

Solid Waste Management in Rural Areas emerging towards growth centre through GIS system- Mahalung, Solapur

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Abstract: Solid waste management is one of the major environmental problems of Indian rural areas which is emerging towards growth centre. Improper management of solid waste causes hazards to inhabitants. Various studies reveal that about 90% of MSW is disposed of unscientifically in open dumps and community garbage bins, creating problems to public health and the environment. In the present study, an attempt has been made to provide a comprehensive review of the characteristics, generation, collection and transportation, disposal and treatment technologies of solid waste management in rural areas. The study pertaining to solid waste management in rural areas has been carried out to evaluate the current status and identify the major problems with the help of GIS software. Various adopted treatment technologies options for solid waste are critically reviewed, along with their advantages and limitations. The study is concluded with a few fruitful suggestions, which may be beneficial to encourage the competent authorities/ researchers to work towards further improvement of the present system.

Keywords: solid waste management, growth centre, Geographical information system

1. Introduction

Solid waste has become one of the biggest problems all over the world and its management in rural areas which emerging towards growth centre is major issues at present condition. For the proper solid waste management consider the component such as solid waste generation, segregation, collection and transportation, disposal. The management in all components is need for proper solid waste management, The objective of solid waste management in rural areas is to collect the waste at the source of generation, recovery of recyclable materials for recycling, conversion of organic waste to compost and secured disposal of remaining waste In this context, the study of existing situation of solid waste management in village at Mahalung such solid waste generation, collection system and existing practices of disposal od solid waste using GIS software. Further identify the issues of present system of solid waste. Finally prepare a plan which includes solid waste component wise recommended interventions for the villages.

2. Existing Solid Waste Management

2.1 Quantity of Waste Generated

On the basis of data collected from village, Presently one vehicle provided by Grampanchayat for the collection of solid waste. In Mahalung village there is no any provision of house to house. Existing situation, Grampanchayat provided 24 garbage bins in different location of Shreepur and Mahalung Gaothan settlement. In remaining Scattered area either conventional composting method (Ukirdas) is practiced by households are used for dumping of solid waste. Assume as per CPHEEO guidelines, per capita waste generated in the village is 0.300 kg. And total waste

collected by GP from the garbage bin and desilted material from drain is about 1.2 tonne. Following table gives ward wise estimation of waste generated in the village.

Table 2.1: Details of quantity of solid waste generation

Settlement No.	No. of HHs	Population	Waste Generation (kg/day)	Waste Generation (Ton/day)
1	1696	7699	2310	2.30
2	621	2817	845	0.84
3	539	2449	735	0.75
4	852	3867	1160	1.16
5	881	4001	1200	1.20
	4589	20833	6250	6.25

Source: Primary data and CPHEEO norms

Thus total quantity of solid waste generated from the village is 6.25 MT. At present only community garbage bin and drain desilted material in Shreepur and Mahalung Gaothan area served through the waste collection system. In the scattered settlement all households are practicing composting (Ukirdas) as an own management. There are 50 and more open dumping spots indentified in different location of the village. These open dumping solid waste is not collected regularly.

2.2 Composition of Waste

With reference to actual sampling carried out in the village to know the composition of solid waste, waste generated in Mahalung consists of 6.25 ton of organic and 1.01 ton of inorganic waste. Details on different categories of waste and their composition found in village are given in the table below.

Table 2.2: Details about solid waste composition

Material	% composition (NSWAI)	Waste generated/per day (tonne)	Waste generated annually (tonne)
Organic	69%	4.3125	1574.0625
Recyclable (Glass, Metal, Paper, rags, Other)	15%	0.9375	342.1875
Plastic	10%	0.625	228.125
E-waste	2%	0.125	45.625
Inert	4%	0.25	91.25
Total	100	6.25	2281.25

Source: CPHEEO norms; Data from GP



Figure 2.1: Showing solid waste sampling exercise

2.3 Collection and Segregation of Waste

At present Gram Panchayat provided two vehicles for solid waste collection but actual one premier tempo truck is used for collection of waste. By and large premier tempo truck is used for emptying of garbage bins and collection of desilted material from the drain. Average waste carrying capacity of the premier tempo truck is 300 kg. About 4-5 trips are made daily by the premier tempo truck to collect waste from different parts of the village. GP has identified six routes in different trips for daily collection of waste covering about 24 community garbage bins are collected and desilted material in Shreepur and Mahalung Gaothan. Near about 25 km daily running of vehicle for the collection of solid waste. About 9 % households are served through factory system and remaining all 54 % households use community garbage bins and dumped solid waste openly and remaining 37 % Households practices composting methods

2.4 Disposal of Waste

Waste collected is dumped on the open land in main gaothan near Ujani canal. No scientific management of waste is carried out by Gram Panchayat. Since this dumping site is located in Gaothan area; it is hazardous to health and environment. Thus new location for storage and management of waste needs to be proposed for solid waste management of village.

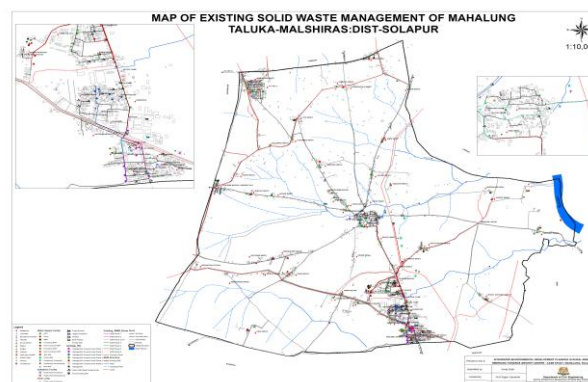


Figure 2.2: Showing Existing solid waste collection Route

2.5 Hospital and Institutional waste

Village Mahalung has 1 PHC and 20 private clinics. Government hospitals don't have any separate facility for bio medical waste management. Biomedical waste from the subcenter is disposed off in the vehicles from Solapur city. There are sixteen major hospitals in the village are associated with a biomedical waste management facility at Solapur named as Bioclean. Here waste is handed over to the team from the BMW facility for further treatment of incineration. Other 04 private clinics are not associated with any Bio-Medical Waste Management facility. They are dumping biomedical waste in the garbage bins finally collected by vehicles of Gram Panchayat. Thus waste from these clinics is dumped in open and is left untreated. This is a hazardous practice and awareness on proper management of Bio-Medical Waste needs to be created amongst hospital managements and public. Most of the educational institutes have their own waste collection systems and compost pits for proper management of solid waste management facilities.

3. Summary of issues in Solid Waste Management

1. Present waste collection system is not consist of house to house collection.
2. Currently segregation and scientific management of waste is not undertaken by Gram Panchayat.
3. Waste is dumped openly and this creates nuisance of fly breeding and odour especially to the settlements in the vicinity.
4. Households practicing conventional composting do not practice scientific waste management. Waste stored openly in the *ukirdas* encourages nuisance of fly breeding and odour.

5. Proposed Interventions

4.1 Management of Existing Dumping Site

As mentioned above existing waste management site is located in the settlement area. In future separate site is proposed to be used for solid waste management. Therefore existing site is to be evacuated by undertaking cleaning of existing site and transportation of waste from this place to newly proposed location needs to be taken up. Cleaning will

include segregation of waste and transportation of segregated waste for further management. This will include segregation of waste and transportation of organic waste to the newly proposed site. Labours will be required for segregation of waste. Segregated inorganic waste can be handed over to rag pickers or can be sent to land filling. Organic waste is to be sending to the newly proposed site for further processing

4.2 Segregation of Waste at Source

Segregation is an integral part of solid waste management system. Segregation at source level is very important as it saves lot of time and efforts. Biodegradable and non biodegradable waste will be separated at source and collected separately for further processing. Therefore it is proposed to segregate waste at household level. To facilitate the segregation at source/HH level providing separate dust bins to each of the HH is proposed. Furthermore awareness on segregation of waste needs to be created by GP. To facilitate the segregation of waste at source level i.e. at HH level providing 2 dust bins to each of the HH is proposed. About 2724 HHs including existing HHs and HHs proposed to be covered are to be provided with dust bins. Similarly about 1404 HHs practicing composting are also to be provided with single dust bin for storage of inorganic waste. Thus total bins to be provided are 6852.

4.3 Strengthening of Waste Collection System

GP has one mini tempo trucks and tractor for waste collection. However this collection system is not adequate. For waste collection purpose village is divided into three parts and waste is collected on every alternate day from each part. To facilitate daily waste collection from all parts of the village and to extend the service of waste collection to the households presently dependant on garbage bins collection system needs to be strengthened.

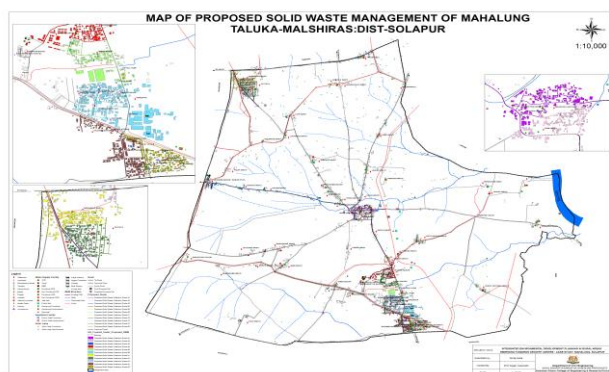


Figure 4.1: Showing Proposed solid waste collection Route

For daily collection and disposal of waste GP need to increase the number of vehicles to be used for waste collection. Total three routes have been defined by GP. Therefore two more vehicles are to be purchased to facilitate waste collection from all parts of village. About 1404 HHs presently practicing conventional process of composting will continue the same by adopting scientific methods of composting such as simple compost pits, vermin compost or biodynamic etc.

4.4. Scientific management of waste

For scientific management of organic waste produced in the village, a fuel pelleting machine is proposed to be used. In this process organic waste will be shredded and dried to convert it into pellets. The pellets produced from waste will be used as fuel and will help to minimize the demand of conventional fuel sources of wood, Kerosene and LPG. At present about 28% HHs in the village reported to use wood and kerosene as fuel sources. This demand can be further minimised by the alternative fuel source of pellets.

Similarly organic waste converter system can also be used for decomposition of organic waste. In this system waste will be shredded in small particle and microbial culture will be mixed with waste during shredding. This will allow conversion of waste into manure.

In addition, development of landfill is proposed to be taken up for inorganic waste. The proposed landfill site is located near canal. So necessary permission needs to be obtained by GP from MPCB to develop such landfill. Segregated organic waste will be processed either through pelleting machine or through the organic waste composter. To process the organic waste of about 2.50 tonne a pelleting machine of producing 1 tonne of fuel pellets per day will be used. This plant is proposed to be established on land available near brick factory on Hol road. Currently this land is owned by GP and total area is about 0.36 ha.

Establishment of pelleting machine will include storage space for raw organic and pellets. The organic waste will be shredded and sun dried to convert them into pellets. Such pellets can be used as fuel. As mentioned above technology option of organic waste processor can be used. Here organic waste processor to process 2.5 tonne of waste is needed. This will also include shredding of waste, mixing of waste in a processor with microbial culture and drying of waste to convert it into compost. Segregated inorganic can either be handed over to Rag pickers or can be send for land filled for further processing. To execute the projects detailed project reports (DPRs) of all the works need to be undertaken by Gram Panchayat along with technical investigation to finalise the specifications and actual cost of the work.

4.5 Policy measures to be adopted by GP

Presently GP has appointed 2 people as driver for two vehicles. Both these staff performs the task of waste collection and unloading this waste at dumping site. This strength needs to be increased for effective collection and management of solid waste.

Similarly capacity building of staff needs to be taken up for collection of segregated waste and disposal of organic and inorganic waste. Community level waste collection beans needs to be discarded to ensure collection of segregated waste. To manage the waste expected to be generated by 2038, private entrepreneurs and self help groups can be involved in the management of segregated waste. Similarly community based groups such as self help groups or youth groups can be engaged in solid waste management.

6. Conclusion

Population of Mahalung continuously increases due to availability income source. After 25 years population of village cross 30 thousands. At present condition lot of issues emerging regarding solid waste management such no house to house collection, no scientific disposal of solid waste, solid waste dumped openly anywhere along roads or nalla. This condition creates unhygienic environment in the society. It needs the proper solid waste management plan. In paper, study existing situation of solid waste management using GIS and remote sensing. In situation analysis, near about 70 % of the total solid waste is organic waste. In paper provide the action plan with block for solid waste management to achieve goals such as 100% segregation at source, collection, optimized transportation and scientific disposal of solid waste. Using GIS prepare optimized solid waste collection route for the solid waste collection. So this paper helpful to achieve goals and objectives to reduce open dumping of solid waste.

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