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## SOLID WASTE MANAGEMENT-IDENTIFYING LAND SUITABILITY FOR LANDFILL SITES (A CASE STUDY OF JAIPUR CITY)

### Doctoral Dissertation Abstract (2020)

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India is facing a sharp contrast between its available services and resources and continuously increasing population. Municipal solid waste (MSW) management is one such service where India has to fill an enormous gap. The MSW management practices followed in India are inefficient and are potential threat to the environment and public health. Disposal of waste in landfill is the most widely used method in MSW management in urban areas, because of its economical acceptability. These landfills or dumping sites are chosen at random without following a scientific procedure thereby causing soil degradation, contamination in the quality of groundwater and other negative economic, environmental and ecological impacts. Therefore, selection of a landfill site is a serious issue in urban planning process due to its implication on economy, ecology, environment and public health. Increasing pressure of population along with high population density and growing urbanization along with industrialization has made this issue more grievous. The sanitary landfill site is an inevitable part of MSW management. Therefore, selection of suitable landfill sites is an important issue to minimize the environmental degradation.

In Jaipur city, approximately 75 per cent of collected MSW is disposed of in open

dump sites, 2 per cent of the MSW is openly burnt and the remaining goes to the processing plants. These dump sites are already filled with millions of tons of solid waste. The processes of reducing, reusing and recycling of the solid waste have not been properly followed by generators, communities, organisations as well as by the corporation. Segregation of waste, its proper transportation and scientific disposal is not happening which has been leading to acceleration of natural resource degradation, environmental pollution, deterioration of public health and poor quality of life. Further, the existing dump sites in Jaipur city have also not been suitable for disposal of MSW due to non-compliance of several criteria mentioned in Solid Waste Management (SWM) Rules 2016, issued by Ministry of Environment Forest and Climate Change (MoEFCC). Hence, it has been felt that a proper analysis of the present status of SWM practices in Jaipur Municipal Corporation should be carried out to suggest suitable alternatives.

### Objectives

Major Objectives of the study are:

- to find out the current status of MSW management in Jaipur with respect to the guidelines issued by Ministry of Environment Forest and Climate

- Change (MoEFCC), SWM Rules 2016;
- to find out the major problems related to the MSW management in Jaipur city and
- to identify the suitable landfill sites for Jaipur Municipal Corporation (JMC) area.

### **Database and Methodology**

The present study is divided into two major parts. First part presents the status of SWM in JMC as assessed in the light of SWM Rules 2016, while the second part is focused on the identification of suitable landfill sites for disposal of waste collected from JMC area. Field survey has been conducted to obtain information about per day waste generation, collection efficiency, transportation, processing, recycling and disposal of MSW. Many visits to dumping sites and processing plants helped to understand the processes and issues related to the waste management system. Samples of groundwater have been collected from five locations near the current dumping sites for water quality testing. Random sampling technique has been adopted for collecting information and the feedback from residents, doctors and private companies engaged in handling MSW. Information has also been collected from JMC personnel about door-to-door waste collection techniques, waste segregation, storage, transfer stations, transportation, processing and disposal of MSW. Information has also been collected from plant operators of all MSW processing plants including bio-medical waste treatment.

Secondary data have been collected to get the information about various characteristics of Jaipur City such as location, climate, physiography, demography, road and rail network, direction of growth, slums, residential and commercial areas. Data have also been

collected from District Census Handbook (2011), Indian Meteorological Department Report (2012 & 2018), Forest Survey of India Report (2015), Jaipur Development Authority Master Development Plan (2025), Central and State Groundwater Boards, Jaipur Nagar Nigam, research reports, manuals, publications, books, information brochures, journals and internet.

Landsat 8 image for Jaipur city has been downloaded from USGS (United States Geological Survey) earth explorer. The bands have been stacked in a single image for further processing. Digital Elevation Model (DEM) has also been prepared and used in classifying the elevated lands in the study area. After identification of various classes, the barren land sites with area more than 40 hectares have been identified as the potential sites for landfill. Various GIS layers for environmental standards have been overlaid in GIS for identification of potential sites. Sites not fulfilling the standards have been discarded and only the sites that cleared all standards of a suitable landfill site have been selected as most suitable landfill sites for disposal of solid waste of JMC.

### **Major Findings**

It has been found that due to rapid growth of population and economic development, solid waste generated in Jaipur city has reached to the extent of approximately 1600 MT per day. Around 90 per cent of the total solid waste generated and almost 75 per cent of the collected waste ends up in open dump sites. The disposal of the MSW still remains a big issue as SWM rules 2016 have not been followed by solid waste generators and transporting agencies. As per SWM Rules 2016, the Urban Department of a State should

develop a policy for SWM. However, the Government of Rajasthan has not developed such policy. Therefore, solid waste is being managed in a very unorganised and haphazard manner by dumping in open dump sites.

Segregation of solid waste at source which is very essential for MSW management has either not been done at all or being done in a very inefficient manner. It has been found that 78 per cent of the residents do not segregate their waste into dry and wet. When segregation of waste has not been carried out at generation stage it becomes difficult for waste collectors to segregate the bulk waste. This in turn affects the function of the plants carrying out the process of recycling. The major role in recycling is being played by the informal sectors like raddiwalas as well as by on-site waste pickers, but in the absence of their regular registration and training and political interference in their day-to-day working has caused ineffective involvement of this sector in SWM process.

All the MSW collected from Jaipur city ends up at Mathuradaspora dump site, Langariawas Residual Derived Fuel (RDF) Plant, Sevapura dumpsite and Sevapura composting plant. Sevapura composting plant can process only 250 tons of waste per day against 738 MT biodegradable wastes generated per day in Jaipur city. Similarly, Langariawas RDF plant has a capacity of handling 350 tons of MSW per day. Both the plants have not been operating in their full capacity due to frequent machinery breakdown, because the inputs have not been segregated at desired standards.

Similarly, bio-medical waste treatment plant with a capacity of 6 tons per day is also facing the problem of un-segregated waste, as the hospitals do not segregate it as per Bio-

Medical Waste Management Rules, 2016. The workers have to face extreme medical hazards and a risk of getting infected while segregating the bio-medical waste. The hospitals use low-quality bags to store waste, which gets torn during the transportation, and the waste gets scattered all over the place which is a serious health hazard. As per the information provided by the plant officials, only 20-30 per cent bio-medical waste generated in the city reaches the plant for treatment.

Existing dump sites in Jaipur city are not suitable for landfill due to non-compliance with criteria mentioned in SWM Rules 2016 and Central Public Health Environmental and Engineering Organization (CPHEEO) manual. The study reveals that dumping of solid waste has degraded the quality of soil, air and groundwater, which poses risk to human life and environment. Laboratory results of all water samples collected from the groundwater sources near the existing landfill and dumping sites reveal high content of copper, lead and total dissolved solids. Many residents of the nearby location to the dump sites have been suffering from respiratory diseases like chronic obstructive pulmonary disease. Instances of tuberculosis and jaundice have also been very high among the residents of nearby locations. Children have been found prone to infections like ringworm and scabies. The frequency of these diseases increases in winter. The solid waste has not only adversely affected human lives but also adversely affected street animals feeding on the mixed waste.

Taking into account all the principles mentioned in CPHEEO manual and SWM Rules 2016, suitable landfill sites have been identified. Further, the landfill sites have been identified by considering the growth rate of population, proportionate generation of solid

waste and to ensure that the landfill site serves for at least 20-25 years. On the basis of overall assessment of all the criteria suggested by

various agencies of Indian government, four most suitable landfill sites with levels of priority have been suggested in this study.

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