

Municipal Solid Waste Management For Dhule City And Remedial Measures

Mr.S.S.Mohite¹, Mr.S.B.Sharma², Mr.H.A.Kuwar³

¹Dept of civil engineering

²Associate Professor, Dept of civil engineering

³Assisat. Professor, Dept of civil engineering

^{1,2,3} SSVPS'sBSD College of Engineering Dhule, Maharashtra 424005 India

Abstract- Solid Waste Management is one of the major problems being faced over the world and India is no exception. Management of Solid Waste, though an essential service, is given low priority. One of the major causes of the problem in the Dhule city is solid waste management (SWM) which acts as an obstruction in the development of Dhule. In this study all the aspects which are comes in Solid Waste Management are studied and analysed properly. Also the Remedial Measures are suggested, proposed and designed. The study is completed with completing each step which includes in the solid waste management from start to end such as, sorting, segregation, collection, transportation, solid waste processing, disposal, landfill etc. Analytical study of the existing Municipal Solid Waste Management has been done consistently from the starting of this project study. Due to this study author understands the poor management of Dhule Municipal Corporation (DMC). Hence, some suggestions, proposals, designs related to MSWM of Dhule City will be helpful to DMC.

Keywords- Municipal Solid Waste Management Dhule Municipal Corporation, Remedial Measures.

I. INTRODUCTION

The management of municipal solid waste in India has surfaced or continued to be a severe problem not only because of environmental and aesthetic concerns but also because of the enormous quantities generated every day. Even though only 31% of Indian population resides in urban areas, this population of 377 million (Census of India, 2011) generates a gigantic 1,43,449 metric tonnes per day of municipal solid waste, as per the Central Pollution Control Board (CPCB), 2014-15 and these figures increase every day with an increase in population.

The management of municipal solid waste is one of the main functions of all Urban Local Bodies (ULBs) in the country. All ULBs are required to meticulously plan, implement and monitor all systems of urban service delivery especially that of municipal solid waste. With limited financial

resources, technical capacities and land availability, urban local bodies should constantly strive to meet this challenge.

Dhule is largely emerging as one of the biggest upcoming hubs of textile, edible oil, and power looms across the state and has gained a strategic advantage for being on the junction of three National Highways viz. NH-3, NH-6 and NH-211 and on most anticipated Manmad – Indore Rail Project. Dhule city is also a part of Delhi Mumbai Industrial Corridor Project, India's most ambitious infrastructure program, aiming to develop new industrial cities as 'Smart Cities' and converging next generation technologies across infrastructure sectors. Dhule city is well known across the state for its quality education institutes.

Satpuda Range of mountains is running from east to west and in the north eastern part of Dhule district River Tapi and small and sub rivers flow through the southern hilly side of the district. Dams have been constructed in the district and water is mainly used for irrigation purposes in the region. As a result this region is very fertile.

Dhule is located at 20.9°N 74.78°E. and has an average elevation of 319 metres. The climate of the district is on the whole dry except during the south-west monsoon season. The year may be divided into four seasons. The cold season from December to February is followed by the hot season from March to May. The south-west monsoon season which follows thereafter, lasts till September. October and November constitute the post-monsoon season. The average annual rainfall in the district is 670 mm.

II. OBJECTIVES OF STUDY

- To identify the issues related to Municipal Solid Waste.
- To fulfill the different aspects of solid waste management. Such as segregation at source, reduce at source of generation, collection, transportation, disposal, etc.

- To study the authorised standard material and sources such as government's guidelines, norms, acts, manuals, etc. For giving better solutions on existing solid waste management.
- To assess the existing Municipal Solid Waste Management of Dhule Municipal Corporation.
- To proposed and suggested some different kinds of practices for improving the solid waste management of city.
- Developing an Alternative Solutions and Remedial measures, suggestions, recommendations for MSWM of Dhule City.
- To help in increase the rank of Dhule in Swachh Survekshan of govt. of India.
- To make Dhule environmentally clean, green and healthy by proper municipal solid waste management.
- To make population estimation and solid waste management for newly increased area of dhule municipal corporation.

III. METHODOLOGY

Approach of methodology will be as per following steps (the analytical assessing will be done for the each following step):

- Waste Generation.
- MSW Projections.
- Sorting- Separation, Segregation and Storage.
- Street Sweeping and Drain Cleaning.
- Collection & Transportation System.
- MSW Processing.
- Environmental Aspect.
- Community Participation (IEC).
- Decentralisation of Administration.

IV. REMEDIAL MEASURES

it is the part of methodology in which the different types of measures will be given:

1. Waste generation –

Based on the survey done in the year 2007 by eco pro, the waste generation rate, per capita waste generation considered for Dhule city is **403 GPCD**. The total waste generated in the city is estimated around **165 TPD**.

But actually, the waste generation in city is more than 165 TPD. Because of some reasons and factors such as,

Increased in DMC area, upcoming industrial projects. But currently the most important factor is increase DMC area. So, as taking **403 GPCD**. The calculations can be made as follows:

Increased DMC Population in 2018 =

$$= \text{No. of households} * \text{Average Members per capita family} \\ = 98651 * 5.2 = 512986$$

Total waste generation in the city = $512986 * 403 = 206733358$ GPD =
206733 KGPD = **206 TPD**.

2. Msw projections –

Table 1: Waste Projection Estimate

Year	2017	2018	2022
City Population	408493	512986	547263
Floating Population	15000	15000	16500
Waste Generation Per Capita in Grams per day	403	403	432
Total MSW Qty, TPD	168	206	221

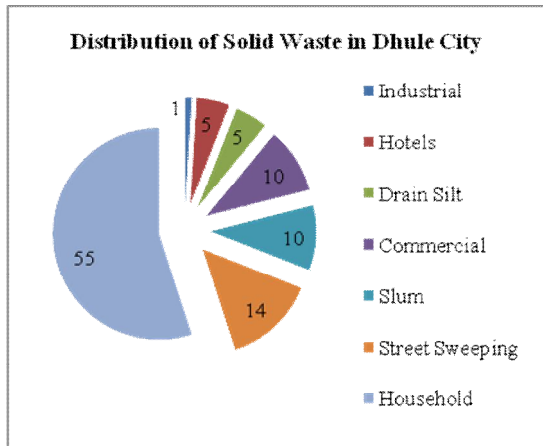
Waste projection estimate for DMC will be suitable for upcoming 6-7 Years only. Because there is the reason is that, in Dhule city as well as District big industrial projects are coming in upcoming 5 years. Projects such as, DMIC (Delhi Mumbai Industrial Corridor-Mega Industrial Park-Node-17-DNIR-Dhule Nardana Industrial Region), Avdhan MIDC phase 2, Nardana MIDC phase 3, Songir MIDC, etc.

So, the population projections will be change. Hence, the further calculations or estimates like waste generation and all will be changed definitely.

So, it is suitable to estimate only for upcoming 6-7 years.

Table 2: Sources of Solid Waste in DMC^{As per Author's Estimation}

Source	% of Total Waste	Solid Waste in (TPD)
Household	55	114
Slum	10	20
Commercial	10	20
Hotels	5	10
Industrial	1	3
Street Sweeping	14	29
Drain Silt	5	10
Total	100	206



Graph 1: Sources of Solid Waste in Dhule ^{As per Author's Estimation}

3. Sorting- segregation, separation and storage –

The term ‘sorting’ indicates separation and storage of individual constituents of waste material. In this chapter, the term ‘sorting’ is used synonymously with ‘separation’ and ‘segregation’.

Proposing Required no. of household bins for slum areas under DMC(increased)

Table 3: Proposing household bins in the city

Name	Year	Number of Households
Dhule M.Corp	2011	72076
Villages/Sub-urban areas	2011	18162
Dhule M.Corp	2017	78556
Villages/Sub-urban areas	2017	19795
Total	2018	98651

Number of Slum Households	Percentage of Slum Households out of total no. of households (%)	Number of bins required for slums (2 bins/family)	Increase in no. of households (%)
16304	22.62	32608	
4109	22.62	8218	
17762	22.62	35524	8.99
4478	22.62	8956	8.99
22315	22.62	44630	

After the inclusion of these villages and sub-urban areas in DMC(updated) area in end of 2017(can be calculated from the year 2018):

Total No. of Households - 78856 + 19795 = 98651

Total No. of Slum households(22.62%) - 17762 + 4478 = 22315

Total No. of bins required for slums (2 bins/family) - 35524 + 8956 = 44630

4. Street sweeping and drain cleaning –

Table 4 : Planning for Street Sweeping for Dhule MSWM ^{As per norms given in SBM Manual}

Equipment	<ul style="list-style-type: none"> • Long handled broom • Metal tray and metal plate • Containerised handcart or tricycle • Secondary storage bin • Dumper placer or compactor • Mechanical street sweeper • Container lifting device
Staff requirement based on road density	<ul style="list-style-type: none"> • High density roads: 1 person per 300–350 running meters of road length • Medium density roads: 1 person per 500 running meters of road length • Low density roads: 1 person per 750–1,000 meters of road length

Proposing Wheelbarrows for collect street waste

Table 5: Proposing Wheelbarrows

Year	Estimated street waste & drain silt quantity @10% of total waste, TPD	Volume of waste @ 0.6t/cum (mainly silt & dust)	No. of Wheelbarrows required @0.1cum capacity, 2 daily trips per unit, 20% extra for repair & maintenance
2017	16.5	27.4	166
2018	20.6	34.33	206
2022	22.1	36.83	221

5. Collection and transportation system

Collection of segregated municipal waste is an essential step in MSWM. Inefficient waste collection services

have an impact on public health and aesthetics of city. Collection of wet, dry and domestic hazardous waste separately ensures maximum recovery of recyclables. It also enhances the potential of cost-effective treatment of such wastes which can then easily meet the minimum quality criteria defined for different products, eg. production of compost from pure organic waste.

Proposing Design of Box Trolley

Proposing design for Box Trolley/Container Trolley which will be useful in Narrow lanes, slum areas, congested places, etc. It can be used by Loading on handcart trolley or fixing on Tricycle.

It should have minimum four boxes or containers for collecting the waste at primary level.

waste can be collect separately as per its type with segregation and sorting at source level.

The size of Volume for each box have 0.6 m^3 .

Each box should have different colour for different type of waste. Such as, Green for wet waste, Blue for Dry waste, Red for plastic waste only (*management of plastic waste is very very essential for our environment, now plastic is banned in state of Maharashtra*), waste and white for sanitary or biomedical wastes.

It is not necessary that the types of wastes are fixed for particular colour, but keeping fix indication by colour will make work more efficient and perfect.

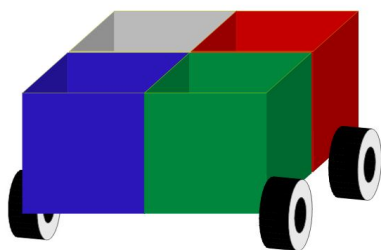


Fig.1: Proposing Design of Box Trolley/Container Trolley

Proposing site for Transfer Station

Now, DMC has increased its area by 2017. There are some sub-urban areas or villages are more than 10 km away from the disposal sites. Areas such as laling, avdhan gaon, avdhan MIDC, Chitod, morane pr, laling, etc.

So, there should be transfer station for diposal of the above area’s generated waste.

Hence author proposing one ideal site which will be suitable for south part of city and also suitable with respect to environmental factor. There is a site near Sakri-Surat Byepass, Hire Medical College, Dhule. This is open place where very low traffic and transportation. No residential area near upto 2-3 km.

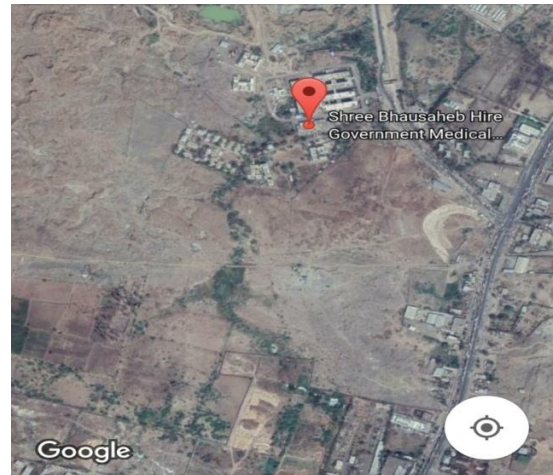


Fig.2: Proposing site for Transfer Station

6. MSW processing system

Table 6: List of Identified MSW Processing Technologies

Waste Technology	Processing	Processes
Thermo-Chemical Processing Technologies		Incimeration (Mass burn)
		Pyrolysis
		Plasma Arc Gasification
Bio-Chemical Processing Technologies	Aerobic	Digestion (Composting)
	Anaerobic	Digestion (Biomethanation)
Physical Processing Technologies		Refuse-Derived Fuel (RDF)
		Densification / Palletization

Recommendation of the Processing Technology

Dhule is a medium size city generating on an average 206 tons of waste on daily basis. As proposed the wet stream which is essentially biodegradable be converted to compost and the dry stream of recyclables would be recovered in MRF. The composting process would produce around 15%

biodegradable rejects that cannot be composted. The inerts would be landfilled. The recyclables would be screened in the MRF to separate out paper, plastic, glass and metals. Around 11% rejects would be produced in this process and would be included in the inert stream. Total of 25% inerts/rejects are estimated to be disposed at the landfill.

For a city like Dhule generating such quantity of waste, composting would be ideal for the organic/ wet waste and recovery of recyclables for dry waste. Suggested system is also in compliance with the MSW rules, 2016 recommendations that mandates disposal of only rejects and inerts in the landfill. This kind of system would help in reducing the content of landfillable waste to not more than 25%.

7. Landfill

Site Suitability Assessment of Proposed Landfill Site

The proposed site for the landfill would be the same one where the inorganic waste is being dumped, currently is located on Varkhedi road. The site is around 4 hectares land and approximately 3-5 km away from the Dhule city.

Proposed Site Assessment^{As per CPHEEO Manual}

(Assessment table is too lengthy, so it is not possible to put the table in this paper. The table is given the project report on page no. 72)

The sites are compliant to the requirements of CPHEEO and other regulation.

8. Decentralization of Administration

In large cities the SWM services can be performed effectively only if its administration is adequately decentralised. Decentralisation can be at least 3 tiered -one at the Ward level, second at the Zone level and third at the city level. The SWM functions would get focussed attention if all functions of the city administration are decentralised at Ward/Zone/Division levels and senior officers are placed in-charge of each Zone/Division functioning independently with adequate delegated powers.

Proposing Zonal Decentralisation of DMC Area

In future, some Industrial projects are upcoming in Dhule like, Delhi Mumbai Industrial Corridor, Raver MIDC, Avdhan MIDC Phase 2, Manmad-Dhule-Indore Railway, Songir MIDC, Nardana MIDC Phase 3, etc. it will creates lots

of job employments directly and indirectly in city as well as District. In 2017 there is also increased in the Area of Dhule Municipal Corporation. Due to these reasons there will be phenomenally increases in population of Dhule city as well as district surely. Hence, it is very important to make pre-plan for these future situations.

So, the Decentralisation of Administration of city should be in various parts as follows:

a) Dhule City -

As our recommendations, Mainly it can be include parts such as Sakri Road, Lumibini Vana Parisar, Peth, Agra Road, Old Dhule, Chalisgaon Road, 80ft Road, Morane, Mahindale, Balapur-Fagne, Varkhedi, etc.

b) Deopur City –

East Deopur, West Deopur, Nakane, Walwadi, Wadibhokar, Wadel Road, Nagaon Bari(East Deopur), Vidya Nagari, etc.

c) South Dhule City –

Mill Parisar, Chitod Road, Chitod Gaon, Mohadi Upnagar, Avdhan Gaon, Avdhan MIDC, Malegaon Road, etc.

Currently, Decentralisation of city level administration is not needed for Dhule Municipal Corporation.

ULB Self Assessment (Summary Report)-Dhule Municipal Corporation

802646 - Dhule (M Corp.)
Date : 04-30-2018

Total Score : 1060 / 1400

Table 7: ULB Self Assessment (Summary Report)

Section's	Score
S1 - Collection and Transportation	278 / 420
S2 - Processing and Disposal	194 / 350
S3 - Sanitation: ODF	386 / 420
S4 - IEC and Behavior Change	62 / 70
S5 - Capacity Building	70 / 70
S6 - Innovation	70 / 70

V. RESULTS

By studying and assessing all the factors, manual, guidelines, etc. which are given in the methodology by author, project work has been done completed. As per author's work in the MSWM for DMC the output is come as **Results or Remedial measures** in the form of proposals, suggestions and recommendations which are given in this project work.

VI. CONCLUSION

The project work indicates the proper management and processing of Dhule's MSW. The determination and type of MSW and the treatment with the respective method is the best way to manage the MSW, so it does not create pollution and damages our society. Dhule Municipal Corporation (DMC) generally uses landfill and composting methods for the treatment of MSW. DMC can also use different treatments such as gasification technology for MSW treatment because it is a renewable energy source for electricity production. As the population grows rapidly as urbanization accelerates, the generation of MSW also increases, this document will help MSWM authorities improve the city.

Some other Conclusions are listed as below:

- Present MSWM system is not energy efficient.
- The monitoring system needs to be improved revise is necessary as per guidelines.
- Cost of collection and separation will be drastically reduce if guidelines will be followed and collection facilities such as design by author is implemented.
- Dustbins for slum households should be provided by DMC as per guidelines which has been calculated in work
- Cost of fuel, labour will be drastically reduce by following guidelines and better designed vehicle for collection.
- The site proposed by author is as per guidelines by CPHEEO.
- DMC may consider implementation for MSWM designed by author calculated for increased area of Dhule M.Corp.

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