	21
R9	Front	1.5	1	9	6	40	25
	Back	1.5	0.5	10	3	38	12
	K	5	4	30	24	135	100
Pharmacy	-	4	2	28	12	104	46
Total	-	29.5	12.25	184	76.5	723	3
Boys hostel		42	4	330	25	1350	100
Girls hostel		50	7	450	52	1810	300



Canteen	30	20	300	200	1100	900
Roads & dust bins	2	3	14	16	55	95
Total	124	34	1094	293	4315	1395
Boys hostel	42	4	330	25	1350	100
Girls hostel	50	7	450	52	1810	300

The above table gives information about the segregation of organic and inorganic solid waste generation at the different campuses. From all educational areas organic solid waste generation is 29.5Kgs/day, inorganic solid waste generation is 12.25Kg/day

**Table 3:** Solid waste at different geographical areas in the campus

variable	Class room	Labs	Staff room	Wash room	Hostel	Road side	canteen	garden	total	%
	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	
plastic	1.5	0.25	0.5	0.25	15	0.75	10	-	28.25	12.29
Food	-	-	-	-	30	-	5	-	35	15.23
Concrete	-	5	-	-	-	-	-	-	5	2.17
Vegetable	-	-	-	-	60	-	20	-	80	34.8
Metal	-	2	-	-	4	-	-	-	6	2.61
Wood	-	10	-	-	-	-	-	-	10	4.3
Electrical waste	-	2	-	-	5	-	-	-	7	3.04
Garden waste	-	-	-	-	-	-	-	30	30	13.05
Paper waste	10	5	3	-	5	1.5	4	-	28.5	12.4
Total	11.5	24.2	3.5	0.25	119	1.5	39	30	229.75	

**Table 4:** Percentage composition of waste during from December to February

Category	Dec(kgs)	Jan(kgs)	Feb(kgs)	Overall	Percentage(%)
Plastic	200	100	140	146.6	8.98
Food	1000	1500	1550	1550	33.72
Concrete	90	50	63	67.66	4.14

<b>Vegetable</b>	1050	500	650	733.3	44.96
<b>metals</b>	40	25	27	30.6	1.87
<b>wood</b>	30	20	24	24.66	1.51
<b>Electricalwaste</b>	8.6	5.7	7	7.1	0.43
<b>Garden waste</b>	30	30	30	30	1.83
<b>Paper waste</b>	50	33.3	40	41.1	2.51
<b>Total</b>	2098.6	1264	1531	1631	-

After the collect of waste separate in sampling the test by weight machine

% Composition of waste fraction =  $(W_f/W_t) * 100$

% Composition of recyclable waste =  $(W_r/W_t) * 100$

% Moisture content on solid waste generated =  $(w_1/w_2) * 100$

Where,  $W_f$  = Weight of each waste fraction.  $W_t$  = Total weight of solid waste generated.  $W_1$  = The weight OF dry waste content.  $W_2$  = The weight of wet waste content

**Table 5:** Compostable and non-compostable percentage of solid waste

Item	Dec (kg)	Jan (kg)	Feb (kg)	Overall (kg)
Compostable	1760	1083.3	1294	1377.575
Non- Compostable	298.6	180.7	214	235.32

**Table 6:** Physio - chemical parameters of solid waste in December month

PARAMETERS	K9	R9	BOYS HOSTEL	GIRLS HOSTEL	PHARMACY	CANTEEN	MEAN
Moisture content	48.7	50.5	50.6	52.4	53.6	51.4	51.2
bulk density	295.3	297.6	297.8	298.4	300.2	298.2	297.9
PH value	6.5	6.4	6.3	6.8	6	6.5	6.4
Carbon	50.2	52.9	52.2	53.9	55.0	51.3	52.58
Nitrogen	6.3	6.5	6.5	6.3	6.5	6.9	6.5
C/N ratio	7.9	7.9	8.0	7.9	8.2	8.1	8

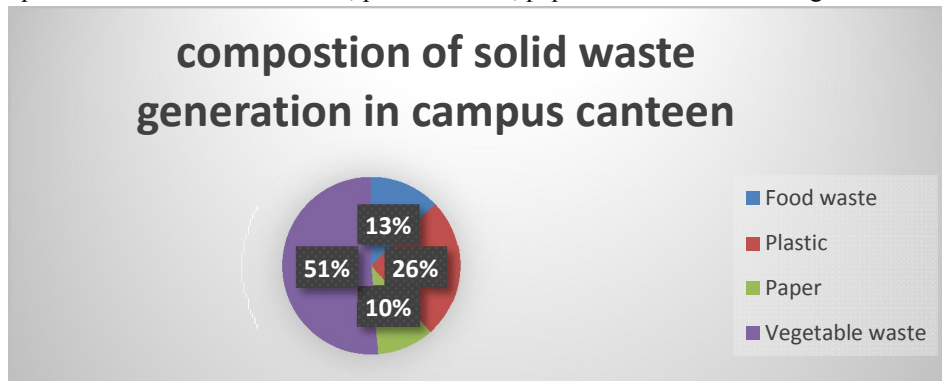
The physio-chemical parameter like moisture content, bulk density, PH value, carbon, nitrogen, and carbon and nitrogen content find in different blocks K9 block, R9 block, boy hostel, pharmacy, and canteen. We find that the mean value of moisture content is 51.2, bulk density is 297.9, PH value is 6.4, Carbon is 52.58, Nitrogen is 6.5, and C/N is 8.

### III. RESULT AND DISCUSSION

Waste generation rates from mess activities, 103kg from hostel and 46 kg from canteen and on regular street dust bin 5kg/day. which contribute to the total 246 kg solid waste per day and garden waste generated is 50 kg. shown in Table 13. Waste generated in TKR educational society.

waste generation from various places in campus to done like canteen, blocks, hostels, garden and road and dust bin of collection. The solid waste generated from the canteen is 19%, block is 17%, hostels is 42%, garden is 20% and road and dust bin are 2%. the highest solid waste generated at hostel because the food waste and vegetables waste will be

more and least is provided at road and dust bin The waste like food waste, plastic, paper and vegetable waste. The composition solid waste generated in campus canteen food waste is 13%, plastic is 26%, paper waste is 10% and vegetable waste is 51%. The waste like food waste, plastic, paper and vegetable waste. The composition solid waste generated in campus canteen food waste is 13%, plastic is 26%, paper waste is 10% and vegetable waste is 51%.



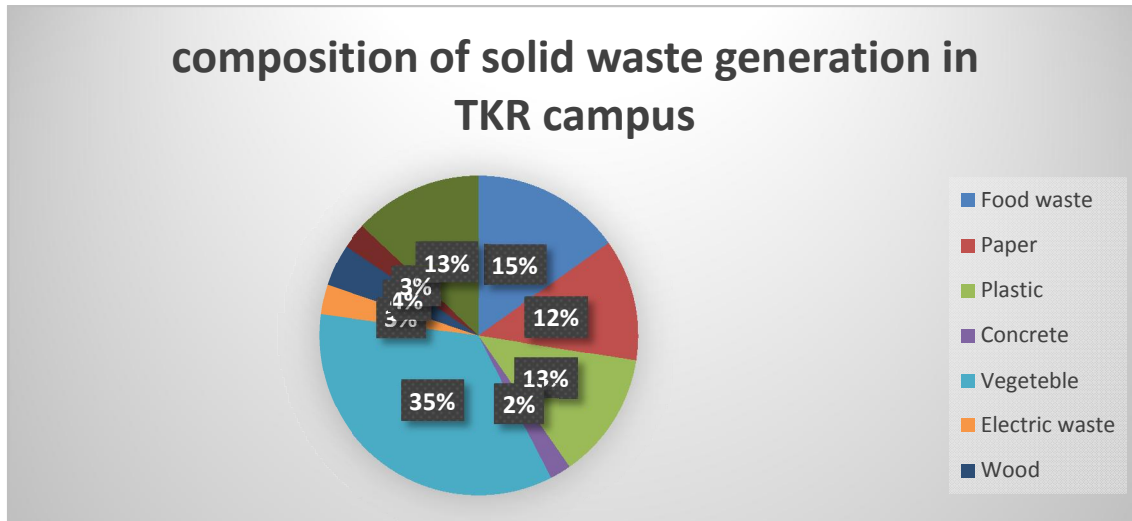
**FIG 4** Composition of solid waste generation in campus canteen

Solid waste generation in hostels of college. The solid waste like food waste, paper, plastic, metal and electric waste .it should in percentage food waste is 26%, paper waste is 4%, plastic waste is 13%,metal is 3.36% and electric waste is 4%. The high percentage waste generated in food waste and least percentage waste generated is metal

**TABLE 7:** Composition of Solid Waste Generated in TKR Campus

S.no	Types of waste	Wt. of Samples	Percentage
1	Food waste	35	15.23
2	Paper	28.25	12.4
3	Plastic	28.5	12.9
4	Concrete	5	2.17
5	Vegetable	80	34.8
6	Electric waste	7	3.04
7	Garden	30	13.05
8	Wood	10	4.3
9	Metal	6	2.61
10	TOTAL	229.75	-

Figure 5, represent that composition of solid waste generation in TKR Campus. The food waste is 15%,paper waste is 12%,plastic is 13%,concrete waste is 2.17%,vegetable waste is 35%,electric waste is 3.04% and wood waste is 4.3%.the highest percentage of food waste is more.



**Fig 5:** Composition of solid waste generation in TKR campus

#### IV. CONCLUSION

In this paper, an in-depth study of the waste management at a college campus has enabled us to obtain a clear picture of the magnitude of waste generation, present management techniques and the methods that can be employed to tackle the problem of waste. The raw data obtained can be effectively used to devise better solutions that are economically, socially and environmentally viable. The study has opened the eyes to alternative management techniques which are already suggested above. This paper serves as a base with which waste management practice can be emulated elsewhere. The solid waste management in TKR Campus appears to be adequate and graded. The solid waste has to be disposed of scientifically through sanitary landfill and recyclable portion of the waste should be salvaged. Segregation of recyclable material would also leads to reduction in quantity of solid waste for final disposal. A system approach needs to be adopted for optimizing the entire operation of SWM encompassing segregation at source, timely and proper collection, transportation and segregation. More emphasis needs to be laid on segregation and collection of waste at doorstep from employee residences and hostels. Segregation of recyclable material from mixed waste not only is Tedious but also wasteful, therefore the residents should be sensitized towards the importance of segregation of wastes at source. Rather than considering the solid waste simply as residue to be thrown away, it should be recognized as resource materials for the production of energy, compost and fuel depending upon the techno-economic viability, local condition and sustainability of the project on long term basis. A better management for recyclable and biodegradable waste utilization provides the facility to reduce the waste disposal up to 60-70 % of the total waste dispose at present

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