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Study of public attitude towards household waste management in selected rural area in Kolhapur District.

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ABSTRACT: One of the frightening issues in modern life is the collection and disposal of municipal solid trash. The ineffective and improper methods of disposing of solid waste cause aesthetic blights, serious risks to public health, such as air pollution, accident risks, and an increase in rodent and insect vectors of disease, have a negative impact on land values, cause public nuisance, and otherwise obstruct community life and development. Unattended SW invites rodents, flies, and other animals, which in turn spread infections. Wet SW also decomposes and emits a foul stench. Health issues result from these unclean circumstances. Therefore, it's critical to manage SW to reduce its negative effects on human health and the environment. Development of understanding is required for solid waste management (SWM).Solid garbage dumped at a dump site serves as a current indicator.Current research focuses on the scientific assessment of public opinion regarding solid waste management and investigation of potential solutions which are practicable in local context. The rural community of Kandalgaon in the Maharashtra state, close to Kolhapur, was chosen as the subject region for this investigation. The primary accomplishments of the programme are the survey of village residents, calculation of the potential for tentative garbage creation, and exploration of alternative solid waste management options.

Key words: Solid Waste, Dumping, Surveying, Landfilling

1. INTRODUCTION:

The collection and disposal of municipal solid waste is one of the grave issues facing modern society. The amount of municipal solid garbage produced every day in the nation is estimated to be over 100000 MT. Solid trash should be disposed of properly and efficiently to avoid major risks. The solid trash dumped at the disposal site serves as a current indicator. It is crucial to do this by reducing the amount of solid waste that is produced. Some disease and

pest vectors have a wide range of activity. As a major part of the waste management initiative in developing country like India improved attitude of the population is also significant. So to reduce the problem arising from solid waste it is necessary to study the problem at local level to understand the composition of the waste and todevise the proper system of such waste management. Current research focuses on the scientific study to explore the public attitude towards the solid waste management and investigation of the possible options which are feasible in local context. The study area selected for this research is a rural area, named Kandalgaon, located near the Kolhapur city in state of Maharashtra. The survey of the citizens of the village, estimation of the tentative waste generation potential and exploration of the various possible options for solid waste management are the key highlights of the work.

Fig. 1.1: Dumped solid waste near study area

1.2 OBJECTIVES:

1. To determine what home habits are currently being used for each waste management method.

2. To learn about people's perspectives toward their existing waste practises (affective, cognitive, and behavioural).

3. To find out how well-informed the community is about various facets of waste management, the effects of improper waste management, and any waste management changes that residents would like to see implemented.

4. To assess the current landfilling site's potential for the chosen study area and predict future demand.

5. To offer the research area's potential improvements in solid waste management solutions.

1.3 METHODOLOGY:

For any project to be successful, the proper methodology must be chosen. The research was completed using the following approach, which was based on the analysis of the numerous literatures read and the determination of the identified objectives.

1. The research area's solid waste management situation as it stands at the moment was carefully planned to determine the scope of the issue.

2. To acquire data on the significance of solid waste management for Kandalgaon's sustainable development, a questionnaire-based survey was created. Improved comprehension of the effects of solid waste on the environment and

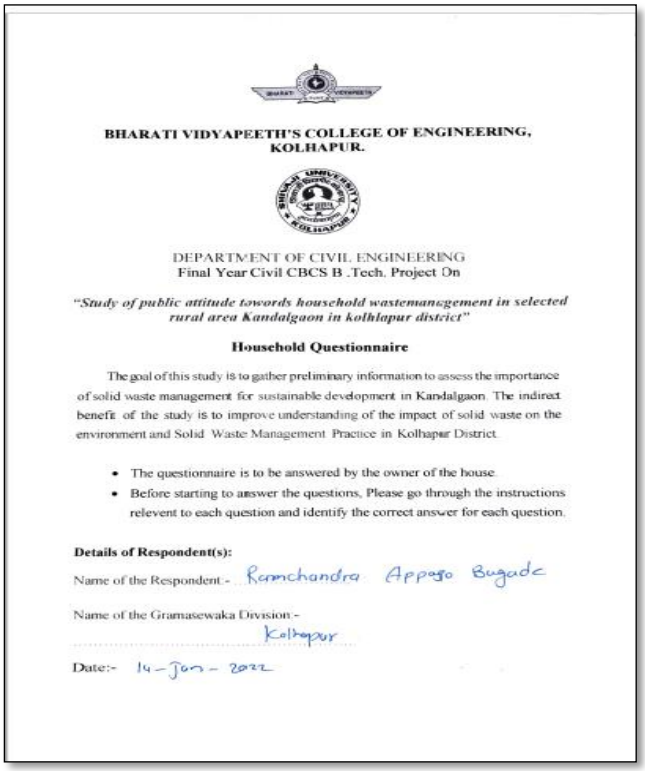
solid waste management practises in Kolhapur District was the study's indirect benefit. The main topics addressed in the questionnaire were solid waste management methods, issues of concern, desire to participate in SWM initiatives, and SWM solutions such composting and liquid waste management. (**Samples of the responses received are included in the Annexures.)

3. The replies were analysed in order to determine how the residents of the research region felt about the SWM programme and whether they were willing to join.

4. The concerned gram-panchayat was contacted to get the fundamental facts on the generation of total solid waste, as well as present practises and population data.

5. Based on an evaluation of the present trend in waste generation, the lifespan of the current landfilling/dumping site was determined.

6. Several practical and workable strategies for managing solid waste were put out for improved SWM.



BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING, KOLHAPUR.

DEPARTMENT OF CIVIL ENGINEERING
Final Year Civil CBCS B .Tech. Project On

"Study of public attitude towards household wastemanagement in selected rural area Kandalgaon in kolhlapur distrcict"

Household Questionnaire

The goal of this study is to gather preliminary information to assess the importance of solid waste management for sustainable development in Kandalgaon. The indirect benefit of the study is to improve understanding of the impact of solid waste on the environment and Solid Waste Management Practice in Kolhapur District.

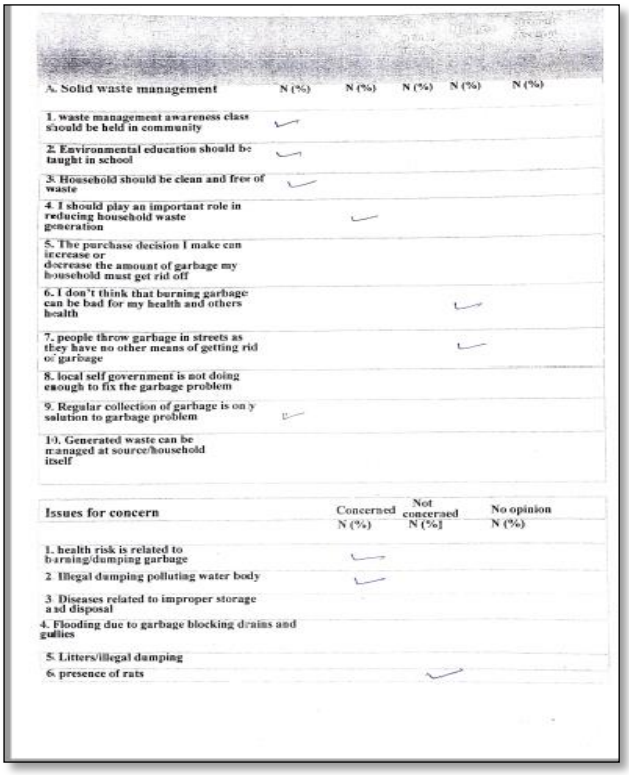
- The questionnaire is to be answered by the owner of the house.
- Before starting to answer the questions, Please go through the instructions relevent to each question and identify the correct answer for each question.

Details of Respondent(s):

Name of the Respondent:- Ramchandra Appaso Bugade

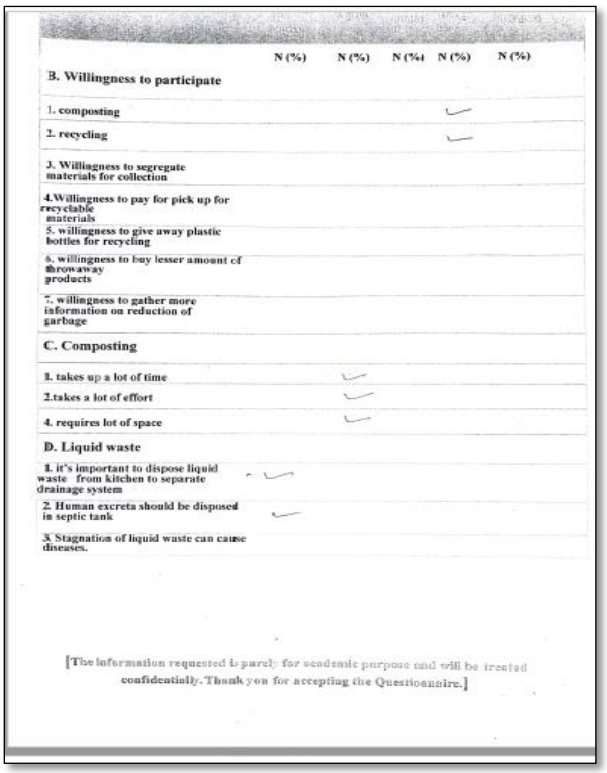
Name of the Gramasewaka Division:- Kolhapur

Date:- 14-Jan-2022



A. Solid waste management	N (%)	N (%)	N (%)	N (%)	N (%)
1. waste management awareness class should be held in community	✓				
2. Environmental education should be taught in school	✓				
3. Household should be clean and free of waste	✓				
4. I should play an important role in reducing household waste generation		✓			
5. The purchase decision I make can increase or decrease the amount of garbage my household must get rid off					
6. I don't think that burning garbage can be bad for my health and others health				✓	
7. people throw garbage in streets as they have no other means of getting rid of garbage				✓	
8. local self government is not doing enough to fix the garbage problem					
9. Regular collection of garbage is only solution to garbage problem	✓				
10. Generated waste can be managed at source/household itself					

Issues for concern	Concerned N (%)	Not concerned N (%)	No opinion N (%)
1. health risk is related to burning/dumping garbage	✓		
2. Illegal dumping polluting water body	✓		
3. Diseases related to improper storage and disposal			
4. Flooding due to garbage blocking drains and gullies			
5. Litters/illegal damping			
6. presence of rats		✓	



	N (%)	N (%)	N (%)	N (%)	N (%)
B. Willingness to participate					
1. composting				✓	
2. recycling				✓	
3. Willingness to segregate materials for collection					
4.Willingness to pay for pick up for recyclable materials					
5. willingness to give away plastic bottles for recycling					
6. willingness to buy lesser amount of throwaway products					
7. willingness to gather more information on reduction of garbage					
C. Composting					
1. takes up a lot of time		✓			
2.takes a lot of effort		✓			
4. requires lot of space		✓			
D. Liquid waste					
1. it's important to dispose liquid waste from kitchen to separate drainage system	✓				
2. Human excreta should be disposed in septic tank	✓				
3. Stagnation of liquid waste can cause diseases.					

[The information requested is purely for academic purpose and will be treated confidentially. Thank you for accepting the Questionnaire.]

Fig. 1.2: Sample questionnaire

2. RESULTS AND DISCUSSION:

2.1. Assessment of current status of the solid waste management:

The observations made during the evaluation of the study area's solid waste management and disposal site's present status are listed below.

It was discovered during exploration of the study area that the hamlet has no formal SWM plan. The village's sole course of action at the moment is landfilling. Additionally, the landfilling is not done correctly. The only method the village is aware of is the dumping. The disposal location is chosen based on convenience rather than taking technical factors into account.

The following are the key technical considerations in choosing a landfill site:

Municipal solid waste (MSW) landfills are designed to dispose of solid wastes on land in a way that minimises environmental risks. This is done by spreading the wastes out to the smallest practical volume and applying and compacting cover material on a regular basis.

The most challenging challenge to solve in an MSW dump is likely site selection. Many suitable sites are eliminated due to local residents' opposition. The following factors should be taken into account while choosing a landfill location:

1. Public opposition
2. Closeness to main highways/Roadways.

3. Speed limits.
4. Haul distance (in time)
5. Hydrology
6. Ava ilability of cover material
7. Climate (for example, floods, mud slides,
snow)
8. Buffer areas around the site (for example,
high trees on the site perimeter).

The dumping area that the gram-panchayat set aside was 30 metres long and 12 metres wide.

The garbage had taken up residence in the desirable section of the site. According to the observations, the garbage contained the following items in a sizable amount.

1. Garbage
2. Rubbish
3. Street rejection
4. Animal remains
5. Ashes
6. Debris from construction and demolition.

There was no waste separation seen. On the facility, garbage was discovered to be combined and deposited. After filling the single-use plastic bag, the majority of the household waste was disposed of. Sharps and other dangerous waste have not been carefully separated. Street animals like dogs and pigs were stumbling around the waste looking for food. As the trash is disposed of.

2.2**. Analysis of the questionnaire based survey:**

In order to learn more about the significance of solid waste management for Kandalgaon's sustainable growth, a questionnaire-based survey was created. The study's unintended advantage was to increase knowledge of Kolhapur District's solid waste management practises and their effects on the environment. The following conclusions were reached after analysing the responses received.

Residents of the village of Kandalgaon support the following...

1. Community education about waste management should be offered.
2. Environmental education ought to be a mandatory component of formal education.
3. It's not a good idea to burn trash.
4. The purchase decision should be made carefully. 5. Regular collection is a potential SWM remedy.
6. Health risk is a concern as a result of incorrect SWM.
7. Illegal dumping contaminates the water.

The following observations were made regarding the willingness to participate in the SWM programme...

1. The villages disagreed on the issue of waste source segregation.
2. They were prepared to give recyclable materials like plastic bottles if the system was created.
3. In their opinion, composting requires a lot of time and work.
4. They were prepared to cut back on their use of disposable goods.

2.3. Estimation of solid waste generation and space requirement:

At first, information about the population's past and present was gathered through the gram-panchayat. To project the future population, this was crucial. The population information is listed below according to the gram-panchayat..

Year	2002	2012	2022
Population	2550	3864	4500

Table 2.3.1: Population data of study area

The life of the landfilling site should be at least 10 years. So the population forecasting for next 10 years was done. The arithmetical increase method for population fore casting was used to estimate the population after 10 years

Year	**Population**	**Increase per decade**	**Av. Increase per decade**	**Population in 2032**
2002	2550			
2012	3864	1314		
2022	4500	636		

Table 2.3.2: Population forecasting

The forecasted population after 10 years was found to be **5475**.

Along with this the information on current quantum of waste generation was also collected. As per the discussion with the officials the total waste generated per day was in the range of 1400 kg to 1500 kg /day. Using the current population and the data of total solid waste generation the per capita waste generation rate was estimated.

Per capita waste generation = 1400kg/4500 = 0.31 kg/capita/day

The rate was found confirming the data given in manual of SWM published by the GoI.

For estimating the waste generation after10 years the increase in the waste generation rate was assumed to be 10 years.

Per capita waste generation after10 years = 0.31*1.1 = 0.33 kg/capita/day

As per these assumptions the total solid waste generated per day will be estimated…

Per day waste generation after 10 years= 5475 * 0.33 = 1806.75 kg say 1800 kg.

As per Indian context and the information provided in manual of SWM the solid waste consists of 50% organic and 50 % inorganic waste. The tentative density of these waste in discarded basis are as follows…

Organic/ wet waste = 300 kg/m^3

Inorganic/ dry waste = 500 kg/m^3

Average per day waste generated was estimated as follow…

(1400 + 1800)/2 = 1600 kg/day for next 10 years.

The calculations involved in estimating the volume of waste are tabulated below…

Sr. No	Year	Dry waste wt. (kg)	Wet waste wt. (kg)	Dry waste volume (m^3)	Wet waste volume (m^3)	Total volume (m^3)
01	2022	700	700	1.4	2.33	3.73
02	2032	900	900	1.8	3.00	4.80
Av. Volume				**1.6**	**2.665**	**4.265**

Table 2.3.3: Estimation of waste volume on daily basis

The availability of any recycling facility may not be the best choice given the extremely low volume available on a daily basis. So, using a landfill might be a better choice. The conversion of wet/organic waste can be a good option because residents of the study area and the surrounding area engage in a significant amount of agricultural activity. Accordingly, the two following options were determined to be practical.

Option 1:

Landfilling of the waste instead of open dumping

Option 2:

Composting of organic waste and landfilling of inorganic waste.

2.4. Space requirement for option 1: Landfilling of the waste instead of open dumping.

As per the technical procedure of landfilling the first option is to estimate the life of current site which has a size of 30m X 12m near the existing dumping site.

As the terrain observed to be more or less flat, it is proposed to have the trench of 6m deep. The sub-surface consists of hard murum, so good stability can be expected. The excavated material can be utilized as daily cover without any problem. The cell formations in the form of horizontal layer on the available land and covering the same with the layer of murum. The layer of SW of the thickness upto 75 cm will be spread in the trench of size 12m X 30 m on which the layer of murum of 30 cm will be spread. Then the mass will be compacted using the bull-dozer or steel wheel compactor. The solid waste has good compressibility, so the final depth of layer of solid waste will be assumed to be around 40 cm, while the murum layer will be assumed to be reduced to the depth of 20 cm. after complete compaction done at optimum moisture content.

Total volume of murum excavated = 12*30*6 = 2160 m^3

Depth of one layer or horizontal cell formed = 40+20 = 60 cm = 0.6 m

Amount of waste utilized per cell = 30*12*0.75 = 270 m^3

Amount of murum required per cell = 30*12*0.3= 108 m^3

Total no. of cells that can be formed in 6m depth = 10

Total amount of waste landfilled in 10 cells = 270 * 10 = 2700 m^3

Total amount of murum utilized for cell formation = 108 * 10 = 1080 m^3

Average amount of waste generation = 4.265 m^3

Life of current site = 2700/4.265 = 633 days. = 2 years and 9 months

As the current rate is lesser as compare to average rate considering the increase in the future, the current site can have the maximum of 2 years of life.

Now, Considering the 10 year life the space requirement will be much higher, at least six times larger than the current size i.e around 2160 m^2. So gram-panchayat has to acquire the space as early as possible if they want to opt for option of 100% landfilling.

2.5. Space requirement for option 2: Composting of organic waste and landfilling of inorganic waste.

In this option it is expected that the citizens of the village are segregating the dry and wet waste at source. This will make this option much easier and effective. The wet / organic waste will be utilized for the production of organic soil conditioner while dry / inorganic waste will be land filled.

Unlike option 1, only the inorganic waste will be used for cell formation. The depth of unconsolidated waste will be 75 cm, on which a 30 cm layer of murum will be spread. The final consolidated depth will be 60 cm, similar to the option 1.

Amount of inorganic waste utilized in one layer = 12*30*0.75 = 270 m^3

No. of layers formed = 10 …. Similar to option 1

Total amount of waste landfilled in 10 cells = 270 * 10 = 2700 m^3

Total amount of murum utilized for cell formation = 108 * 10 = 1080 m^3

Average amount of dry waste generation = 1.6 m^3

Life of current site = 2700/1.6 = 1688 days. = @ 4 years and 7 months

As the current rate is lesser as compare to average rate considering the increase in the future, the current site can have the maximum of 5 years of life. So at least double space as compare to available space will be needed for fulfilling the need of next 10 years.

2.6 Space requirement for the composting shade

Assuming the time required for composting = 3 months

Total depth of the trench for composting using aerobic composting or windrow composting = 2m

Amount of waste utilized in 3 months = 2.665 * 90 = 239.85 say 240 m^3

Space required = 240/2 = 120 m^2

Providing 100 % buffer…. Total space required = 240 m^2

So additional space of 240 m^2will be required for the composting.

Considering the scenario of next 10 years total space requirement will be as follows…

Space for land filling = 360 * 2 = 720 m^2

Space for composting shade = 240 m^2

Total space requirement = 720 + 240 = 960 m^2 say 1000 m^2.

2.7. Preparation of sub-base for landfilling site:

It is important to have a properly prepared sub-base as the landfill liner is constructed directly on the sub-base. If sub-base is not properly compacted, waste compaction in the first few lifts becomes challenging. In Sandy soils, the general recommendation is to compact the sub-base to 85–90% of the relative density. If there is clay in the sub-base, then consolidation characteristics of the material need to be investigated as well. As in the study area the murum is available such need may not arise at all.

2.8. Leachate collection:

Leachate can be eliminated either by pumping or by using gravity flow. Leachate collected from the landfill may be transported for treatment and disposal off site, or it may be held on site for subsequent treatment. The most common leachate storage solutions include tanks and surface impoundments. Transporting leachate to an off-site facility for treatment and disposal is the most cost-effective choice. Leachate treatment is summarised in the annexure.

2.9.Landfill Gas Management:

Both active and passive gas collection methods are possible. Gas from landfills is released into the atmosphere by passive systems using vents. They are suggested in this situation and are typically employed in smaller landfills. A system for passive gas venting consists of numerous separate gas vents. A passive vent's depth might range from just a few feet below the top to 75 percent of the depth of the landfill. In this instance, one such vent is sufficient.

2.10 Final closer of site:

After completion of designated life the final cover over the whole landfilling site needs to be done as per the closer layer shown in fig. 4.7. A final cover (or cap) is placed on MSW to minimize rainwater intrusion, spread of waste, and odor. USEPA regulations require that the cover be less permeable than that of the liner. Typical side slopes are from 1:3–1:4. They typically consists of a vegetation layer (at the top) followed by a supporting soil later, filter/drainage layer, hydraulic barrier, gas control layer, and a foundation layer.

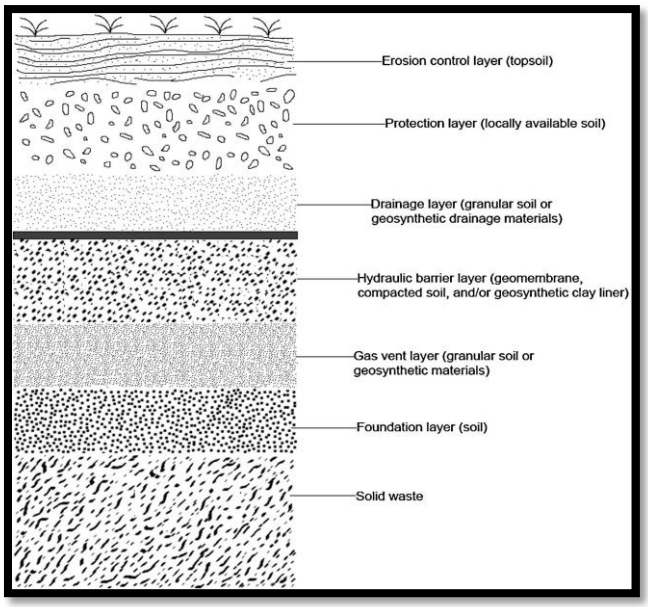


Fig 4.7: Final closer layer for landfilling site

3. CONCLUSION:

1. The villagers of Kandalgaon are in favour of organising the MSW awareness campaign.
2. The option of using organic waste for the production of organic compost or soil conditioner can be extremely helpful for the village of Kandalgaon as it will reduce the space need as well as the product created can be beneficially used by the villagers or can be.
3. They are wiling to reduce the consumption of non biodegradable products.
4. Landfilling is the best method for management of solid waste.

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