

# Solid Waste Management – A Case Study of Moradabad

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## Article Info

Article history:

Received 2 January 2014

Received in revised form

10 January 2014

Accepted 20 January 2014

Available online 1 February 2014

## Keywords

Solid Waste Management,

Environment,

Dump, Source,

Slum,

Landfill,

Population

## Abstract

Many people feel that solid waste management is simply putting waste into a vehicle and unloading it at a dump. But if we consider it true then why do so many towns suffer from uncollected refuse, blocking street and drains, harbouring flies and rats and degrading urban environments? Successful solid waste management is rarely achieved without thought, efforts and much learning from mistakes. Preparation and management of a good solid waste management system needs inputs from a range of disciplines, and careful consideration of local conditions.

Keeping in mind all above, the present paper is an attempt to combine several aspects of environmental, biological, chemical and civil engineering to resolve the problem related to solid waste management for the Moradabad district. It is felt that there is need to focus more on recycling and resource recovery as a common practice, need to focus on environmental impacts (e.g. surface and groundwater) of solid waste around dump sites etc a plan was prepared for its proper management. At present A2Z Waste Management Private Limited is involving for the solid waste management work in Moradabad. Data related to waste generation, composition of municipal solid waste etc is provided by Nagar Nigam, Moradabad, Municipal Corporation and A2Z Moradabad.

In Moradabad, there are about 100 notified slum settlements constituting about 21% of the total population i.e. 1,80,000. The steady incremental in the city population results in the increase of domestic waste generation. This project consists of the hierarchy of solid waste management starting from sources, types and composition of solid waste, waste generation, handling, storage, collection, reduction, combustion, upto landfill and recycling for waste management.

## 1. Introduction

Solid wastes are all the wastes arising from human and animal activities that are normally solid and are discarded as useless or unwanted. The term solid waste as used in this text is all inclusive, encompassing the heterogeneous mass of throwaways from the urban community as well as the more homogeneous accumulation of agricultural, industrial and mineral wastes. In the early times, the disposal of the human and other wastes did not pose a significant problem, because the population was small and the land available for the assimilation was sufficient enough. Indications of recycling may still be seen during that time also as the farmers recycle solid city is situated in western U P between  $28^{\circ} 21'$  to  $28^{\circ} 16'$  Latitude North and  $78^{\circ} 4'$  to  $79^{\circ}$  Longitude waster

as fuel and fertilizer.

Many people feel that solid waste management is simply putting waste into a vehicle and unloading it at a dump. But if we consider it true then why do so many towns suffer from uncollected refuse, blocking street and drains, harbouring flies and rats and degrading urban environments? Successful solid waste management is rarely achieved without thought, efforts and much learning from mistakes. Preparation and management of a good solid waste management system needs inputs from a range of disciplines, and careful consideration of local conditions.

## 2. Study Area

Moradabad is a small town in the western part of the state of the Uttar Pradesh, in northern India. The geographical area of the Moradabad is 70 sq. Km. The East. It has an average elevation of 186 meters. The total population of the city is 27, 61,620 out of which

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males are 14, 94,220 and females are 12, 67,400. It lies within the great Gangetic plain, and is demarcated into three subdivisions of a submontane country, with an elevation slightly greater than the plain below, and is traversed by numerous streams descending from the Himalayas. There are about 100 notified slum settlements in the Moradabad city. The approximate slum population is 1, 80,000 in 2010. The percentage of slum population to total population is about 21% in 2010. The steady incremental in the population results in the increase of domestic waste generation. The project deals with the hierarchy of the Solid Waste Management and its major components such as Source reduction, recycling, combustion and landfill.

### 3. Objectives and Scope

Keeping in mind all above, the present paper is an attempt to combine several aspects of environmental, biological, chemical and civil engineering to resolve the problem related to solid waste management for the Moradabad district. It is felt that there is need to focus more on recycling and resource recovery as a common practice.

There is a need to focus on environmental impacts (e.g. surface and groundwater) of solid waste around dump sites etc to plan for its proper management as ecological such as water and air pollution have also been attributed to improper management of solid wastes. For instance, liquid from dumps and poorly engineered land fills have contaminated surface waters from waste dumps may contain toxic elements, such as copper, arsenic, uranium, or it may contaminate water supplies with unwanted salts of calcium and magnesium. Although nature water supplies with unwanted salts of calcium and magnesium. Although nature has capacity to dilute, disperse, absorb, or otherwise reduce the impact of unwanted residues in atmosphere, in the waterways and on the land, ecological imbalances

have occurred where the natural assimilative capacity has been exceeded.

In its scope, solid waste management includes all administrative, financial, legal, planning and engineering functions involved in solution to all problems of solid wastes. The solutions may involve complex interdisciplinary relationships among such fields as political science, city and regional planning, geography, economics, public health sociology, demography, communications and conservation, as well as engineering and material science. Many people feel that solid waste management is a simple affair—simply putting waste into a vehicle and unloading it at a dump. If this were true, then why do so many towns suffer from uncollected refuse blocking streets and drains, harboring flies and rats and degrading urban environments? Successful solid waste management is rarely achieved without thought, effort and much learning from mistakes. The preparation and management of a good solid waste management system needs inputs from a range of disciplines, and careful consideration of local conditions.

### 4. Data Sources

At present A2Z Waste Management Private Limited is involving for the solid waste management work in Moradabad. Data related to waste generation, composition of municipal solid waste etc is provided by Nagar Nigam, Moradabad, Municipal Corporation and A2Z Moradabad.

### 5. Sources, Types and Composition

Knowledge of the sources and types of solid wastes (Table 1), along with data on the composition and rates of generation (Table 2 & 3), is basis to the design and operation of the functional elements associated with the management of solid wastes. Sources of solid wastes are mainly dependent on the socioeconomic and technological levels of the society.

**Table: 1.** Sources and types of Solid Waste

S. No	Source	Typical Waste Generator	Types of Solid Waste
1	<b>Residential</b>	Single and multifamily Dwellings	Food wastes, Paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g. Bulky items, consumer electronics, white goods, batteries, oil tires), and household hazardous wastes.
2	<b>Industrial</b>	Light and heavy manufacturing, fabrication,	Housekeeping wastes, packaging, food wastes,

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		construction sites, power and chemical plants	construction and demolition materials, hazardous wastes, ashes, and special wastes.
3	<b>Commercial</b>	Stores, hotels, restaurants, markets, office building, etc	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
4	<b>Institutional</b>	School, hospitals, prisons, government centres	Same as commercial
5	<b>Construction &amp; Demolition</b>	New construction sites, road repair, renovation sites, demolition of buildings	Wood, Steel, concrete, dirt, etc.
6	<b>Municipal Services</b>	Street cleaning landscaping, parks, beaches, other recreation areas	Industrial process wastes, scrap materials, off- specification products, slag tailings

Composition of the solid waste is the term used to describe the individual components that makes up the solid waste stream and their relative distribution, usually in percent by weight. Information on the composition of solid waste (Table 2) is important in evaluating equipment needs, system and management programs.

Knowing the characteristics of the physical component of a community solid waste is important for the selection and operation of the equipment and facilities, to assess the possibility for the resources of

energy recovery and finally to design and analyze disposal facilities.

Various methods were used for physical composition analysis which includes:

- Analyse the components of solid waste by type
- Sorting and separation of each and every component
- Statistical produces ( i.e. representativeness and randomization)

**Table: 2.** Typical distribution of components in residential solid waste for Moradabad (in % of total)

Components	Low Income	Middle	Upper Income
Organic			
Food Waste	40-85	20-65	6-30
Paper	1-10	8-30	20-45
Cardboard	-	-	5-15
Plastic	1-5	2-6	2-8
Textile	1-5	2-10	2-6
Rubber	-	-	0-2
Leather	-	-	0-2
Yard Waste	1-5	1-10	10-20
Wood	-	-	1-4
Inorganic			
Glass	5	5	8
Aluminium	2	2	0
Dirt Ash	20	15	51

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**Table: 3.** Typical Variation observed in the collected composition residential municipal solid waste in Moradabad

	% By weight in Winter	% by Weight in Summer	% Variation decrease	% Variation Increase
Food Waste	11.1	13.5		21.6
Paper	45.2	40.0	11.5	
Plastic	9.1	8.2	9.9	
Other Organic	4.0	4.6		15.0
Yard waste	18.7	24.0		28.3
Glass	3.5	2.5	28.6	
Metal	4.1	3.1	24.4	
Inert & other Waste	4.3	4.1	4.7	
	100.0	100.0		

The individual component study involves to get the present composition of solid waste by volume and by weight Volume measurements although difficult but essential for calculating incinerator sizes and landfill areas and for limiting the hauling capacity of refuse tracks, etc.

Density of solid waste is also one of the important parameter to assess the total mass and volume of waste that need to be managed.

Chemical composition involves the ultimate analysis of a waste component which includes the determination of the percentage of Carbon (C), Hydrogen (H), Oxygen (O), Nitrogen (N), Sulphur (S), and ash. The results of the Ultimate Analysis are given in Table 4.

**Table: 4.** Typical data on ultimate analysis of the combustible components in municipal solid waste Percent by weight (dry basis)

Component	C	H	O	N	S	Ash
Food waste	48.0	6.4	37.6	2.6	0.4	5.0
Paper	43.5	6.0	44.0	0.3	0.2	6.0
Card Board	44.0	5.9	44.6	0.3	0.2	5.0
Plastic	60.0	7.2	22.8	-	-	10.0
Textiles	55.0	6.6	31.2	4.6	0.15	2.5
Rubber	78.0	10.0	-	2.0	-	10.0
Leather	60.0	8.0	11.6	10.0	0.4	10.0
Garden	47.8	6.0	38.0	3.4	0.3	4.5
Wood	49.5	6.0	42.7	0.2	0.1	1.5
Mise Organic	48.5	6.5	37.5	2.2	0.3	5.0
Dirt, Ashes, Brick Etc	26.3	3.0	2.0	0.5	0.2	68.0

## 6. Summary & Conclusion

This is an attempt to combine several aspects of environmental, biological, chemical and Civil Engineering. In planning for future management systems, a preliminary study is carried out and it was

found that there are mainly four waste components that have an important influence on the composition of the wastes collected viz., food waste, paper and cardboard, yard waste and plastics.

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The operations of A2Z Moradabad include collection & transportation (C & T), and processing and disposal (P & D). The C & T involve door to door collection of Municipal Solid Wastes (MSW) from households, slums, commercial establishments and other bulk waste generated is transported to disposal site for further processing. At P&D facilities, the waste received from C&T operations is pre-stored and segregated. Upon sorting, the products were classified

into compostable, combustible, recyclable and inert materials.

Finally, the compostable materials are processed and sold to costumers such as fertilizer companies. The combustible material is compressed and processed into RDF pellets and sold as fuel. The recyclable materials recovered from the sorting process such as plastics, glass and metals are sold to recycling facilities and the inert materials are sent to the landfill.

**Acknowledgement**

Author is thankful to Principal, College of Engineering, Teerthanker Mahaveer University for providing necessary facility to conduct the project. I am also thankful to B B Banerjee, Deputy

Commissioner, Municipal Board, Moradabad & officials of A2Z Moradabad for providing information during the project work.

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