



Feasibility Study on Waste-to-energy as a Key Component of a Sustainable Municipal Solid Waste Management Strategy: The Case of Lebanon

ABSTRACT

Lebanon is an upper middle income developing economy with nearly 90% of its population living in urban areas. High economic growth rates as well as rapid population growth have substantially increased the generation of municipal solid waste to reach 0.33 tons per capita in 2011, accounting for over 5% of the national cost of environmental degradation.

Currently only 8% of MSW is recycled, while 9% is composted, 30% is disposed of in open dumps, and 53% in landfills that are close to saturation and turning dangerous due to the production of landfill gas.

The development of a comprehensive, integrated and environmentally sustainable municipal solid waste management strategy is urgently needed, to allow the treatment of waste through five major pillars: source reduction, recycling, composting, landfilling, and recovery of energy. The latest is currently being considered as one of the possibilities to increase the share of renewable energy in the supply mix to reach a target of 12% for by the year 2020.

In order to assess the feasibility of the use of municipal solid waste for energy production a survey is conducted to collect data on waste generation and disposal by 61% of the municipalities in Lebanon. The results are treated and trending analysis is performed based on the projected progression of urbanization.

The waste profile in Lebanon is mainly dominated by organic waste followed by paper and plastics, with more paper being disposed of in urban areas and more organic waste being disposed of in rural areas. The moisture level of waste is as low as 40%, and the production rate estimated to grow to more than 450 tons per day in the coming years.

Our analysis has revealed that it is vital to implement an integrated municipal solid waste management strategy with an important component of energy recovery through gasification with an IRR of 13% and a NPV of \$48,436,411.

In the short-run, 6 gasification waste-to-energy facilities, with capacities ranging from 500 to 1500 tons per day, are required to cover the different regions of Lebanon, and reach a total capacity of 5,000 tons per day. The distribution of the plants is based on the waste generation profile by region and the availability of space to be utilized.

Keywords: *Municipal Solid Waste Management Strategy, Waste to Energy, Integrated Solid Waste Management, Renewable Energy, Gasification*