



SOLID WASTE MANAGEMENT FOR SAKOLI CITY

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Abstract : There is an increased generation of solid wastes* due to increased population. Organic waste decomposed quickly and releases acrid odors. The discharge of organic waste attracts flies, rats, and other pests. These vectors spread diseases such as typhoid and cholera, and can also cause diarrhea, eye problems, skin diseases, etc. Inappropriate disposal of solid waste leads to choked drains, an increase in contaminated water bodies, an increase in the mosquito population, and many more diseases. All these will affect the human health of the public by reducing life expectancy and increasing infant mortality. The water, air, and surrounding environment have been affected due to lack of management of solid waste. The contaminated solid waste and leachate from solid waste pollute water bodies. The unauthorized burning of solid waste causes air pollution and health problems. Improper solid waste management not only threatens the natural beauty of water bodies, forest reserves, diversity-rich mountains, and beaches but also cities and villages. Littering deface the pleasing beauty of the environment. Cleaner cities are better able to attract private investments and tourists, and thus relate more jobs in the locality. The inflow of investments brings economic prosperity and more revenue to the government, hence satisfactory services to its citizens. This study seeks to assess the better ways to improve solid waste management through improved solid waste storage, collection, and transport processes* before to disposal. The results of this study will add valuable information to be availed to the general public about solid waste collection and transport processes essential elements in solid waste management. Better solid waste management improves the health of all citizens, sustainability of the environment, and beauty of the environment and attracts investors.

Keywords - municipal solid waste, solid waste generation, collection, solid waste management, composting, disposal, reuse, recycle, and recovery...

I. INTRODUCTION

Sakoli is a city as well as a Municipal Council in Bhandara district in the state of Maharashtra (India). It is connected with NH-53 and NH-353C. Sakoli is positioned at 21.08° N ×79.98° E. It has an average elevation of 233 meters (767 feet). It is positioned on Mumbai-Kolkata National Highway 6. Sakoli is well surrounded by lakes, ponds, and hills [of small to medium heights]. Nearly 2-3 km from the city the Chulbhand river flows. The Gondomar Palace is just 10 km away from the city. It is of historical importance due to the presence of Zamindari kingdom memorials* that can still be found today. Two important tourist points, viz., Nagzira National Park and Navegaon Bandh Bird Sanctuary are very close to the city, making* as visitors' the only convenient place. Sakoli is well connected to the major and minor cities. It lies along National Highway 6, which mainly connects Mumbai and Kolkata (via Nagpur, and Raipur). Further cities such as Gondia, Gadchiroli, Chandrapur, etc., are also well-connected through roads and/or rails. Soundad (10 km) & Gondia Junction (60 km) and Nagpur Junction (105 km) are the nearest major railway stations. Another railway station of importance is Saundad (a convenient place to go by train to Gondia and Chandrapur). The nearest airport is Nagpur International Airport (120 km). The city has good education facilities cover from kindergarten to degree program. This city has several schools (Marathi and English), high schools (five Marathi, one English), and one government polytechnic college. Many other degree colleges include B.Pharm, B.Tech, B.A, M.A, B.Sc., M.SC, B-com, M-com, D.Ed., D.Pharm, physical educational institutes, nursing institutes, etc. Sakoli is well known in the Bhandara District for its quality education. Peoples of many religion can be found at Sakoli. A few temples of Lord Durga, Lord Ganesha, Buddha Vihar, and a mosque can be found in the city. The religious festivals, such as to name few, Gudi Padva, Buddha-purnima, Rama Navami, Hanuman Jayanti, Dr. Ambedkar Jayanti, Ashadhi and Kartiki Ekadashis, Gokulashtami, Pola, Ganesh Chaturthi, Durga Puja, Saraswati Puja, Gauripujan, Dasara, Divali, Holi, Muharram, Ramzan Id and Bakri-Id, and few fairs are observed. Sakoli City belongs to the Bhandara district. It is situated on the Northeastern side of Maharashtra state. The total population of the city is 14636 (as per the 2011 census) and the total area of the city is 10.00 Sq.km. The city has 12 Wards. A Detailed study of collection, storage, transport, and disposal of solid waste practices was conducted for Sakoli City. The site has been planned as an integrated facility for Composting, Incinerating, and FSTP plants.

A considerable proportion of organic carbon was found which causes health problems for the dwellers of the city. To avoid this situation small community bins are placed in the nook and corner of the city; in addition, the litter bins are provided as per requirement. Disposal vehicles, Septic tank cleaner machines (suction machines), small auto rickshaws, hand carts, and tricycles are provided to maximize the collection of waste. Still, the services are insufficient, and it is a sincere need to improve the solid

waste. Moreover, the authorities of the municipal council are apathetic towards MSWM. Considering all these aspects such as growing population and Industrialization the strategy should be well developed and formulated.

Chronological development of Bhandara District:-

According to local interpretation, the name Bhandara is a profligacy of Bhandara. Reference to Bhandara is found in an inscription of 1100 A.D. traced at Ratanpur. The district was under influenced administration from 1818 to 1830. Before 1820, the district was administered from Lanji, thereafter the headquarters of the district were shifted from Lanji to Bharara in 1820-21. The area became British Territory in 1853. In 1881 there were only two tehsils viz., Tirora and Sakoli in the district. There were no major changes in the boundaries of the district or its talukas between 1911 and 1955 except that the headquarters of Tirora tehsil were shifted to Gondiya and the name of the tehsil was changed to Gondiya tehsil in 1914. From 1947 to 1956 the district of Bhandara along with the other districts of Vidarbha zone continued to form a part of the central provinces. With the reorganization of states in 1956, the Bhandara district was transferred from Madhya Pradesh to the Bombay State, which came into existence in the same year. In 1960, with the formation of the state of Maharashtra, it formed a part of the newly created state. At the time of the 1961 census, the district comprised of three tehsils, covering 1648 villages and 5 towns. In the 1971 census, the district had 3 tehsils comprised of 1659 villages and 5 towns. In the decade 1971-81, the number of tehsils in the district has remained unchanged till 1st March 1981. But there have certain changes occurred in the number of villages and towns within the district with the upgrading of hamlets/wadis in the district, the number of villages has gone up to 1774, alike, 2 new towns have been added. After the 1981 census, 10 new tehsils were formed and 26 new villages were created. As compared to the 1981 census (1774 villages) number has gone up to 1803, in the 1991 census one more town has been added. Again in the 2001 census, Bhandara district is divided into two districts viz., Bhandara and Gondiya. The new Bhandara district has 7 tehsils, 12 towns, and 864 villages (including 93 uninhabited villages) in the 2011 census.

II. SOLID WASTE MANAGEMENT IN SAKOLI

Sakoli City generated about 3 metric tons of solid waste per day in the year 2016 which has risen to 5 metric tons in the year 2024. All the solid waste brought from every ward in Sakoli is brought to the Municipal Solid Waste facility at Sakoli where it is processed there after sorting it. The plant has a pre-sorting unit, aerobic composting unit, vermicomposting plant, construction and demolition plant, Incinerator and sanitary landfill, etc. To combat this huge amount of solid waste generated, Municipal Council Sakoli has adopted the best way of managing solid waste. Municipal Council Sakoli has abolished the waste bins system and has introduced door-to-door collection of waste through "auto tripper vehicles" with the song (gadi wala aya ghar se kachara nikal) from 2018. In total auto trippers, more than 7 regularly receive waste from householders which are sorted out the recyclable material from it, and it is sent through recycling to the recycling industries. Municipal council Sakoli has established a plant for converting garbage into valuable compost or manure. The collected solid waste is transported to a compost plant where it is manually or mechanically segregated and processed to produce fine-quality compost. 40% non-biodegradable material which cannot be converted into compost. It is transported for recycling purposes to the industries and the remaining hazardous waste which is sanitary waste is burned and the remaining portion in the form of ash is dumped at sight. The production of compost manure is sold in the market which gives net profit. This project of Municipal Solid Waste Management has made the city free from waste bins system.

1. Chief sources of solid waste generated in municipal areas:-

- a) Household Waste
- b) Commercials.
- c) Street sweeping
- d) Hotels and Restaurants
- e) Construction and Demolition
- f) Sludges and Scales.

2. Classification of Solid Waste:-

- a) Biodegradable wastes- Garbage (putrescible waste), food, vegetables, and meat.
- b) Non-biodegradable wastes- Rubbish (non-putrescible waste) either combustible or noncombustible. Rubber, wood, paper & glass, metals, ceramic.
- c) Agricultural waste- farm animal manure & crop residue
- d) Construction and Demolition waste
- e) Hazardous waste – Sanitary waste

III. COLLECTION OF SOLID WASTE IN SAKOLI CITY (MH) INDIA

MC Sakoli has the collection and transportation of solid waste in the 12 wards of the city. The collection and transportation include door-to-door collection of solid waste through auto tripper and transported to the Municipal Solid Waste Treatment Facility. Solid waste is collected from 7605 households of 12 wards of the city through 7-10 auto trippers and ownership of the auto tripper is with MC Sakoli.

(Table 1: No. of establishments covered by door-to-door service)

Sr. No.	Establishment type	Total No.
1	Households	7605
2	Hotels and Restaurants	20
3	Commercial Establishment	18

(Fig 1.1 Solid waste collected by auto tripper vehicle)



IV. PROCESSING UNITS OF WASTE IN SAKOLI CITY (MH) INDIA

1. Waste segregate unit: - It is a manual segregation system for incoming non segregated MSW with the capacity of 18 TPD and it consist of two lines with all requirements and materials. After mechanical segregation, compostable material will go to windrow composting, a material with calorific value goes to the RDF plant and inert will be further processed at the Inert processing plant

2. Aerobic Composting Unit: - Composting is done through the windrow composting method and sheds have been constructed for windrows. Today out of the total MSW 25 to 30 % is converted into compost. The compost has already become popular amongst the farmers within a 100 km radius of Sakoli. By maintaining the budget line with necessary backup support, the entire quantity of compost will be marketable in this belt. Once segregation at source is practiced then the quantity of generation of compost will increase up to 30 to 45 % of total MSW.

3. Inert processing unit: - Inert processing unit, with a capacity of 3.3 TPD, comprises of mechanical sieve and air density separator. The main purpose of an inert processing plant is to recover the construction material from the waste and to recycle it by selling or utilizing it for in-house construction activities. This is mainly to minimize landfill burden on O&M cost and also saving of land.

4. Compost leachate tank: A compost leachate tank with a capacity of 0.3mld leachate or 8 TPD organic wastes has been installed for the treatment of leachate coming out from the windows, the solid waste dumps and sanitary landfill site. Proper arrangements for the collection and transportation of leachate have been made. As leachate is primarily generated in monsoon season and during other periods, the same plant is utilized for biogas generation from organic waste. The power is generated through the plant and utilized for the operation of pumps at the MSWM facility.

5. Incinerator: - For burning small quantities of sanitary waste nearly 5-7%

(Fig. 1.2 Material flow diagram proposed)



(Fig. 1.3 Map of showing SWM Centre Sakoli)

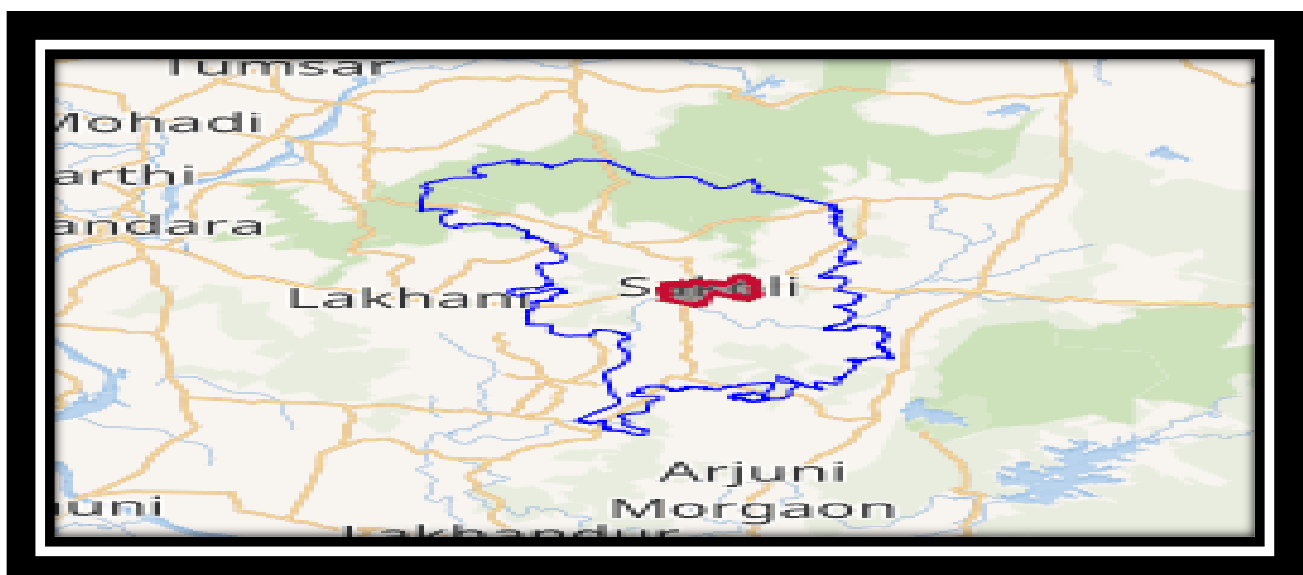
V. DISPOSAL METHODS & SITE IN SAKOLI [MH] INDIA

1. Methods of Dispose of Solid Waste-

In municipal council Sakoli, whatever solid waste is collected, is sorted into two major types one is the waste that is not useful for any good purpose i.e. rejects non-recyclable materials, it collects in the landfill. It is known as "Non-Biodegradable solid waste". The second one is the waste which is utilized for any good purpose, it is sorted out separately i.e. it is used to make manure. This method is known as the "Decomposition of solid waste" or "Biodegradation".

2. Reduce/Recycle/Reuse of MSW Streams in Sakoli:

A. Glass, paper, metal: A substantial amount is collected by auto tripper workers and informal rag pickers and this is further handed over to scrap merchants in the city. B. Organic Waste: Organic waste is segregated at the processing facility through the mechanical segregation process and it is then converted to compost through aerobic composting. Most of the organic waste is converted into compost and sold to farmers. Waste from permanent and temporary vegetable markets is collected and transported to the composting plant and reused as organic manure. C. Construction Debris: MC Sakoli has identified sites for dumping the construction debris. This waste stream is currently not entering the MSW stream. The responsibility for disposing of the construction debris is with the waste generators and not with the Council. D. Street Sweeping/ Drain Cleaning: This material is collected by the safai karamcharis and transported to the auto tripper in the respective wards.



(Fig.1.4 Process Flow of Current Municipal Solid Waste Streams in Sakoli)

VI. RECOMMENDATIONS

The generation of waste cannot be stopped completely, but by adopting certain practices it can be disposed of effectively. If the waste is not disposed of properly, it may cause health problems to humans and animals. Incineration and landfills can cause air pollution and soil pollution. Due to landfills, leachate forms contaminate surface and groundwater, and as a result, various water-borne diseases spread all around. The heaps of garbage reduce the aesthetic beauty of our towns and cities. Plastic waste chock up the drainage lines meant for the flow of water. For effective solid waste management in the city, it is important that both municipal authorities as well as citizens actively participate in waste management.

A. Community/ Citizens Role:-

- To separate the wet waste and dry waste.
- To reduce, reuse, and recycle the waste.
- To stop throwing waste into drainage lines as it is not designed for solid waste.

B. Municipal Council Role: -

- To provide and maintain necessary infrastructure for waste management, if required through projects.
- To design an innovative waste management system that is sustainable and economically beneficial.
- Provision of health gear to Safai Karamcharis.
- Regular monitoring and field visits of the officers.

C. NGO Roles: -

- Public awareness of the situation of waste management.
- Make sure and observe the situation in the city.

D. Composting Pot at Home: - Composting is one of the most effective ways to minimize the amount of garbage our family sends to landfills. Around 30% of what we throw away is food scrap and yard waste, says the EPA (Environmental Protection Agency). Not only does this reduce methane gas, which is a major factor in global warming gas but composting also controlling bad odors. And the biggest payout we'll be left with is a rich fertilizer we can use in our garden or donate to our favorite cause. We prepared a composting pot at home. The organic waste from houses such as vegetable peels, fruit peels, etc. is used in the pot. The benefit of this composting pot is that we can reduce our kitchen waste at home without using many resources. Along with it, the benefits of composting pot are:-

- We can reduce our kitchen waste at our home.
- The compost can be used as a natural fertilizer to nurture soil for gardening of flowers.
- Less load on municipal authority
- No transportation of kitchen waste
- Economical
- No large space is required.

We can add almost anything from our kitchen and garden:-

Some surprising organic materials include eggshells, cut flowers, coffee grounds (and paper filters), old newspapers, tea and tea bags, etc. The only disadvantage is that it produces a bad smell if composed in a plastic plant.

VII. FUTURE SCOPE

The state has positively adopted the SWM Rules 2016 in totality and is working towards scientific management of solid waste in ULBs of the state. The state has a robust solid waste management policy by the Solid Waste Management Rules 2016 and lays stress on 100% segregation, collection transportation & processing of wet waste through composting, bio-mechanization, etc., Dry waste recycling, reuse and recovery through establishing Material Recovery facilities, Landfilling of inert, Processing of legacy waste through biomining. ULBs are practicing segregation of waste at source and adequate provisions are made in Solid Waste Management DPRs for achieving 100% segregation of waste at source. ULBs in the state segregate waste into three categories wet, dry, and domestic hazardous waste. Source segregation of waste is a statutory requirement as per the MSW (M&H) Rules, 2000. Mixed wet and dry waste loses value and makes it very difficult to handle the waste or to segregate it further. There is a thus need

to segregate waste at the source into wet and dry fractions. Wet waste can be defined as vegetable peels, food waste, garden waste, etc. Dry waste can be defined as metal, paper, wood, cloth, etc. Segregated waste is easier to handle by the waste collectors. Treatment of segregated waste is less energy intensive, reduces the burden on the environment, improves the quality of compost, and increases the production of compost and recyclables. There is a further need to segregate and separate Hazardous and Hospital waste as per the MSW (M&H) Rules 2000, Hazardous Waste Management Rules 2008, and Biomedical Waste (M&H) Rules 1998. In the future there is scope for improvement in the selection of a proper system of collection & disposal. The Number of vehicles should be increased and the equipment required for the processing plant should also increase for the smooth functioning of the processing plant.

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