

## A Review on Municipal solid waste collection of Bhopal city

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**Abstract:***Solid Waste Management is one among the basic essential services provided by Bhopal Municipal Corporation to keep the city of twin lakes clean. However it is among the most poorly rendered services, the reasons of which have been discussed in the present study and the remedial measures have been suggested. The administrative body, the Bhopal Municipal Corporation has failed to redress the growing problems of waste and sanitation with its poor infrastructural facilities and apparent mismanagement. With rapid growth in urbanization of Bhopal city, the situation is becoming critical over the years. The present study has thrown light over the areas where improvement can be done.*

**Key words:** Solid Waste Management, Urbanization, remedial measures.

### INTRODUCTION

We all produce waste in nearly everything we do. We produce waste at around 42 million MT annually (Asnani, 2006). Solid waste management is one among the basic essential services provided by municipal authorities in the country to keep urban centre clean. However, it is the most poorly rendered services in the basket; the systems applied are unscientific, outdated and inefficient; population coverage is low and poor are marginalized.

Waste free activities are hard to find as every activity dissipates energy and matter. Waste is littered all over leading to unsanitary living conditions. The impact of man on the environment extends to his sensual limits with which one can see, hear and smell. Ironically, this is all the extent to which one can act. Wastes are detractors through visible, audible and odorous intrusion and are potential hazards to human health, aquatic and terrestrial environment and the atmosphere. The basic problem is obvious, unprecedented growth of population, excessive urbanization and the resultant slumming of cities. Municipal laws governing the urban local bodies do not have adequate provisions to deal effectively with this ever-growing problem of solid waste management. With rapid urbanization, the situation is becoming critical. The urban population has grown fivefold (today 31.16% of India's population live in urban areas and on an average one fourth of this number live in slums) in the last six decades with 377 million people living in urban areas as per the 2011 census.

Bhopal, the city of lakes is growing at unprecedented rate. The growing mounds of unsanitary dumps, overflowing dustbins and littered open spaces are evident of the low priority status accorded to solid waste management. Solid waste management is characterized by poor infrastructure and low service levels, The Urban local bodies are not able to cope up with the problem in

an effective manner due to institutional weakness, shortage of human and financial resources, improper choice of technology, inadequate coverage and lack of short and long term planning. There is little or no information on the preferences or behavioural attitudes of the people concerning solid waste management. Also there is no inventory available on the informal sector of recycling, which is mining wastes for value and contributing to waste management. A comprehensive analysis of these two parameters alone can be utilized in making solid waste management successful.

Keeping all these in mind there is a strong need to study the existing setup, identify issues which need immediate intervention, role of public participation, legislation and role of the informal sector and sustainable processing techniques to prepare a eco-friendly and viable solid waste plan. Clearly if change has to come it will have to be spearheaded by a massive movement of community participation.

### NEED OF THE STUDY

Bhopal, like most other Indian cities has accorded a low priority status to municipal solid waste management. The population which in 2011 was almost 17.98 lakhs is expected to increase to around 30.0 lakhs in 2028.

In solid waste terms this means that the generation of solid waste will increase from 800 tons per day (2014) to almost 1000 tons per day in 2028. It needs little imagination to realize to what proportions waste will accumulate by 2028, at the present backlog rate of 98 tons per day, in simple words out of the 800 tons generated per day only 650 tons is collected leaving a backlog of 150 tons per day.

Waste contains its own anti-thesis. It is at once valueless and valuable. These two modes exist, but seldom harmoniously. This is amply demonstrated in Bhopal. On one hand the municipal corporation dumps almost 60% of the waste it collects and on the other hand there is a network of private rag pickers scavenging the waste for its recyclable value. In spite of the existence of a strong informal sector the municipal corporation has made no effort to integrate this system into its formal system or municipal waste management programme. So, there is a strong need to initiate an inquiry into the informal sector to prove that there is a market for waste, which can be recovered substantially.

This inquiry can support the augmentation for private entrepreneurs to enter the business of recycling. Municipalities are obliged to provide their cities with public services but they have not been able to raise taxes and are poorly funded and poorly managed. Bhopal seems to be no exception.

The need is to properly evaluate the existing setup, locate the intervention areas and formulate guidelines or policies to solve

the problems. Municipal bodies cannot afford large investments required for putting in sewerage or privatization of services because of insufficient funds. Thus there is a need to plan at least partial privatization after studying the viability of the idea. There is an urgent need to bring about change in municipal legislation. The Municipal Solid Waste Management Rules 2000, which should have empowered municipalities and local bodies hasn't been implemented in its right spirit.

## OBJECTIVES

The overall aim of the study is to minimize the adverse environmental effects of indiscriminate disposal of solid wastes through a management plan, which focuses upon sustainable recovery techniques and public participation.

- To study existing solid waste management system of Bhopal in general and study area in particular.
- To study the physical and chemical characteristics of solid wastes of the city.
- To study and compare different methods of waste processing, recovery and to determine their suitability for the waste of Bhopal.
- Design of a Sanitary landfill to facilitate the above objectives.

Considering the extensive nature of the subject each of the following points can form the basis of further independent study-

- Study of existing solid waste management situation.
- Study of various modern processing techniques used in Solid Waste Management (SWM)
- Preparation of transport route plan for collection using GIS & GPS.
- Use of remote sensing in SWM.
- E.I.A. of solid wastes.
- Health implications of solid wastes.
- Changing characteristics of solid wastes with respect to seasons, locations etc.
- Role of Recycling in SQM.
- Analytical-study of ambient Air-quality surrounding Landfill-site.
- Settlement of Sanitary Landfill sites and their future-usage.
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## LIMITATIONS

Due to non-availability of data and the technical nature of the subject the study has been limited to -

- A general analysis of the existing solid waste management situation of Bhopal.
- Study and analysis of characteristics of waste.
- Role of public participation.
- Comparison of most commonly adapted, bio-friendly processing techniques.
- Finding a waste management solution at neighbourhood level based on above factors with reference to new and developing Bhopal.

## METHODOLOGY

### Stage I

1. Selection of topic.
2. Relevance and need of study & formulation of objectives.
3. Literature review including study of existing managerial setting and legislations.
4. Data collection.

### Stage II

1. Study of existing system of SWM on following parameters-
  - 1.1 Generation of waste.
  - 1.2 Storage and handling.
  - 1.3 Collection
  - 1.4 Transfer and transport
  - 1.5 Processing and Recovery.
  - 1.6 Disposal.
2. Study of physical characteristics of waste.
3. Study and comparison of different sustainable waste processing techniques and analysis of their suitability for the waste of Bhopal.

## Literature Review

### Solid Waste

The World Health Organization defines waste as something which the owner no longer wants at a given at a given place and time and which has no current perceived value. Solid waste can be defined as waste not transported by water. Solid waste is defined by Resource; refuse, sludge semisolid, liquid or contained gaseous material.

### Municipal Solid Waste

Since the municipal bodies are generally entrusted with the task of management of waste, arising within municipal limits, these wastes of commercial and residential nature are called municipal wastes. Indian Municipalities follow the definition of the WHO, which excludes trade and Industrial waste.

### History of Solid Waste Management

In the very early days of human civilization as far back as 2500 B.C. in the towns of Babylon, Assyria, Mohenjo-Daro etc., considerable attention was paid to the problem of waste disposal. Early Romans constructed sewers to carry waste. About 1700 B.C. Hammurabi, a Babylonian king set up laws that governed health and family life it is said that in Roman towns, there used to be displayed signboard warnings "take your refuse further or you'll be fined". The Romans invented city level solid dumps and for about 2000 years, solid wastes were not perceived as problem. With growth of civilization the scenario worsened and the 14th century saw the outbreak of plague. It was not around till the 16th century that health control measures became a vital consideration. The period around 1900 has been called the great sanitary awakening.

### Physical Characteristics of Waste Composition

Composition is influenced by climate, frequency of collection, social customs, public attitudes, per capita income, acceptability of packaged goods & degree of urbanization. International variations are caused by literacy, wealth and work habits. Residents of large towns seem to generate more waste than people in small towns. The general note is that as one moves

from a small, poor community to a large rich community the refuse weight increases, the density decreases and so volume increases however these trends do not always hold true (Coad 1973). (Refer Table No.1)

**Table No. - 1: Classification of Solid Waste**

Type	Name of Classification of Solid Waste		Source
Garbage	Waste from the preparation, cooking and serving of food. Market refused, waste from the handling, storage, and sale of products.		Household, institutions & commercial concerns such as hotels stores, markets etc.
	Combustible (primarily Organic)	Paper, cardboard, cartons, wood, boxes, plastics cloth, bedding, Leather, rubber concerns such as yard trimmings.	
Rubbish	Noncombustible (Primarily inorganic)	Metals, tin cans, metal foils, Dirt, stones, bricks, ceramics crockery, glass, bottles other mineral refuse	
Ashes	Residue from fires used for cooking and for heating buildings, cinders		
Bulky Wastes	Large auto parts, tires, Stove refrigerators other large appliances, Furniture, large crates. Trees, branches, palm fronds, stumps, float age.		Streets, sidewalks, alleys vacant lots, etc.
Street Refuse	Street sweepings, dirt leaves, catch basin dirt, content of litters		
Dead animals	Small animals: Cats, Dogs, poultry, etc. Large animals : Horses cows, etc.		
Abandoned vehicles	Automobiles, trucks		
Construction & demolition wastes	Lumber, roofing, and Rubble, broken concrete, plaster, etc., Conduit, pipe, wire, Insulation, etc.		Factories, Power plants etc.

Industrial refuse	Solid wastes resulting form industry processes and manufacturing operations such a : food processing wastes, boiler house cigars, wood plastic and metals scraps and shavings, etc.	
Special wastes	Hazardous wastes: Pathological wastes explosives, radioactive materials Security wastes: Confidential documents etc.	Households Hospitals stores, industry, etc.
Animal & Agricultural wastes	Manures, crop residues	Farms, Food lots
Sewage treatment residues	Coarse screenings, grit septic tank sludge, dewatered sludge.	Sewage treatment plants.

The Survey of quantification and characterization of MSW was carried-out in the period from 18.11.2013 to 25.11.2014. Samples were collected from residential areas (HIG, MIG, LIG & EWS) Commercial Areas, (Fruit and vegetable markets), weekly markets, slaughterhouses, fish and meat market, hotels, restaurants, garden, hospital and nursing homes. Samples collected everyday were packed in poly bags and were sent to lab for analysis.

After weighing each sample in lab, composite samples of each category were prepared for physical and chemical analysis. The average quantity of waste generation from residential areas, worked out from the survey result is 400 gms/capita/day; with this total quantity of waste generation is estimated to be 800 MT/day for current population (in year 2014).

The generation rate of non-domestic wastes (commercial areas, fruit and vegetable markets, slaughter house, fish and meat market, hotels and restaurants, garden waste, construction and demolition waste)

Based on this the current waste generation is 400 gm/capita/day. The quantity of waste being collected and transported to Bhanpura dumping site is around 750 to 800 MT/day. The efficiency of dumping base on the 7 days record (from 18.11.2013 to 25.11.14) of weighing of Waste coming to Bhanpura dumping site is 65 to 70%.

#### **Solid Waste Management**

Solid Waste Management involves managing activities associated with generation, storage, collection, transfer and transport, processing and disposal of solid wastes; which are environmentally compatible, adopting principles of economy, aesthetics, energy and conservation (Bhide 1991).

Municipal agencies spend 20-40% of their annual budget on solid waste management in the developing countries (cointreau 1982) and on an average 10% of that in India (NEERI 1973). Labour and transport absorb 65% of the operating costs of solid waste management programmes. Solid waste management schemes can absorb up to 1% of the gross national product. (GNP) (Gopal1994). In majority (<90%) of Indian Urban Centres the health officer (from Medical Profession) is assigned the task of managing this activity. The main established solid

waste management techniques practised all over the world is as follows:

- Composting/Windrow composting
- Incineration/Pyrolysis
- Landfill
- Recovery & Recycling
- And alternative treatment technologies practiced is as follows:
- Anaerobic digestion
- Alcohol/ethanol production
- Bioconversion of biomass to mixed alcohol fuels (pilot scale)
- Biodrying
- Gasification
- GasPlasma: Gasification followed by syngas plasma polishing (commercial test scale)
- Landfarming
- In-vessel composting
- Mechanical biological treatment
- Mechanical heat treatment
- Plasma arc waste disposal (commercial demonstration scale)
- Pyrolysis
- Refuse-derived fuel
- Sewage treatment
- Tunnel composting
- UASB (applied to solid wastes)
- Waste autoclave

#### Observations and Deficiencies in the Present System:

- At present, crude dumping of waste is taking place
- Transportation vehicles centering the landfill site are generally found to be under loaded.
- Plastics and papers are scattered all around the site thereby spoiling the aesthetic appearance.
- Daily cover material is not spread on dumped waste, as such waste remains open to atmosphere.
- No compaction of waste is done to increase the life of landfill site. Equipment like bulldozer and loaders are available but are not utilized to the capacity.
- Existing disposal site is not fenced to prevent unauthorized entry of persons/habitations and stray animals within the disposal site.
- There is no control over the dumping of inert and organic waste at the site.
- Basic facilities as per the requirement of MSW Rules, 2000 unavailable.
- Little attempts have been made for processing and treatment of mixed waste before disposal at the site.
- Apparently no studies have been carried out to determine the effect of the landfill operations on the environment and ground water. No Environment Impact Assessment study reports are available.
- Dumping of waste is being done by private contractors in low lying areas in Jamuri Maidan.

- Industrial waste and construction debris are being dumped unauthorized at the disposal site.
- The safety and environmental aspects as per the MSW rules 2000, are neglected at the site.
- Open truck are used to transport waste to the landfill site. This causes dropping of garbage, contamination of soil, odor, and nuisance problems along the transport route.

#### CONCLUSIONS

Following conclusions can be drawn from the present study.

- With rapid growth in urbanization of Bhopal city, the situation is becoming critical over the years.
- The administrative body, the Bhopal Municipal Corporation has failed to redress the growing problems of waste and sanitation with its poor infrastructural facilities and apparent mismanagement.
- In the present study observations and deficiencies have been suggested. The present study has thrown light over the areas where improvement can be done.

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