

**Abstract of PhD Thesis
On**

**Solid Waste Management and its Impact on the Ground
Water System in Parts of Delhi**

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Solid Waste Management and its Impact on the Ground Water System in Parts of Delhi

Rapid industrialization and population explosion in India has led to the migration of people from villages to cities, which generate thousands of tons of Municipal Solid Waste (MSW) daily. The problem becomes acute in metropolitan cities such as Delhi because the disposal facilities available are less than the generated quantity of MSW. The main problem facing policy makers in municipal solid waste management (MSWM) sector is how to predict the amount of MSW that is likely to be generated in the near future, in order to devise the most appropriate treatment/disposal strategy. Threats to the ground water from the unlined and uncontrolled landfills exist in many parts of the world, particularly in the under-developed and developing countries. The present study analyzes the MSWM activities being practiced in Delhi city in order to investigate the current problems and propose guidelines to improve MSWM system (MSWMS). In addition, a comprehensive user-friendly computer program to handle, update and organize a large amount of data regarding MSWM has been developed using Microsoft Access. An attempt has also been made to analyze MSW treatment and disposal facilities and to develop prediction model for MSW quantity generated in Delhi. In addition, a system dynamics computer model has been used to predict MSW generation, collection, disposal, recycled and treated capacities, and to estimate the electricity generated from MSW and to predict the fund required for MSWM in Delhi. Finally, a chemical analysis of leachate and ground water samples in and around Gazipur landfill site have been done to determine the impact of landfill leachate on ground water.

The study revealed that Delhi generates 8567 tons of MSW every day at the rate of 0.5 Kg/capita/day approximately. MSW contains high organic content (55-75%) and moisture content (40-60%), which indicate the possibility for composting and bio-methanation as best options for treatment. The waste from commercial, hotels and institutional areas can be used for Refuse Derived Fuel (RDF). Most of the treatment and disposal facilities of MSW are found to be in disorder except few one. All compost plants are working in low capacity because of the low market of compost and it needs regular maintenance, and two of the

plants (MCD and NDMC composting plant at Okhla) are closed. Incineration is not successful because of high capital and operation costs, high moisture content, high organic material and low calorific value of MSW. The predictive model developed in this study showed that the quantity of MSW generated and the per capita generation rate in Delhi expected to increase up to 18500 t/day and 0.77 kg/day/capita respectively in 2025.

A system dynamics modeling showed the expected growth of population and the corresponding increase in MSW generation rate along with the electricity generation rate from MSW, projection of revenue produced and budget required for MSW treatment and disposal in 2001, 2006 and prediction for 2024. Furthermore, the physio-chemical characteristics of ground water samples in the proximity of Gazipur landfill site exceeded with the permissible limits of ground water standards, and it does not conform to the drinking water standard. It is noticed that the pollution of ground water is more in north and north-western areas of landfill, and the pollution is more in the areas near landfill and it reduces gradually with the distance in the north and west direction, which indicates that the landfill leachate affected negatively the ground water in the proximity of landfill.