

Solid Waste Management and its Impact on Surrounding Environment: A Case Study of Ajmer City



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Abstract

Solid wastes may be defined as useless, unused, unwanted, or discarded material available in solid form. Semisolid food wastes and municipal sludge may also be included in municipal solid waste. The subject of solid wastes came to the national limelight after the passage of the solid waste disposal act of 1965. The subject of solid wastes came to the national limelight after the passage of the solid waste disposal act of 1965. Today, solid waste is accepted as a major problem of our society. NEERI (1995) has reported that the generation of solid waste varies from 0.33 kg/capita/day to 0.50 kg/capita/day in metro cities like Bombay, Calcutta and Hyderabad. In other cities the per capita contribution ranges from 0.15 kg/capita/day to 0.35 kg/capita/day. To introduce the reader to the solid waste management field, an overview of municipal solid waste problems, sources, collection, resource recovery, and disposal methods are presented in this paper. Greater emphasis has been given to the design and operation of municipal sanitary landfills, regulations governing land disposal, and leachate generation, containment and treatment methods.

Keywords: Urbanization, Generation, Landfills, Disposal, Population, Solid Waste.

Introduction

Municipal solid waste can be classified into garbage, rubbish/trash, ashes and bulky wastes. Garbage comprises waste from preparing, cooking and serving food, and market wastes from the handling, storage and sale of food. Rubbish and trash includes paper, cartons, boxes, barrels, wood, tree branches, yard trimmings, metals, tin cans, glass, crockery and minerals. Ashes include residues from fuel and the combustion of solid wastes, while bulky wastes includes wood furniture, bedding, packing material, metal furniture and rubber tires (USEPA, 1972 and USOTA, 1989). MSW does not include wastes from sources such as municipal sludge, combustion ash, and industrial non-hazardous process wastes that might also be disposed of in municipal waste landfills or incinerators.

The Municipal Solid Waste Management (SWM) system in Ajmer was earlier grossly deficient and ineffective. However, under the RUIDP certain improvements have taken place, yet the overall SWM system has significant scope for improvement. Ajmer Municipal Council is the agency responsible for Solid Waste Management in the City. All works pertaining to preparation of plans, collection, transportation and disposal of waste, creation of assets to perform these functions, its maintenance and financial inputs is an obligatory function of AMC.

A study conducted under RUIDP estimated that approximately 150 TPD of Municipal Solid Waste (MSW) is generated per day in Ajmer city. For a current population of about 5.39 Lakh, MSW generation should be about 135 Tonnes Per Day (TPD). This estimate is based on CPEEHO norms for waste generation in cities by population classification; viz. Ajmer will have a waste generation rate of 250 gms/capita/day. This quantum of waste can be expected to increase to 180 TPD by 2011. The MSW generated in the city mainly consists of domestic waste, wastes from commercial areas, vegetable fruit market, slaughter houses, bio-medical waste, wastes from hotels and restaurants and industrial solid wastes. Apart from these, waste are also collected from drains in the form of wet silts, which are dried alongside the road itself, prior to being carted away.

Aim of the Study

The main objective of the study is to find out the present status of Solid Waste in Ajmer city and its impacts on environment and human health.

Review of Literature

World Health Organization states that 85% of hospital wastes are actually non-hazardous, whereas 10% are infectious and 5% are non-infectious but they are included in hazardous wastes. About 15% to 35% of Hospital waste is regulated as infectious waste. This range is dependent on the total amount of waste generated (Glenn and Garwal, 1999).

Using a wide range of waste management possibilities as part of a comprehensive integrated waste management system, allows for improved ability to adjust to changing environmental, social and economic conditions (McDougall et al., 2001).

Tests performed by Şchiopu et. al. (2009) on the old landfill in Iasi County has shown that the organic components and heavy metals present in the leachate that penetrates through infiltrations in soil induce impacts and risks in environment.

According to the study of Nguyen P. T. and Yasuhiro M. (2013), most of municipal solid waste (MSW) in Vietnam is often disposed of at open dumping and landfill site and the methane gas from waste is the un-ignorable source of greenhouse gas (GHG) emission.

Sources and Characteristics**Residential and Commercial Area**

Waste is generated by approximately 82,000 households in Ajmer city. The collection of MSW in Ajmer has been divided into different zones for better performance in SWM.

Hotels and Restaurants

There are approximately 230 hotels and restaurants in the city with total waste generation of approximately 10 TPD.

Industrial Solid Waste

There are approximately 165 industries at two industrial areas namely Prabhatur and Makhupura on Nasirabad road. Apart from these, there are two major railway workshops, HMT and a dairy plant in the city.

Vegetable and Fruit Market

There are six vegetable and fruit markets and various wholesale and trade centres in the city. The wholesale markets have been shifted to outskirts of the city and KrishiUpajMandi, whole sale vegetable market; BakraMandi and FCI godowns have been shifted to Beawar road. Approximately 12 TPD of wastes are generated from these areas. Past reports clearly state that the solid waste management in the market areas are not satisfactory.

Slaughter Houses

There are six meat and fish markets with an expected waste generation of 2 TPD. There are only two authorised slaughter houses in the city which slaughter about 20%-30% of the total animal requirement, while the rest is done by unauthorised slaughter houses/ locations. Wastes accumulated outside slaughter houses often lie unattended and are then disposed into the drains or mixed along with municipal wastes.

Collection and Transport

1. The city of Ajmer has been divided into three zones for managing municipal solid waste. Each of the three zones are further divided into three circles that are further divided into four to nine wards, depending upon population size and area in each zone. Discussions with municipal official have indicated that approximately 120 T of Solid Waste is collected daily (indicating a collection efficiency of approximately 80-90%). Collection of waste is managed by 950 safaikarmacharis (sweeper). Additional 30 safaikarmacharis have been engaged for cleaning road side drains and public toilets.
2. The primary collection system of MSW in the city still remains poor. The wastes from houses, shop and establishments are thrown on the road side heaps (or sometimes on roads) and open drains, as door-to-door waste collection is not practiced in the city. Primary collection of waste is handled by means of approximately 400 nos. open hand carts. Discussions have indicated that there is severe inadequacy of collection vehicles, and hence one hand cart is shared by approximately 2 to 3 safaikarmacharis. Solid waste is collected and transported by means of open hand carts to 365 designated primary collection points/depots. Apart from this, there are 25 containers (transported through Dumper Placers) at different locations across the City.
3. The Municipality owns and operates approximately 30 vehicles comprising tractor-trailers with 3 hydraulic loaders, 2 dumper placers and one JCB and one auto rickshaw container to transport the solid waste. The waste from the depots/collection points are collected and transported to the waste dumping site. Transportation of the waste from 70 percent of the depots has been outsourced to private parties and remaining 30 percent is catered by Municipality. Apparently private participation in the waste management was introduced to tide over inadequate transportation systems available with Municipality.
4. Discussions with officials have indicated that, overall transportation cost of the vehicle fleet works out to Rs. 420 per ton, which is high compared to a typical cost of Rs. 200-250 per ton in other cities of same size-class.

Disposal of Solid Waste**Recycling**

Many components of municipal solid wastes can be reused as secondary material. Among these are papers, cardboard, plastic, glass, ferrous metal, aluminum, and other nonferrous metals. These materials must be separated from MSW before they can be recycled. In this section, material recycling, and separation methods are first briefly presented, followed by bioconversion and refuse derived fuel (RDF) methods.

Incineration and Energy Recovery

Incineration of MSW is practiced to reduce waste volume and recover energy. The batch-fed incinerators built in the 1930s and 1940s reduced the

volume but were major contributors of air pollution problems. Most of these incinerators have been shut down or replaced by newer designs. The newer incinerators utilize innovative technology to produce steam more efficiently and reduce air pollutants to greater extent. The capital and operating costs, however, are quite high. The unit cost of incinerators for smaller cities is even larger. The high cost of installing the air pollution control equipment forced municipalities to seek cheaper methods such as sanitary landfills for solid waste disposal. Due to stricter regulation on landfilling, and rapidly diminishing capacity, there is renewed interest in incinerator design and construction.

Disposal by Landfilling

The volume of municipal solid waste is greatly reduced by incineration, conversion processes or resource recovery. In all cases, there is a residue that must be disposed of so that it no longer creates a nuisance or hazard to the society. Engineering principles must be followed for site selection and design of ultimate-land disposal methods. An

acceptable land disposal method of MSW and residues utilizes sanitary landfills.

The current solid waste dumping site is at Makhupura, which is located on the western side of Ajmer-Nasirabad highway, at a distance of 10 km from center of the city. Field visit and discussions have indicated that although the Dumping Site has a carrying capacity for more than 20 years, but its proximity to the growing urban area is a major cause of concern. Also, the topographical features hill slopes, valley and drainage makes the site very vulnerable to environmental pollution. With reference to the above, it is proposed to develop a new landfill site, near Sedariya, with assistance under RUIDP.

Demand Assessment

The total waste generation for the ULB is estimated for base year (2006) and future upto 2021 on a waste generation rate of approximately 250 gms/capita/day (based on CPEEHO norms). The waste generation rate can be expected to grow higher than 250 gms/capita/day as the city population increases and there are enhanced levels of consumption.

Year	Estimated Population <i>In Lakh</i>	Waste Generation <i>TPD (@ 250 gms/capita/day)</i>
2006	5.37	134.25
2011	5.93	148.25
2016	6.52	163.00
2021	7.18	179.50

Source: Analysis

The total quantity of solid waste is large and increasing day by day in Ajmer city due to increase in population and industries. Rapid urbanization, increasing commercial and industrial activities and changing life styles in Ajmer are leading to a steady increase in the generation of solid waste. Solid wastes are generated by many activities. Improper management of waste is leading to environmental pollution, public health hazard, and adverse effects on an urban economy.

Impacts of Solid Waste On Health

The unsanitary methods adopted for disposal of solid wastes is, therefore, a serious health concern. The poorly maintained landfill sites are prone to groundwater contamination because of leachate production. Open dumping of garbage facilitates the breeding for disease vectors such as flies, mosquitoes, cockroaches, rats, and other pests. MSWM is a part of public health and sanitation, and is entrusted to the municipal government for execution.

On Environment

Solid waste, including household, commercial, and industrial waste, is the most important type of waste. Solid waste contributes significantly to the pollution of the environment by polluting the main elements (soil, water, and air) with the different formulations, concentrations, and quantities of its materials and components as well as

its physical and chemical properties. When solid waste is disposed off on land in open dumps or in improperly designed landfills (e.g. in low lying areas), it causes the following impact on the environment. (a) ground water contamination by the leachate generated by the waste dump, (b) surface water contamination by the run-off from the waste dump, (c) bad odor, pests, rodents and wind-blown litter in and around the waste dump, (d) generation of inflammable gas (e.g. methane) within the waste dump, (e) bird menace above the waste dump which affects flight of aircraft, (f) fires within the waste dump, (g) erosion and stability problems relating to slopes of the waste dump, (h) epidemics through stray animals, (i) acidity to surrounding soil and (j) release of greenhouse gas.

Key Issues

1. In slum areas and low income group residential areas, MSW collection and transportation system is found neglected.





2. Transportation of MSW to the dump site in the city from every collection point is not done on daily basis. Due to lack of vigilance, many a times waste are not at all carried to the dumping yard, rather thrown into some low lying areas.
3. MSW are neither stored nor segregated at source. They are littered on the streets, footpaths, open spaces drains or water bodies indiscriminately. Cleanups are not done at every place regularly. Daily sweeping is provided only for 50 percent of the area.
4. Occupational health hazard is also cause of concern. The waste collection, loading and unloading operations have been done manually. The sanitary workers have not provided with any protective equipment posing health hazards.
5. The absence of the door-to-door solid waste collection system in the city, coupled with poor citizen waste disposal practices leads to a number of downstream problems discussed above. It is understood that segregation and door-to-door collection of waste through private participation, is under active consideration by the AMC.
6. Apart from the MSW, other waste that finds its way to the MSW dumping ground includes bio-medical infectious waste and hazardous industrial waste.

Conclusion

The quantity of MSW generated is increasing rapidly due to increasing population and change in lifestyle. The current MSW crisis should be approached holistically; while planning for long term solutions, focus on the solving the present problems should be maintained. The Government and local authorities should work with their partners to promote source separation, achieve higher percentages of recycling and produce high quality compost from organics. While this is being achieved and recycling is increased, provisions should be made to handle the non-recyclable wastes that are being generated and will continue to be generated in the future. Policy to include waste-pickers in the private sector must be introduced to utilize their low cost public and environmental service and to provide better working conditions to these marginalized populations.

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