

Sustainable Solid Waste Management Strategies for Chaibasa Town

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Abstract:

The management of urban solid waste is one of the major problems faced by Indian cities and towns. Day by day, waste volumes are increasing, and municipal authorities are unable to scale up the facilities needed for proper management. Garbage is littered all over the roads and footpaths in many cities and towns. In India more than 50% MSW is buried in landfill sites. Eventually, some waste rots and some do not, and it works and produces methane gas in the process, which is very volatile and adds to the greenhouse effect. The study in this paper presents the review of current solid waste management practices for Chaibasa town and suggests sustainable strategies to manage the same.

Keywords: Municipal Solid Waste Management, Sustainable Solid Waste Management, Municipal Solid Waste Management, Circular economy.

1. Introduction:

Waste- 'Any product that constitutes waste material, effluent or other unwanted surplus arising from the use of any substance that has been destroyed, worn out, contaminated or otherwise ruined and that needs disposal,' according to the United Kingdom Environmental Protection Act (1990) [1].

According to the Resource Conservation and Recovery Act, solid waste, waste, sludge from wastewater treatment plants, water treatment plants, air pollution control plants, industrial waste, and other discarded materials, including solid, semi-solid, liquid, or contained gaseous materials resulting from industrial, commercial, mining, agricultural, and community activities (RCRA). There is some kind of waste that leaves almost everything we do behind. Not only is the concept of solid waste restricted to waste which is physically solid. Solid, semi-solid, or other gaseous materials are many solid waste products [2].

Municipal Solid Waste (MSW)-According to the United Nations Environmental Program (2009), Municipal Solid Waste is a form of waste that primarily includes household waste, often with the addition of industrial waste collected in urban areas for which municipalities are generally responsible for the final disposal of the collection [3].

Municipal solid waste management (MSWM) is a strategic planning and execution practice. Collection and segregation, transport, refining, recovery and recycling, and disposal are included [4]. The primary aim is to protect the health of the people, promote environmental quality, establish sustainability, and promote economic productivity under local government authority [5].

1.1. Source and Type of Municipal Solid Waste

There were various classification requirements to categorize urban solid waste constituents. Some of those parameters may be categorized into organic or inorganic, combustible, or non-combustible, putrescible, or non-putrescible, on the basis of the nature of products that constitute solid waste. Categorized solid urban waste as household, garbage, institutional waste, street sweeping, waste from commercial areas, as well as waste from building and demolition [6].

Domestic solid waste: waste from household tasks such as food storage, old clothing, laundry, furniture and newspaper waste, garden waste, etc.

Commercial waste: waste from stores, restaurants, offices, etc. and consists mostly of products for packaging and food waste [7].

Institutional waste: waste from schools, government departments, hospitals, etc., including infectious and hazardous materials, as well as hospital and clinical waste.

Industrial waste: Industrial waste depends on the type of industry that is involved. It consists of kitchen food waste, canteens, plastics, paper and metal products, packaging materials, etc.

Sweeping the streets: dust, soil, etc. Street sweeping in developing countries often includes household waste dumped along highways, drain cleaning, animal manure, etc.

1.2. Strategic SWM plan

Highest level is the policy plan established by the national government and next lower level is the strategy plan which should operate from the framework of the policy, it is divided into two parts, strategy which provides the strategic vision for next few years where we want to reach and the action plan which sets out the detail actions over the years to realize that vision [1]. Therefore, the strategic plan can be defined as a guideline document which determine the need and priorities and necessary action to be taken to develop the solid waste management practices. Finally, the operational plan, detailed implementation of the strategy required it takes the action plan to the higher level of detail.

1.3. Household Participation in Waste Management

Communities in many parts of the world appear to be seen as passive recipients of government programs and are sometimes ignored even in local decision-making processes (Tadesse, 2006). There are many solid waste management methods across the globe, involvement for better solid waste management may be a missing link. There is also a rising consensus on the issue of solid waste from the immediate stakeholders. In this case, to deal with this problem that has far-reaching implications on the environment and human health, individuals need to join hands with the authorities. Urban waste volumes have increased in particular due to the rising urban population, factory concentration, resident consumption and inadequate financing and waste collection and disposal facilities [8]. This state of affairs has caused the quantity of solid waste generated to go beyond what the available facilities can handle. Participation as a concept came to the fore as a consequence of campaigning for the end of top-down growth intervention policies in favor of greater inclusion of the subjects of development initiatives. Although participation is usually regarded to be a voluntary mechanism, it effectively enables individuals to be drawn into activities that are of no interest to them, but, in some cases, are coerced in the name of participation. The level of public engagement in the management of solid waste differs greatly between developed and developing countries [9].

1.4. Challenges faced by households in sustainable waste management.

Depending on the approach chosen for this reason, and the characteristics of the household in a specific area, the process of household involvement in solid waste management is complicated by many factors. Some individuals see the work of community-based organizations as an additional voluntary activity to which they are not prepared to contribute entirely. If such a mentality prevails, systems typically fail without someone operating and controlling them on a full-time basis.

1.5. Study Area: Chaibasa Town

Chaibasa is a town and a municipality in West Singhbhum district in the state of Jharkhand, India. Chaibasa is a district headquarter of West Singhbhum district. Chaibasa town has a population of 50,000 (2020 estimation). When the old Singhbhum District was bifurcated in 1990, West Singhbhum district came into being. West Singhbhum was once again split into two sections in 2001. Saraikela-Kharsawan district has now come into existence with 9 blocks. The town of Chaibasa is the headquarters of the West Singhbhum district in the state of Jharkhand and has a municipality that came into existence in 1875. West Singhbhum has 18 blocks and three administrative subdivisions. The Chaibasa municipal boundary was altered in 2013 and the 26 municipal wards were reduced to 21 municipal wards.

The West Singhbhum district forms the southern portion of the Jharkhand State and is the largest district in the state. The neighborhood is situated 244 meters above sea level and has an area of 5351.41 sq. The district borders the Khunti district to the north, the Saraikela Kharsawan district to the east, the Keonjhar, Mayurbhanj and Sundargarh districts of Orissa to the south, and the Simdega and Sundargarh districts to the west (in Orissa). The longitude and latitude of Chaibasa are 22.5474 ° N, 85.8025 ° E (refer figure 1.1)

Chaibasa Municipal Corporation covers an area of about 4.27 sq. km as per new revised boundary with a population of 69565 (2011 census) and population is 50,000 (2020 est.). Chaibasa is located at 22.5474° N, 85.8025° E, at the southernmost part of the Chotanagpur plateau. The average altitude is 222m above the sea level. The Roro River lies at the periphery of the city and the other towns mainly Saraikela are located on the east of the town.

Chaibasa is known for agricultural trade centre. The town also acts a gateway of the mineralized sector of West Singhbhum as the district is well equipped with mineral resources.

1.6. Analysis of Municipal Solid Waste Management of Chaibasa Town

- Assuming that 20% of the waste that is 4.8 MT is not collected by municipal corporation. So the total waste generated by the Chaibasa town is 28.8 MT per day.
- As per population projection 2041 Chaibasa will generate 51 MT of solid waste.
- Chaibasa town generates almost half amount of waste compare to Ambikapur town and also process
- 5.56 % of waste at household level. And in Chaibasa town no one yet to start household processing. Table 1.1 represents the current status of MSWM in chaibasa town.

Table 1: Current status od MSWM in chaibasa town

Secondary Source	Municipal Corporation Data	Primary Survey
Peoples separate dry waste and wet waste at their home	Quantity of solid waste collected is 24 MTper day. Total No. of households / establishments =10116 80% Percentage of HH practice storage ofwaste at source at domestic bins	Still 100% source segregation is not practiced due to lack ofawareness.



Figure 1. 1. Location map of Chaibasa

2. Methodology

The methodology for the present study includes study of current practices towards municipal solid waste management. Detailed study of a selected area, Chaibasa town is carried out to understand the sustainability of the current practices and suggestions on the same is provided towards the sustainable management of the generated municipal solid waste in the chaibasa toen region. The detail methodology is presented through figure 2.1.

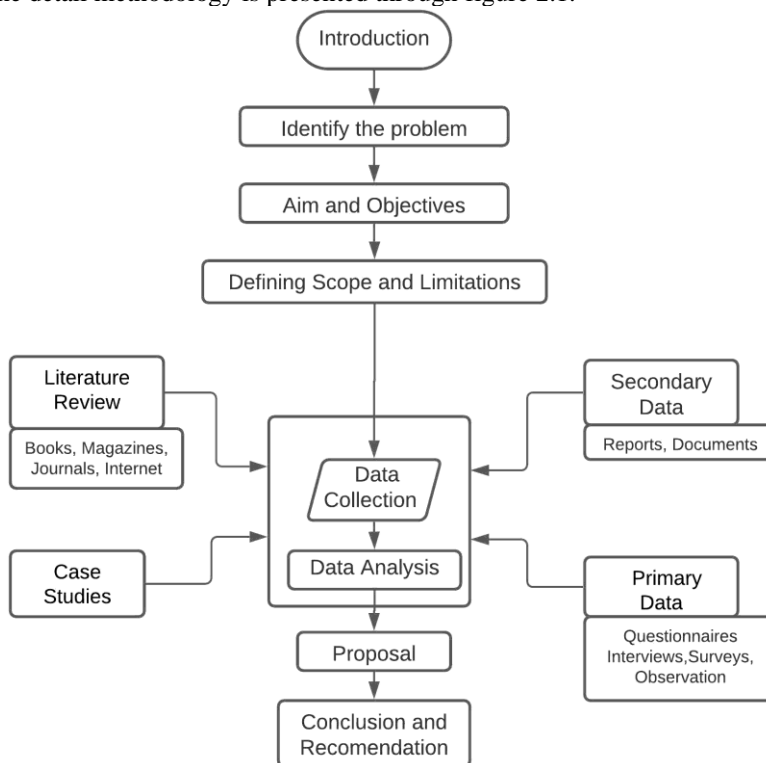


Figure 2-1: Methodology

3. Result and Discussion

Problem Identification

1. Door to door collection vehicles are not coming on regular basis. Existing numbers of vehicles couldn't able to collect waste from every household and shops.
2. Some wards are left over, no proper cleanliness of roads and drainages
3. Both wet and dry waste is dumped in landfill site, no processing is done at all. If peoples will have a knowledge of this practice than why peoples bother to segregate their waste at the first place?
4. Pit composting is not in working condition. Municipal corporation attempted to process but couldn't sustain.
5. Municipal corporation don't have their own material recovery facility(MRF) or SLRM centre

Public Awareness Campaigns

Public Awareness Campaigns need to be conducted through the town for improving segregation at source and recycling of waste.

From the case of Coimbatore Guinness Championship Campaign 2015, we know that was one of the largest recycling lesson at a single venue.

Resource recovery was 6% due to lack of awareness, training of collection crews and absence of appropriate methods. Campaign aim was to bring awareness and do capacity building of all stakeholders including municipal staffs, citizens, civil society organization with a key emphasis on students at schools and colleges. Its objective was to create a more sustainable solid waste management system focusing on resource recovery and recycling.

The Campaign event was widely publicized through various media

- Design of awareness leaflets
- Website to make people aware
- Announcement of FM radio
- Provision for registration
- Missed call for event registration
- WhatsApp group messages

Final electronic count of participants stood at 12994.

One of the most important aspects of this campaign was the recommendation that students take the contest card home with them and practise for seven days after the session. They were told that for most of the wards, 1200 postcards with six kinds of source segregation had been forced into duty for a litter-free and bin-free system.

Result of the campaign

- Recycling rate has increased from 6% to 23% in few months
- Dumping of recyclable and compostable waste was reduced by 23% or nearly 120+ tons per day
- This campaign encouraged other campaign like zero waste wards, happy streets campaigns and no food waste campaign-feed the need.

Collection and transportation

To improve collection of waste from door to door; three wheeled motor van can be introduced in every ward. A small charge varying from Rs 10 to Rs 20 per month is to be levied for the services provided. The collected rubbish will be transferred to waste transportation vans with separate sections for biodegradable and non-biodegradable waste. Non-biodegradable garbage should be disposed of in a landfill, while biodegradable waste should be composted.

Spatial allocation and modification of composting process.

As per the current scenario of the Chaibasa town there is no composting process is running condition. The attempt was made by municipality to run pit composting at 5 different locations but they failed to maintain and unfortunately the compost plant got shut down.

The factors affecting composting plant are investment, maintenance, space, time and labor. There are some composting techniques that can be adopted as per advantages and disadvantages as per requirements of Chaibasa town (refer figure 3.1).

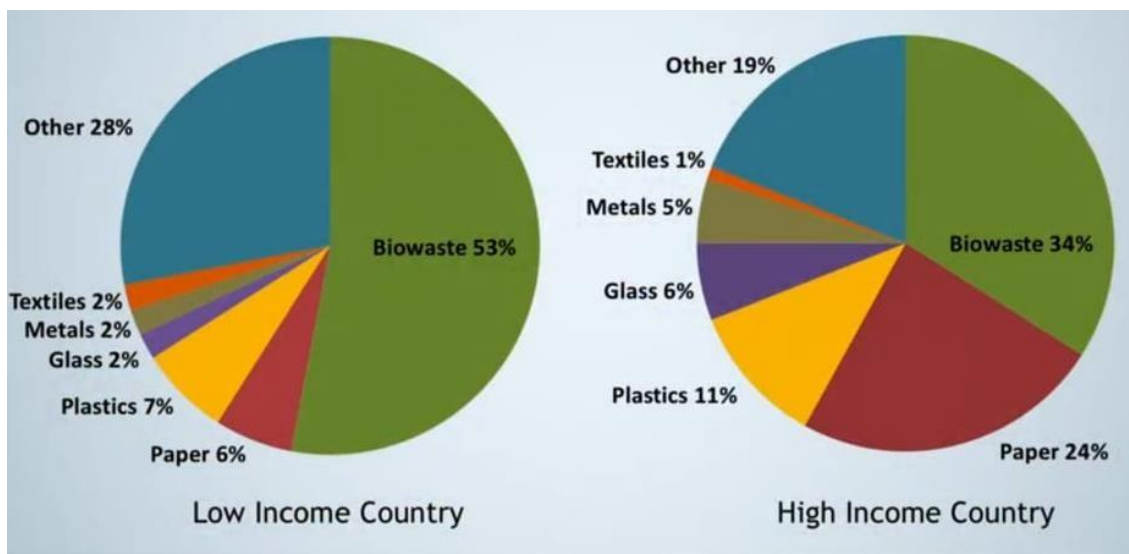


Figure 3.1. Shared of bio waste in municipal solid aste

In case of Chaibasa town bio waste is 53% (as per low income country). Chaibasa generates 15.2 MT of bio waste per day.

Ambikapur earns Rs1.24 crores annually from the sale of compost made from wet waste (27 MT of bio waste per day). So Chaibasa can earns approx. Rs 60 lakh annually from wet waste (15.2MT of bio waste per day)(refer figure 3.2)

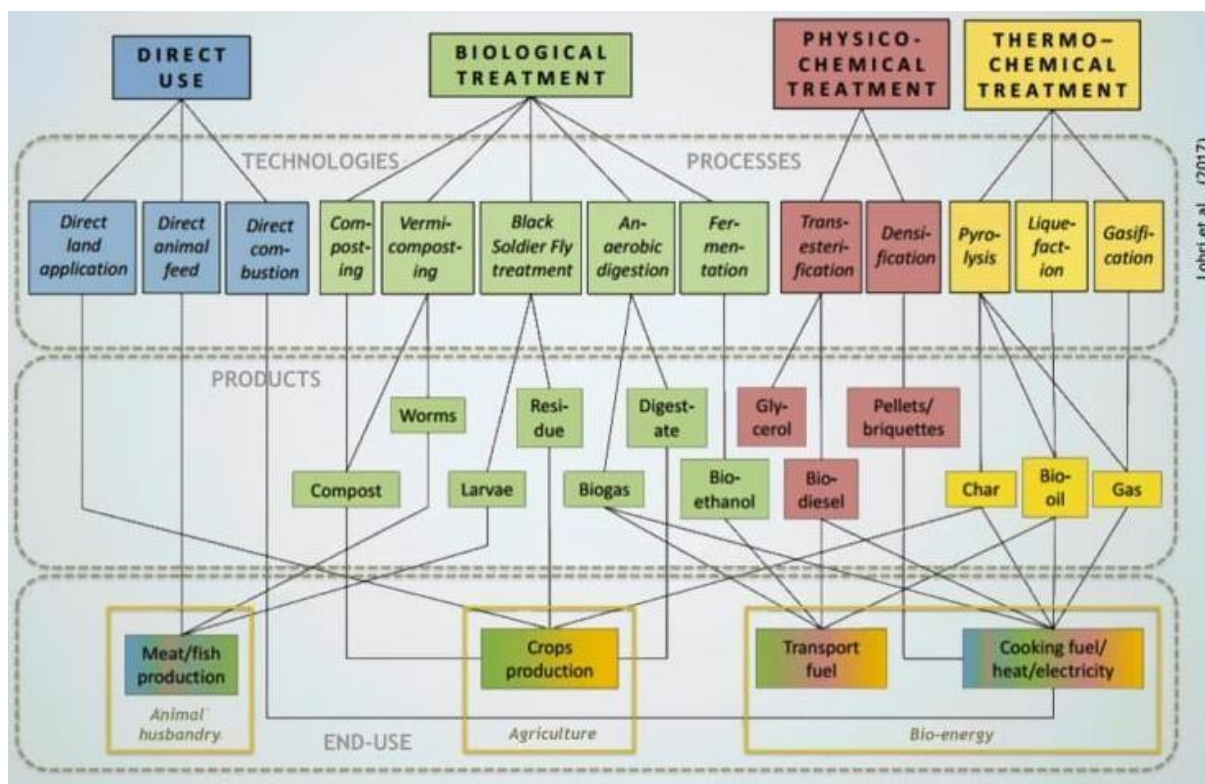


Figure 3.2. Bio waste treatment Technologies

Spatial allocation of one Solid & Liquid Resource Management (SLRM) centres in the Chaibasa town.

3.2 MT of dry waste recovered at 4 MRF centres in the Chaibasa Town. Approximately 10.4 MT of drywaste per day is not recycled and dumped in the landfill site.

Ambikapur recycles 98.87% of total collected dry waste by centralized or decentralized processing. And earns Rs84.81 lakhs annually through selling recycling products. (24 MT of dry waste per day)

Chaibasa has also a potential of earning approximately Rs35 lakhs annually through selling recyclable products. (10.4MT of dry waste).

Potential site for the SLRM centre identified is near to landfill site.

- Space available to construct SLRM center and also space for future expansion
- Fuel consumption will be minimum because location is on the way of waste collection vehicles
-

Proposal for sanitary landfill

Landfilling is not a long-term solution. We don't actually process the garbage; instead, we keep it in a secure environment. The consequences of a landfill on water will be long-term. However, in most situations, there are other options, and landfill is the only inexpensive option for the coming year, so we must create and maintain a decent landfill to safeguard human health and the environment to the greatest extent feasible.

Chaibasa don't have landfill site but only dumpsite which is causing problems like everywhere: we have fire, water contamination, noxious smokes, strong odors, health danger for humans and animals, represented in figure 3.3.

This needs to be stopped and can be stopped.

- measure to take for a good operation is to close the site and limit access.
- Reduce the garbage disposal surface area.
- Every area that is not in use must be covered, and the working space must be kept to a minimum. This will reduce the presence of animals, as well as their water infiltration and leachate output.
- It is critical to have a non-active zone cover, which might be made of inert or earthy materials.
- Compaction should be done in the surface of the landfill
- Ensure a slope stability with a slope of one is to three
- Providing vertical drainage for gas
- Good drainage system should be provided for landfill.



Figure 3.3. Chaibasa current Dumpsit

4. Conclusion

This study evaluates the current solid waste management system in the Chaibasa municipal region. Waste generation, garbage disposal procedures, waste collection, transportation, and dumping are all major aspects in this analysis. demonstrates that Chaibasa's existing solid waste management system is unsustainable. The local administration has started a solid waste management transition process that, if successfully handled, has the potential to grow over time. The following are some of the study's general conclusions.

Current system

The current solid waste management system is unsustainable in the long run. In every ward, trash is not segregated at the source, and waste collection and transportation are not done on a regular basis. The collection and transportation methods are primitive, posing a risk to both humans and the environment. People in general have a habit of dropping trash on street corners. The municipality currently does not provide for composting or recycling of solid waste. Recycling is entirely carried out by private actors, which is inefficient, harmful, and dangerous. The municipality of Chaibasa does not have a sanitary landfill, thus both wet and dry garbage are dumped in the open. Waste employees are not protected by any safety measures, and the municipality does not provide basic services such as immunisation and the provision of suitable clothing and equipment.

Understanding sociocultural and geopolitical context of Chaibasa town and understanding their strength and weakness, and problems associated with current waste management systems and practices, some suggestions were made based on the understanding of the problems and literature review. These suggestions have the potential to improve the long-term viability of the solid waste management system in small.

This research endeavours to include a holistic view of the solid waste management situation in Chaibasa town. There had been no previous research or studies on the solid waste management system in Chaibasa before to this study. This research has filled in some of the gaps. However, a thorough assessment of the problem that takes into account geographical, environmental, and socioeconomic factors could aid in the establishment of new knowledge paths.

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