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A Systematic Approach towards Waste Collection and Treatment for a Suburban Area

A case study: Narhe

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ABSTRACT: The change in environmental conditions of any city, state or even a country are takes place due to change in population density. Cities are getting crowded and thus generation rate of solid waste is increasing. The Pune city is popular for its Job opportunities and education thus large number of people moves here. Due to which population density is increasing and so waste generation. The presented paper deals with the Solid Waste Management system in Narhegaon region, which is situated in outskirts of Pune and popular for its economical housing. The paper also focus on suggestions regarding complete solid waste management system

KEYWORDS: Solid waste Management, MSW, TPD, ULBs

I. INTRODUCTION

Generation of solid waste continues to increase in urban India with rapid urbanization, Change in living standards, consumption patterns and a shift from recycling to a throwaway in society.

Solid waste management is an obligatory function of urban local bodies (ULBs) in India. Most ULBs are unable to cope with the challenging task of collection, transportation and disposal of solid wastes not only due to rapid urbanization but also due to the non-availability of required open-spaces near urban centers for land filling. Waste, therefore, often accumulates in open spaces, streets, and even stagnant water bodies causing serious health and environmental problems. Accumulation of uncollected wastes pollutes ground water (through leachates) and surface water (due to runoff during rains). This country has long been familiar with woes brought by MSW and its substandard disposal. For example, in 1994, a plague broke out in Surat and was attributed to “uncollected solid waste blocking drains” by the official inquiry on its causes. The infamous 2005 flood in Mumbai was also caused due to drains being blocked by plastic bag.

SWM generally consumes a significant proportion of municipal budgets, revenues from the service are negligible. Management of municipal solid waste is a service, which needs efficiency improvements and also substantial financial support in order to bring about significant change in the service.

The energy issue is a global concern, given the recurrent crises in the electricity sector. Over the past decade, the energy sectors of many countries endured intense changes with stimulus to the de-centralization of power generation, giving the distribution networks central role in this new model. Energy generation plays a key role in human life, along with means of transportation, telecommunications, water and sanitation.

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II. RELATED WORK

After understanding the problem statement it is clear to focus on each aspect of SWM and combine them together to achieve required goal. For example, Say open dumping and its ill effects in one aspect of SMW^[1]. Also when this improperly disposed waste comes in contact with water it will trigger health issues in the area^[2]. Survey and estimation should be done to understand the waste generation cycle^{[8][13]}. Incineration and unscientific dumping is either polluting or making land infertile^[3]. The tool of route optimisation helps us in building the system economically and well organised^{[4][9]}. A mixed waste is a devil while a segregated waste is profit^[13]. Characterisation is the study to erect the segregation mechanism^{[5][10]}. Wet waste should be handled by composting techniques^{[11][12]}. Being a social issue any innovative solution would fail without public awareness^[9]. Lastly, similarities in problems of Jalgaon, Bobbili and Indore has helped as an reference line for our project area^{[6][7][9]}.

III. PRESENT SCENARIO OF SOLID WASTE MANAGEMENT PRACTICES IN INDIA

India is experiencing tremendous growth in urban areas and now the suburban areas are accompanying them too. India is the third largest producer of waste, specifically municipal solid waste (MSW). Urban centers of India produce around 1,20,000 tons of solid waste per day. Some metropolitan cities like Mumbai, Calcutta, Bangalore & Pune show typical urban pollution. The characteristic of solid waste varies from place to place to time. The Central Public Health and Environmental Engineering Organization (CPHEEO). The technical wing of Ministry of Urban Development has classified solid waste in fourteen categories based on source, origin and types of wastes.

IV. STUDY AREA

Narhe is a suburb of Pune, Maharashtra, India. It is approximately 11 kilometers from Pune. The Figure given below shows the study area, i.e. Narhe which is also mentioned as Narhegaon.



Map 1: Area taken under consideration

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- It is connected to areas like Sinhgad road, Dhayari, Vadgaon, Mumbai-Bangalore Highway, etc
- It is a naturally self-sufficient village and its industrial growth rate is higher
- The economic development of Narhe is faster than Pune city.

Table 1: Details of area under consideration

Sr. No.	Particulars	Details
1	Name of Village	Narhe
2	Co-ordinates	18.4475° N, 73.8232° E
3	Population(Approx.)	35000
4	Annual Average Rainfall	897.67 (2003-2012)

V. PRESENT SCENARIO OF SOLID WASTE MANAGEMENT PRACTICES IN NARHE

Narhe being suburb its development is slower than that of cities though the growth of facilities and infrastructure cannot cope up with increasing population and demand. During the preliminary survey in Narhe the overall scenario of waste management (mainly disposal) is observed. In unplanned areas of Narhe where the collection service is poor due to improper road and collection routes. Individuals commonly dump their waste into drainage ditches, streams and by the roadside due to the absence of garbage containers causing wind-blown litter, open burning and the potential for disease vectors.

In Narhe garbage is collect from residential areas in a garbage collection vehicle (Ghantagadi). The garbage from industrial and commercial areas is not collected by Grampanchayat vehicles thus that waste is directly thrown by them on landfill. The present dumping ground of Narhe uses no advance technology for disposal of waste. Even Segregation of waste is done manually. Availability of land for dumping ground is also less in Narhe. After segregation by the workers useful dry waste is separated and remaining waste is directly thrown in to the channel which carries waste water. Due to which in monsoon the garbage accumulates and blocks the water flow and that water overflows on roads. Its a need of the day to use modern technology by which managing waste on small piece of land is possible.

A. *Quantity estimation considering various zones such as residential, commercial, public, etc. and characterization of waste generated in Narhe.*

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Table 2: Quantity Estimation

Sr. No.	Name	Number	DW	WW	TOTAL DW (kg)	TOTAL WW (kg)
1	Restaurant (Major)	21	8.815	76.391	185.13	1604.22
2	Restaurant (Average)	60	4.004	18.842	240.18	1130.571
3	Restaurant (Minor)	123	1.312	4.123	161.48	507.198
4	Residential (per flat)	23748	0.310	0.733	7363.80	17427.51
5	Chicken Centre	44	0	17.664	0	768.396
6	Hospital (Clinic)	41	1.756	1.625	72.013	66.654
7	Industry	128	7.679	0	984.089	0

Table 3: Total quantity of waste

DW (kg)	WW (kg)	DW + WW (kg)
8988.7725	21487.889	30476.662

Total waste generated in Narhe per day=30.47 Tones / day

From Table 2, we get know the approximate numbers of waste sources such as Restaurants, residential flats, clinics, etc. Then by multiplying these numbers to the average waste (Dry and wet) generated by respective sources we get total quantity of Waste generated in Narhe per day. Table 3 shows the total quantity of Dry waste, Wet waste and their total respectively.

VI.METHODOLOGY AND PERFORMANCE ANALYSIS

In order to apply it more effective strategy for waste management that will be suitable for human health and environmental, practice classification of the waste must be done. Quartering and coning method is a well-established technique for waste characterisation. This method is used for characterisation. The characterisation was done on six days .

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Table 4: Categorisation of waste in percentage

Categories	In Percentage
Paper and Cardboard	5.71%
Plastic	8.28%
Rubber	2.34%
Vegetation and Food	66.11%
Textile	2.60%
Metal	2.73%
Glass	6.88%
Others	6.98%

Table 4 shows the quantity of various different materials present in the waste in percentage. It clearly says that 2/3rd of the total waste is food waste and remaining 1/3rd contains mostly dry waste which includes paper, plastic, glass, etc.

VII. WASTE COLLECTION AND TREATMENT METHODY

Results from estimation and characterization gives data the percentage of different components present in waste generated in Narhe. From this the proper quantity of Dry waste and wet waste can be found and thus suitable methods for their collection as well as treatment can be decided and applied. For author/s of only one affiliation (Heading 3): To change the default, adjust the template as follows.

A. Primary Garbage collection center-

The present location of dumping ground is small in space. It may get overloaded by advancements made in collection system. For that we should set up primary collection centers at every chronic spot. These centers will be as small as kiosk with one worker each. In the first stage the waste would be collected here. The worker will manually segregate the waste and keep it ready when the waste vehicle arrives to pick it up. The possible basic segregation can be paper, plastic, organic, non-decomposable.

Use of this technique will reduce burden on waste handling at secondary level. It will also be easy for local people to approach collection centres if required. This type of decentralisation will increase employment opportunities in Narhe.

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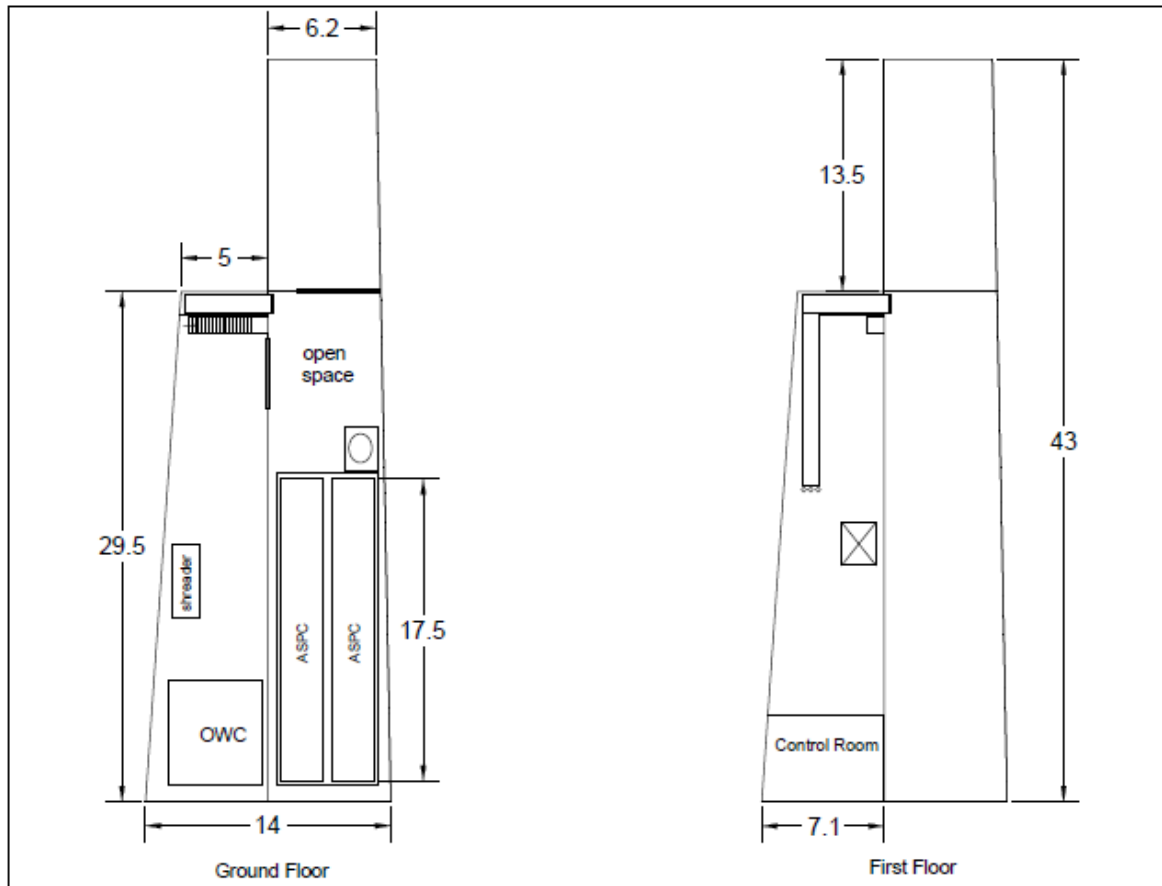
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B. Treatment for Dry and Wet waste-

Fig.1: Plan of suggested Solid waste management plant



The Primary segregated waste will transported to plant with Ghantagadi. Then for further segregation the dry and mix waste is moved upwards by means of lift and segregated in various categories like wet, paper, glass, plastic, etc. Then the material that can be shredded is sent to shredding machine so this waste is converted into small size and be collected and sent for recycling. Overall wet waste will be proceed for further treatment. Part of wet waste will be sent to OWC and other part to Static Pile Composter. After this the output from these treatments like manure, biogas, plastic, paper, etc. an be sold to different vendors to get some profit.

VIII. CONCLUSION

A major part of waste in project area is wet waste. Due to road side dumping and improper treatment the conditions have spoiled. Action must be taken before they become severe. Being a mass issue coordination of local people and gram panchayat becomes significant. Efficient collection system and preliminary segregation will make the initial path simpler. It will also reduce burden over the main treatment plant. The by-passing nala and limitation of land size brings more challenges for construction of treatment plant. Waste treatment may cost a lot so to reduce economic burden we can generate money by selling waste. Waste is a burden when it is mixture while when separated it is profit. Using OWC and Static Pile composting wet waste will be used as fuel and compost. After breaking down dry waste it can be

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sold. Magnetic belt could be used to separate dry waste. Public awareness is very much required to initiate and run this system.

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