

Net Zero Solid Waste Management-A Case of Sanga Reddy Municipality

Mrs. K. Praveena¹ and Mrs. B. Mrunmayi Dhawad²

^{1,2}*School of planning and Architecture, Jawaharlal Nehru Architecture and Fine Arts University, Hyderabad.*
E-mail: ¹*praveenareddy.k.ce@gmail.com*, ²*mrunmayi.157@gmail.com*

Abstract—Solid waste management is an obligatory function of Urban Local Bodies (ULBs) in India. However, this service is poorly performed resulting in problems of health, sanitation and environmental degradation. With over 3.6% annual growth in urban population and the rapid pace of urbanization, the situation is becoming more and more critical with the passage of time. Recycling Council of British Columbia defines “Zero Waste” as goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles. Lack of political will, inadequate financial resources, institutional weakness, improper choice of technology and public apathy towards solid waste management have made this service far from satisfactory.

Unless concerted efforts are made to improve the flow of resources to solid waste management and build up systems which incorporate the basic requirements of a proper waste management practice, the problem of urban waste will be further intensified and cause environmental health problems.

Localities of the urban poor and slums pose are great challenge to deal with, lack of sanitation practices results in creating unhealthy conditions. A survey by the CPCB on the status of municipal solid waste management reported indiscriminate dumping on open lands. This dumping of debris on open land is one of the major reasons for underground water pollution. Designed sanitary landfills to prevent contamination of ground water, stench, and other forms of environmental hazards are largely absent.

1. GRAVITY OF SITUATION

India produces about 42 million tons of urban solid waste annually. The current municipal solid waste generation is estimated to be approximately 0.4 kilograms per person per day. Waste generation ranges from 0.2 kilograms to 0.6 kilograms per capita per day in cities ranging from 1 lakh to more than 50 lakh population. The Central Pollution Control Board (CPCB) has estimated that 5000 urban areas in India generate more than 1 lakh tons per day (TPD) of which 20-50% remains uncollected. It is estimated that the ULBs spend about Rs 500-1,500/ton on waste collection, transport, treatment, and disposal, most of it on collection and transport and very little on disposal and treatment and; 75 to 80% of this expenditure is on staff salaries. In spite of this, collection efficiencies range from 50 to 90% of the waste generated. Localities of the urban poor and slums are likely to be the ones

most neglected, exposing the residents to extreme squalor, made unbearable especially when it rains.

2. NET ZERO WASTE

The concept of Zero Waste aims to minimize use of resources and maximize the ongoing benefits of the intrinsic value within the waste generated by society. The hard truth is, probably not. Here’s why: Even as you do your best to reduce your waste and reuse, recycle and compost as much as possible, the waste you see in your trash can is only a fraction of the problem—1/87th to be exact. For every can of garbage at the curb, there are 87 cans worth of materials that come from the extraction industries—such as timber, agricultural, mining and petroleum—that manufacture natural resources into finished products.

Zero waste is a philosophy that encourages the redesign of resource life cycles so that all products are reused. No trash is sent to landfills and incinerators. Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste will eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health.

- **Reduce** - reduce generation of waste at the source
- **Reuse** - maximize recovery of materials for reuse
- **Recycle** - maximize recycling of discarded material

The concept of the “zero waste city” includes a 100 per cent recycling rate and recovery of all resources from waste materials.

3. PROCESS OF ZERO WASTE

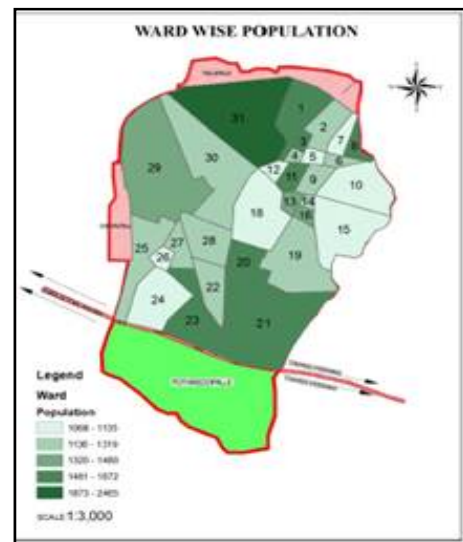
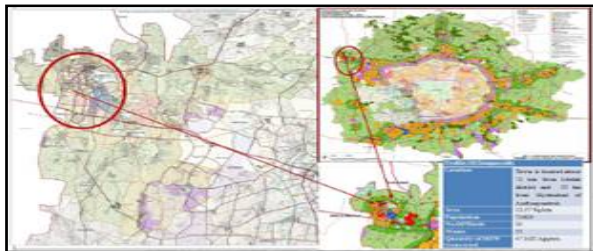
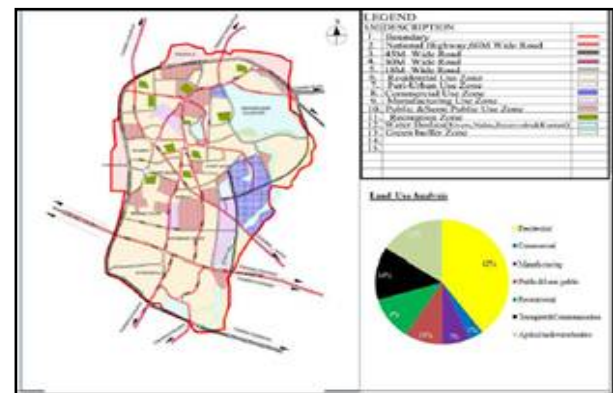
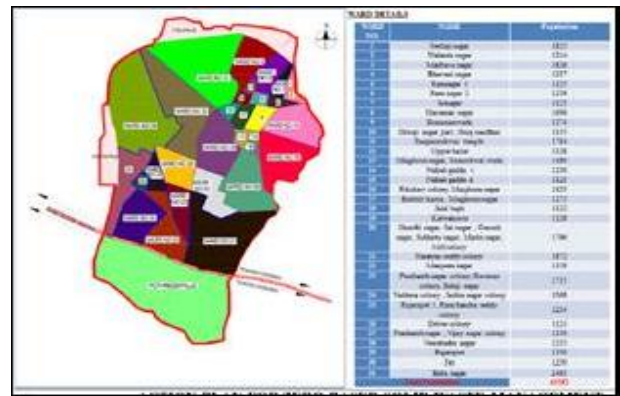
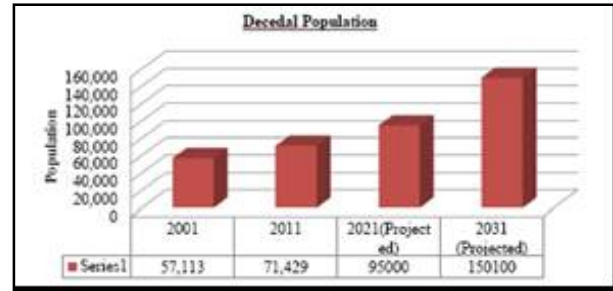
Zero Waste represents an aspiration to minimize use of resources in manufacture and distribution, minimize consumption by society and maximize the capture, reuse, recycling, and recovery of the intrinsic value within the waste generated by society. Conservation of resources and environmental protection are the two fundamental objectives of Zero Waste.

- Zero Waste Generation focuses on the conservation of valuable resources
- Zero Waste Disposal focuses on the protection of public health, environment, and local system.

4. SANGA REDDY MUNICIPALITY:

1.	Name of the Municipality	Sangareddy
2.	Year of establishment	1954
3.	Extent (in sq. kms.)	13.67
4.	Population as per 2011 census	71,426
5.	Projected population as on date(year to be specified)	95000(By 2021)

Sangareddy or Sangareddy earlier known as Sangareddypeta) is the district headquarters of Medak district in the state of Andhra Pradesh in India. It is about 72 km from Medak and 55 km from Hyderabad and is located on Hyderabad—Mumbai Highway (NH9). Manjira Wildlife and Bird Sanctuary situated with an area of 20 square kilometres is nearby. This is the biggest town in Medak district. This is the nearest district headquarters to the capital of the state, Hyderabad. It has got its name by the ruler Sanga, who is the son of Rani Shankaramba, ruler of Medak during the period of Nizams.



Solid Waste Management Indicators:

Sr.no.	Indicators	Benchmark	Sangareddy
1.	House hold Coverage	100%	51.9
2.	Efficiency of collection of MSW	100%	92.7
3.	Extent Of Segregation	100%	0.0
4.	Extent Of MSW recovered	80%	0.0
5.	Extent Of Scientific disposal	100%	0.0
6.	Efficiency in redressal of Customer complaint	80%	74.5
7.	Cost recovery	100%	0.0
8.	Efficiency in collection of charges	90%	0.0

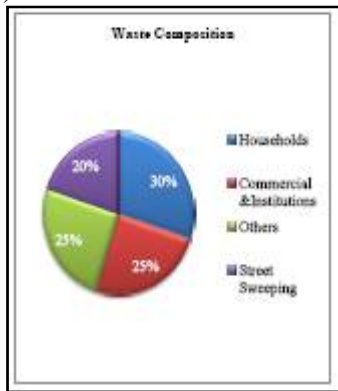
Current Practices:

For any solid waste management projects the following aspects should be studied and analysed:

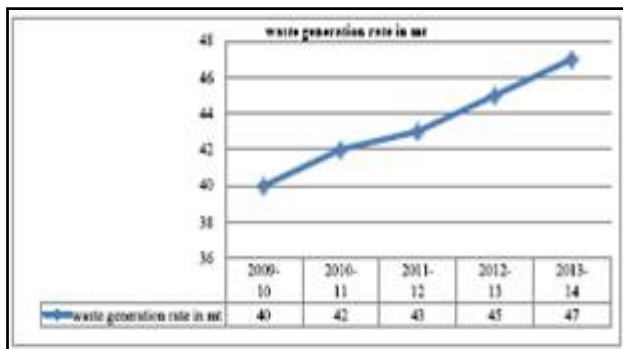
- Existing waste generation
- Waste composition
- Major Generation/Litter Points
- Waste collected, waste segregated and waste recycled
- Existing areas and population covered and not covered under waste collection system
- Waste transportation system
- Waste Treatment and Final Disposal
- Gap between existing system available and current as well as future projected demand should be identified

WASTE COMPOSTION

- Waste Generated by Households -14.1 MTPD
- Waste Generated by Street Sweeping -9.4TPD
- Waste Generated by Other sources -11.75MTPD
- Waste Generated by Commercial Establishments (eg. Institutions, etc) -11.75 MTPD



Inference: Generation of waste indicates with a percentage of 14% of Households, which have prominence compared to other waste generation.



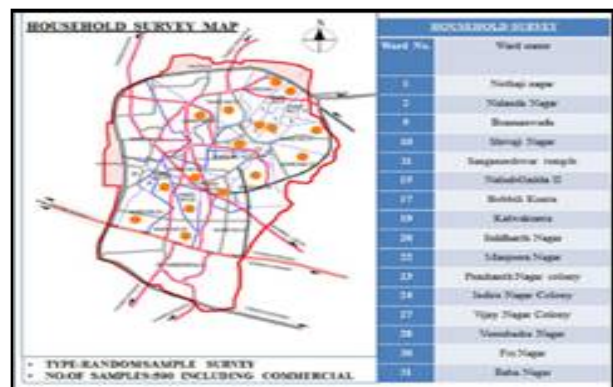
Inference: Household waste generation indicates more prominence with a percentage of 30%, commercial & Institutions have 25%. others share the equal percentage.



Inference: Waste generation in sangareddy municipality has increased from 2009-2014 with a rate of 40mt-47mt, indicates drastic change.

Operational Flow

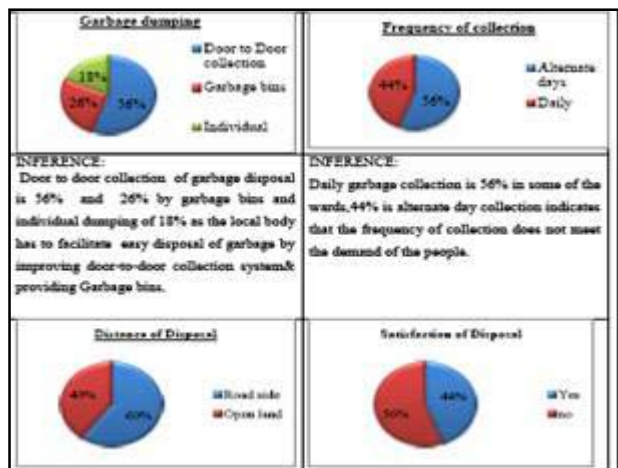
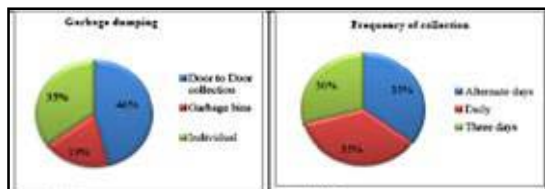
- By 10 am: DTDC using tractors with trailers. On entering each lane at a pre-set time, the tractor driver blows a whistle to inform the residents to hand over their dustbins to the municipal staff.
- 10 am to 12 noon: Collection of waste from shops, business establishments and hospitals.
- 2 pm to 5 pm: Lifting of drainage silt and collection of waste from meat shops.
- Waste is transported by tractors to a Dumping yard.
- Sweeping of main roads is done at night.



House hold survey analysis:



Slum Survey Analysis



Commercial Survey analysis

5. PROPOSED STRATEGIES

MSW Guidelines

The Municipal Solid Wastes (Management and Handling) Rules, 2000.

• Central Government notified in exercise of the Powers conferred by Section 3, 6 and 25 of the Environment (Protection) Act, 1986 with the objective of regulating the management and handling of the Municipal Solid Wastes.

Applicability

• Apply to all municipal authorities responsible for collection, segregation, storage, transportation processing and disposal of municipal solid wastes.

Responsibility of Municipal Authority

• Every municipal authority shall, within the territorial area of the municipality, be responsible for the implementation of the provisions of these rules, and for any infrastructure development for collection, storage, segregation, transportation, processing and disposal of municipal solid wastes.

• The municipal authority or an operator of a facility shall make an application in Form-I, for grant of authorization for setting up waste processing and disposal facility including landfills from the State Board or the Committee in order to

comply with the implementation programme laid down in **Schedule-I.**

- Municipal authority shall comply with these rules as per the implementation schedule laid down in **Schedule-I.**
- The municipal authority shall furnish its annual report in Form-II.

Sr. No.	Description	Quantity/Day(Kgs)
1	Compost	24440
2	Paper	2350
3	Paper Plastic	3247
4	Metal	5170
5	Glass	509
6	Total Recyclable	11276
7	Non Recyclable	13164

- To the Secretary-incharge of the Department of Urban Development of the concerned State or as the case may be of the Union Territory, in case of a metropolitan city;
- To the District Magistrate or the Deputy Commissioner concerned in case of all other town and cities, with a copy to the State Board or the Committee on or before the 30th day of June every year.

Schedule-I

S. No.	Compliance Criteria	Schedule
1.	Setting up of waste processing and disposal facilities	By 31.12.2002 or earlier
2.	Monitoring the performance of waste processing and disposal facilities	Once in six months
3.	Improvement of existing landfill sites as per provisions of these rules	By 31.12.2002 or earlier
4.	Identification of landfill sites for future use and making site(s) ready for operation	By 31.12.2002 or earlier

Municipal solid waste generated in a city or a town, shall be managed and handled in accordance with the compliance criteria and the procedure laid down in **Schedule-II**

• The waste processing and disposal facilities to be set up by the municipal authority on their own or through an operator of a facility shall meet the specifications and standards as specified in **Schedule-III and Schedule-IV.**

Schedule-II

- Collection of Municipal Solid Wastes
- Segregation of Municipal Solid Waste
- Storage of Municipal Solid Wastes
- Transportation of Municipal Solid Wastes
- Processing of Municipal Solid Wastes
- Disposal of Municipal Solid Wastes

Schedule-III

- Site Selection
- Facilities at the Site
- Specification for land filling
- Pollution prevention
- Water Quality Monitoring
- Ambient Air Quality Monitoring
- Plantation at Landfill Site

Closure of Landfill Site and Post-care • Special provisions for hilly areas

Segregation of Municipal Solid waste-47MT

Inference: Segregation of waste indicates with 80% of composting, second 10% of paper plastic and other occupiers of 8% & 2% respectively.

Revenue from Recyclable

Description	Amount(Rs.)
Revenue Generation from Vermi composting (Percentage of Operating Expenditure)	1,22,200 (25%)
Revenue Generation from Recyclable	79,178

Decentralized process suitability

- Land sites for composting are available
- Large number of informal workers in existing waste management system (rag-pickers)
- High degree of organic content in waste
- Risk of poor self-governance is low
- Markets for compost are accessible
- Possible to manage health risks adequately

Land fill analysis

- Population of Sangareddy Municipality (2021) =95000
- Number of Households(2021) = 19000
- Estimated Waste Generation (2021) = 57MTPD
- Current Waste Generation (2010) = 40MTPD
- Total Waste Generation in 20 years = $\frac{1}{2}*(40+57)*365*10 = 177025$ tonnes
- Total Waste Volume (assume density 0.5 tonnes/cu.m.) $V_t = 354050$
- Volume of daily cover (10% of above), $V_c = 0.1*354050=35405$
- 15cm soil cover on top and sides for lift height of 1.5 metres
- Total Volume required for liner and cover systems (assume 1.5m liner system, including Lechate collection layer, and 1.0m thick cover system, assume height of land fill = 20m), $V_l = k V_t = 0.125*354050 = 44256.25$
- Volume likely to become available due to settlement/biodegradation of waste and other factors $V_o = m V_t = 0.1 *354050 = 35405= V_t+V_c+V_l-V_o = 354050+35405+44256.25-35405 = 398306.35$ cu.m.
- Area of Landfill required: (assume height of landfill = 15m)
- Area required for infrastructure facilities = $398306.35 /15 = 26553.75$ sq.m = 6.56 Acres Dimensions: Preferred ratio of length & breadth is 2:1
- Area = $2L^2 = 26553.75$; $L = (\text{Square root of } 26553.75)/2 = 115$ m ,Breadth = 230m
- Add 25% extra for side slopes, total land required = $1.25*6.56 = 8.2$ Acres

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