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## Municipal Solid Waste Management System for Ujjain City – A Review



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**Nikita Sharma<sup>1</sup>, A. K. Dwivedi\*<sup>2</sup>**

*1. Research Scholar, Ujjain Engineering College, Ujjain*

*2. Professor, Head of the Department of Chemical Engineering, Ujjain Engineering College, Ujjain*



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### ABSTRACT

Now a day's population growth, urbanization, economic prosperity etc. lead to a sustainable increase in MUNICIPAL SOLID WASTE Quantities. A higher polluted country like India generates a high amount of municipal solid waste not only in quantity but the composition also diverse inside the country. This study investigates the green cleaning of the municipal solid waste generated in municipal areas of Ujjain district present in Madhya Pradesh, India. Ujjain is selected for this study because of lack of knowledge of legal regulations and public participation; there is practically no separation at collection places and households. This leads to a higher concentration of putrescible domestic wastes resulting in less calorific value of municipal solid waste as compared to municipal solid waste of developed countries. The wet municipal solid waste from households of 54 wards of Ujjain city also adds to a large volume, decreasing the calorific value of the energy generation done from Solid waste. Nearly 225 tonnes of total municipal solid waste is been generated in Ujjain City daily.

## 1. INTRODUCTION

The Solid waste management is one of the most essential services for maintaining the quality of the life in the urban areas and for ensuring better standard of health and sanitation. In India, this services falls short of the desired level as the system adopted are outdated an inefficient institutional weakness, shortage of human and financial resources, improper choice of technology, inadequate coverage and lack of short and long turn planning are responsible for the inadequacy of service. The city of Ujjain is also having these deficiencies in varying degrees and there is need to make substantial improvement in the SWM practices prevailing in the city to raise the standard of health, sanitation and urban environment keeping pace with the rapid urbanization and growing population. The adverse effect environment due to lack of scientific management of waste disposal is well known. These are underground and surface water pollution, air pollution due to bad odour of the waste, greenhouse gases, harmful effect of rate stray animals flies, mosquitoes, germs and other insects, increase in acidity of soil near the garbage heaps, probability of diseases and epidemics etc.

In the preparation of an environmentally compatible MSW plan, it is a prerequisite to understanding linkages and interactions that exist between different components of the urban environment. Secondly, the data collected on different aspect of the urban development. Thirdly, there is also a need to aggregate this information according to administrative/natural and hierarchical unit. To keep these environmental problems in mind, new practices viz. the device cost effective systems for primary collection of waste, the efficient system of day-to-day cleaning of streets and public places, the device system to element the age old practice of throwing garbage on the streets or outside the dustbins causing nuisance to the people and posing a threat to the health of the community at large, the modernization of the system of communal storage of waste which may synchronize with the system of primary collection as well as transportation of waste and simultaneously eliminate manual mechanical loading of the waste into open transportation vehicles are being suggested. The new system also includes the improvement of the system of transportation of waste by following the principle handle waste once only and the promotion of the processing of waste for deriving Bio-organic fertilizer reduce quantity of waste going to landfill site, derive income from the processing of waste and help agricultural production to insure safe disposal of waste and effective cost recovery.

## 2. Present Scenario of SWMP in Ujjain

The most of the population does not store the waste at source and instead dispose the waste into the municipal bins, streets, open spaces, drains etc as and when waste is generated. Segregation of recyclable waste is generally not practiced. Most of the recyclable material is disposed of along with domestic and trade waste. Therefore recyclable waste is generally found mixed with garbage on the streets, into the municipal bins and at the dumpsites from where part of this waste is packed up by the rag pickers. There is no system of door to door collection. The details of present scenario of solid waste management scenario of solid waste management practices are details as under:

### **Administrative setup:-**

The municipal corporation's administrative is under the control of municipal commissioner. His appointment is made by the state govt. he is assisted by a workforce of municipal officers and other employees to discharge the function of corporation.

**Storage of waste at source:-** Most of the population does not store the waste at source and instead dispose of the waste on the streets open spaces, drains; etc as and when waste is generated.

**Segregation of recyclable wastes:-** Segregation of recyclable wastes is generally not practiced. Most of the recyclable material is disposed of along with domestic and trade waste. therefore recyclable waste is generally found mixed with garbage on the streets, into the municipal bins and at the dumpsites from where part of this waste is packed up by the rag pickers.

**Primary collection of domestic, trade and institutional waste: -** There is no system of door to door collection of waste nor adequate community bins for the collections of waste people throw the waste on the streets which is collected through street sweeping. Street sweeping is thus the only method of primary collection of waste.

**Hospital and nursing home waste:-** There are twelve hospital and nursing homes in the city having 500 beds. Hospitals have joined to dispose off their waste and having applied to pollution control board for deep burial permission. Deep burial of waste may lead to groundwater contamination. An option for incinerator facility must be explored. some

pathology labs, small nursing homes dental clinic, clinics and dispensaries still throw their waste with municipal solid waste.

**Construction waste:-** There is no system of primary collection of construction waste generally the people dispose of their construction waste on the streets or near their building.

**Street Sweeping:-** The main system of primary collection of waste is street sweeping. The old city area is divided into beats. Some roads are cleaned each day and some are cleaned periodically, such as twice a week or once in a week.

**Three Tier System of Street Sweeping:-** A team of three members works for street cleaning. One person sweeps the street, other clean open drain and third picks up the waste in the cart. This combination cannot work successfully as all the members of the team do not remain present on all the days as the absenteeism among sweepers is very high.

**Working Days:** - Street sweeping is not carried out on all days of year. No cleaning is done on public holidays and Sundays. A skeleton staff is kept on holidays to clean certain market areas and transportation of small quantity of waste is done.

**Work Norms:-** The street sweepers on an average are given 7000 sq. feet of sweeping area the working hours are from 6:30 am to 12: 30 pm and 3 pm to 6:00 pm they sweepers are given traditional wheelbarrows @1 barrow for 6 sweepers, long and short handle brooms besides handcart for a team of 3 workers.

**Quality of Waste Generated & Transportation:-** It is an estimated that 80 M Tonnes of solid waste is generated in the city each day which is collected through street sweeping and from the communal waste storage sides. The quantity of waste generally transported each day is 75 tons /day.

### **3. RECOMMENDED MEASURES**

Solid waste generating from household, shops and establishment should not be allowed to be disposed of on the streets, footpaths, open spaces, drains, water bodies, etc and instead the waste should be stored at the sources of generation. Out of the waste generated recyclable waste should be stored separately and primary collection system should ensure either doorstep collection community based collection. This collection system should also

synchronize with communal waste storage facility and transportation of waste in such a manner that multiple handling of waste is avoided and waste only lands up at the processing or final disposal site.

The organic waste should be processed to make bi-organic fertilizer and only rejects should be landfilled in an environmentally acceptable manner following sanitary landfill regulations. Decentralization of administration, adequate delegation of administrative and financial powers, training of staff, private sector participation levy of penalties and adequate health care measures are recommended to make the SWM system efficient and effective.

The following specific measures recommended for improving and modernizing the Solid Waste Management Practices in the city:

### **I]. Household**

All Households may be directed that they shall not throw any solid waste in their neighborhood, on the street, open spaces and vacant plots or into drains. They shall keep the food waste/Bio-Degradable as and when generated, in any type of domestic waste container, preferably with a cover. The use of a Metal or Plastic container with lid is advised for the storage of food/bio-degradable/wet waste. A container of 15 liter capacity for family of 5 members would ordinarily be adequate. A private society, association of flats/multistory buildings etc shall provide a community bin facility for the members of their society/association for storage of domestic wastes and instruct residents to deposit their domestic waste into it. Further, In slums, where because of lack of access or narrow lanes it is not found convenient to introduce house to house collection system. Community bins of suitable size ranging from 40 to 100 liter capacity per 10 to 25 houses may be placed at suitable locations by them. They may be to facilitate the storage of waste generated by them. They may be directed to put their waste into the community bins before clearance at each day.

### **II]. Shops/Offices/Institutions/Workshops etc.**

All shops and establishments may be directed that the Shops, offices, institutions shall refrain from throwing their solid waste / sweeping etc. on the footpath streets open spaces etc. They shall keep their waste on site as and when generated in suitable containers until the time of

doorstep collection. The size of container should be adequate to hold the waste they normally generate in 24 hours with 100% spare capacity to meet unforeseen delay in clearance. They shall keep hazardous waste separately. The association of private commercial complexes /multistory building shall provide suitable lift able bin which from where waste can be transferred into the community bin.

### **III]. Hotels and Restaurants**

They shall also refrain from disposal of their waste into municipal street bins or containers. They shall store their waste in containers of not more than 100 liters capacity. The container should have appropriate handle or handles on the top or side and rim or at the bottom for ease of emptying. In case of large hotels and restaurants wherein may not be convenient to store waste in 100 liter or small size containers, they may keep larger containers which match with the primary collection and transportation system that may be introduced in the city by the urban corporation to avoid double handling of waste.

### **IV]. Vegetable/ Fruit Markets**

The association of the market should be directed to provide large size containers which match with the transportation system of the corporation. The most of the area have weekly haat bazaar. Corporation should deploy extra vehicle on the days of haat bazaar and on the next morning of the haat bazaar for picking up the waste. The shopkeepers may be directed that they shall not dispose of waste in front of their shop/establishment or anywhere on the street or in open spaces and instead shall deposit their waste as and when generated into these large size container that may be provided for the storage of waste in the market.

### **V]. Meat and Fish Market**

The corporation may provide large closed body containers at the rate of one container per market for the storage of waste and direct that the shop-keepers shall deposit meat and market waste in different containers provided by the corporation on day to day basis.

### **VI]. Street Food vendors**

All street food vendors may be directed not to throw any waste on the street or pavement. They must keep bins or bags for the storage of waste that generates during their activity.

Their handcarts must have a shelf or canvas below for storage of waste generated in the course of business.

#### **VII]. Marriage Halls/Kalyan Mandap/ Community Halls etc**

A lot of waste is generated when marriage or social functions are performed at these places and unhygienic condition are created. Suitable containers with lid which may match with the primary collection or transportation system of the corporation should be provided. On-site biodigesters for food waste should be encouraged.

#### **VIII]. Hospitals/nursing homes/pathological laboratories /dispensaries / etc.**

These establishments should be directed that they shall refrain from throwing any bio-medical waste on the streets or open spaces as well as into the municipal dustbins or the domestic waste collection sites. All institutions such as hospitals/nursing homes/pathological laboratories/healthcare centers/clinics dispensaries etc, who generate biomedical waste should either treat their waste through the common facility or should install their own facility for the same. They shall keep color-coded bins or bags as per the directions of the Govt. of India, Ministry of environment from time to time for the storage of biomedical waste.

#### **IX]. Construction and demolition waste**

Construction waste shall be stored until removed only within the premises of the building or in containers where such facility of retaining out containers is available. In exceptional cases where storage of construction waste within the premises is not possible, the waste procedure shall take prior permission of the corporation of such waste and having obtained and paid for such permission, may store such waste in such a way that it does not hamper the traffic.

#### **I]. Segregation of Recyclable / Non-Bio-Degradable Waste**

It is essential to save the recyclable waste material from going to the waste processing and disposal sites and using up landfill space. Segregating it at source for recycling could make profitable use of such material. This will save national resources and also save the cost and efforts to dispose of such waste. This can be done by forming a habit of keeping recyclable waste material separate from food waste, in separate bag or a bin at the source of waste

generation by having a two-bin system for storage of waste at homes, shops and establishment where the domestic food waste (cooked and uncooked) goes into the municipal system and recyclable waste can be handed over to the waste collectors (rag pickers) at the doorsteps.

#### **4. PRIMARY COLLECTION OF WASTE**

It is necessary to provide a daily service to all household, shops and establishment for the collection of prescribed organic, food biodegradable waste from the doorstep because of the hot climate conditions in the country. This services must be regular and reliable recyclable material can be collected at longer regular intervals as may be convenient to the waste producer and the waste collectors, as this waste does not normally decay and need not be collected daily.

Corporation shall arrange for the primary collection of waste stored at various sources of waste generation by any of the following methods or combination of more than one method.

Doorstep collection of waste through containerized handcarts/tricycle or other similar means with active community participation. Doorstep collection of waste through motorized vehicles having nonconventional horns deployed for doorstep waste collection with active Community participation. Collection through community bins from private society's multi stored buildings commercial complexes. Doorstep or lane-wise collection of waste from authorized /unauthorized slums or collection from the community bins to be provided in the slums by the corporation. House to house collection of waste from posh residential areas where community participation is not likely no full recovery basis as illustrated below.

The corporation should provide special bins for the disposals of domestic hazardous waste.

#### **5. Suggested Options for Solid Waste Managements**

##### **I]. Composting**

Composting is slow natural process in which mixed bacteria, fungi, insects and worms consume plant animal wastes and convert them slowly to a soil-like substance very beneficial to plant. This improves the quality and pest-resistance of produce, makes crops drought resistant and decreases irrigation water requirements. The use of compost to enrich the soil,



along with chemical fertilizer in a balanced ratio, is therefore very necessary. Government bodies as well as the fertilizer association for over a decade have repeatedly expressed this view. Compost can find a good market if properly promoted and made conveniently available to the farming community.

Composting is a natural biological process, carried out under controlled aerobic conditions (requires oxygen). In this process, various microorganisms, including bacteria and fungi, break down organic matter into simpler substances. The effectiveness of the composting process is dependent upon the environmental conditions present within the composition system i.e. oxygen, temperature, moisture, material disturbance, organic matter and the size and activity of microbial population.

## **II]. Sanitary Land Filling**

This is term mistakenly use by Municipalities to refer to open dumping, presently the commonest method of waste disposal, which causes problems of subsoil water contamination. True sanitary landfills for untreated mixed wastes require impervious soil strata or liners at the bottom plus bottom piping for collecting and pumping out leachate for treatment and re-circulation along with piping arrangement to collect, extract and use part of the methane gas generated in such anaerobic conditions.

The waste is also to be covered daily by soil or inert material in scientifically managed cells. These precautions are expensive but necessary. With available land for waste disposal becoming and more scarcer every year, effort must be make to strictly minimize the wastes going to landfills by segregating non-biodegradable waste for recycling and by composting of biodegradable wastes.

Landfilling should be used as the last step in the waste processing chain, for treated wastes. Only rejects should be landfilled in a scientific manner, once compost plants are set up.

## **III]. Incineration**

This is a thermal process for burning the waste at a very high temperature. Incineration requires high calorific value waste, which can burn without any external fuels. Indian waste contains only 3 to 7% of combustibles paper, plastic by the time the waste reaches the disposal site. This is because most of the burnable material is retrieved by rag pickers from

the waste lying on the streets, dustbin and dump yards. This calorific value of Indian waste at the dump yards is found to range from 800 to 1000 Kcal/kg. This is very low. The system of incineration is therefore not suitable under Indian conditions for following additional reasons:

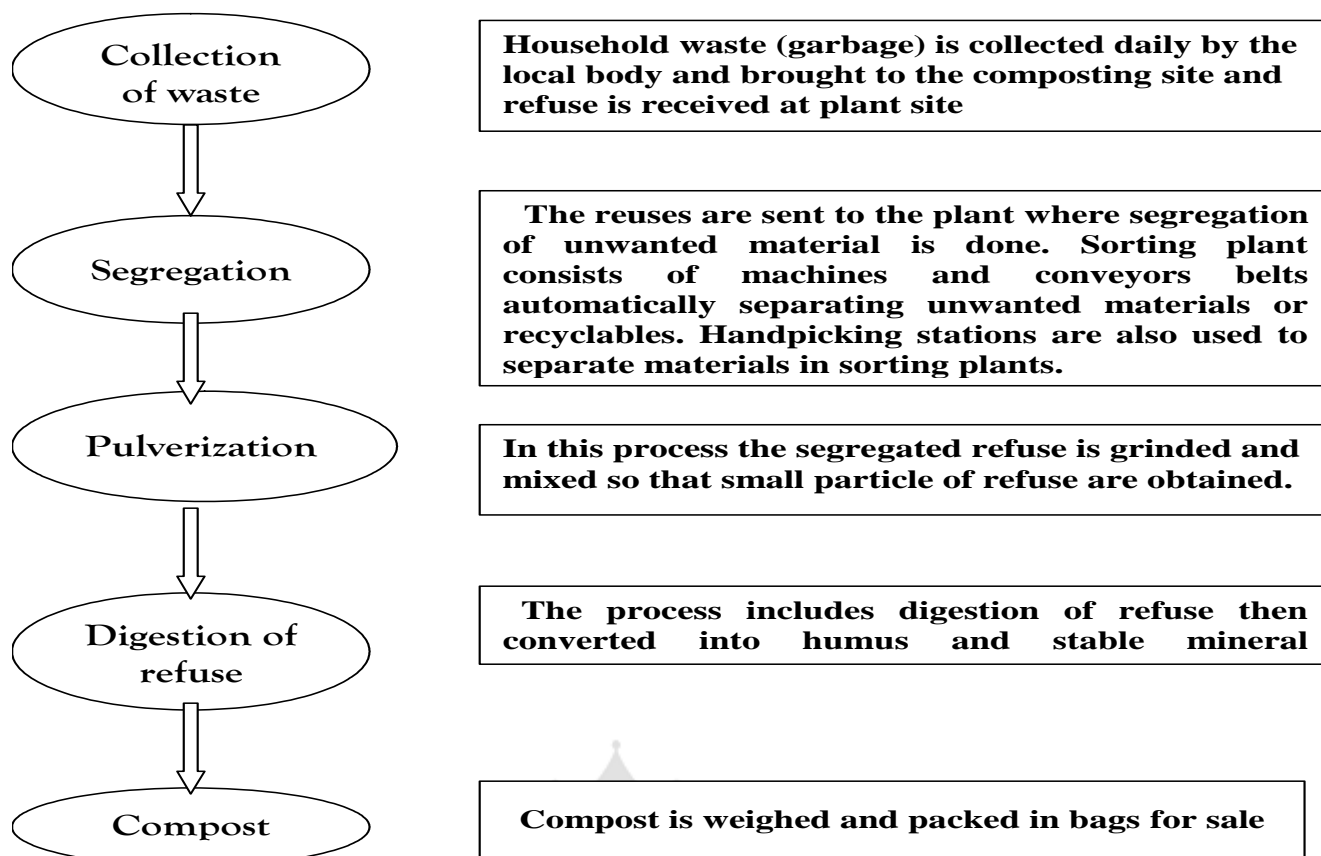
1. High ash and dust contents of Indian wastes.
2. The system is not environmentally friendly.
3. High capital cost, especially for adequate control of emissions.
4. High operation and maintenance cost.

#### **IV]. Mechanical Composting**

The open window method of composting is very laborious and time consuming process. Also, it requires a large area of land which may not be available in big cities. These difficulties are overcome by adopting mechanical composting in which the process of stabilization is expedited by mechanical devices of turning the compost. The mechanical method stabilizes the refuse compost only within 3 to 4 weeks.

At the end of the 3 to 4 weeks period, the material is known as green or fresh compost wherein the cellulose has not been fully stabilized. It is hence stored in large sized windrows for 1-2 months either at the plant or the farms. At the end of the storage period, it is known as ripe compost.

***PROCESS***



**Figure 1. Different steps in Composting.**

**6. CONCLUSIONS**

The objective of solid waste management is to reduce the quantity of solid waste disposed off on land by recovery of materials and energy from solid waste. This in turn results in lesser requirement of raw material and energy as inputs for technological processes. With the growing urbanization as a result of planned economic growth and industrialization, problems are becoming acute and call for immediate and concerted action. The proper disposal of urban waste is not only absolutely necessary for the preservation and improvement of public health but it has an immense potential for resource recovery. In the light of above, the following conclusions are drawn in respect of SWMP in Ujjain and suitable measures suggested. There has been no major effort to create community awareness either about the likely perils due to poor waste management or the simple steps that every citizen can take which will help in reducing waste generation and promote effective management of solid

waste generated. The degree of community sensitization and public awareness is low. There is no system of segregation of organic, inorganic and recyclable wastes at household level. Door to door collection is not practiced in the city.

A detailed survey of available solid waste from different sources in city was conducted and suitable methods viz. composting, incineration and landfilling are suggested to improve the environment of the Ujjain city.

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