

## **ABSTRACT**

Municipal solid waste is a key environmental issue in Jordan and one of the top components in the country's environmental agenda. This is due to the relatively high per capita generation of waste in urban areas (0.9 kg/person/day). The rapid population increase estimated at 2.2 percent and the rise in community living standards have accelerated solid waste generation in recent years. The daily amount of municipal solid waste generated in Jordan was 5750 ton/year in 2011, and the waste stream is composed of a high percentage of organic components (53% by weight). According to the current population growth trend, the solid waste quantity generated will continue to increase with an annual growth of 3.3%. In all cities in Jordan, landfill remains the main disposal method. There are a total of 21 landfill sites across the entire country, but only one sanitary landfill receives waste from the capital city and nearby cities. Currently, only 43% of Jordan's municipal waste is treated in the sanitary landfill.

In this thesis, we analyze the Municipal Solid Waste Management (MSWM) System in Amman, Jordan, considering proper treatment of municipal solid wastes from the cradle to the grave. The objective is to investigate and evaluate effects and impacts of adopting possible alternative waste treatment technologies based on the life cycle assessment method and to identify the most environmentally and economically efficient system.

Ten municipal solid waste management scenarios are designed. With each scenario, alternative waste collection, treatment, and final disposal methods are considered. Each is evaluated on the basis of reducing landfilled wastes and emission of greenhouse gas and enhancing recycling and waste-to-energy conversion. The overall environmental burden associated with each scenario is estimated and comprehensively evaluated based on the Life Cycle Assessment Method. The emission of the weighted sum of greenhouse gases with Global Warming Potential, the remaining capacity for landfill disposal, and the recycling ratio are utilized as major indicators of the environmental performance index to identify the best scenario. The results show that the proposed Integrated Solid Waste Management (ISWM) system is the best scenario that minimizes environmental loads, improves revenues, increases recycling ratio, and decreases final disposal waste

to be landfilled. This scenario is a combination of composting, a recycling rate of 14 percent of the waste generated with waste separation at the source, and incineration of the remaining waste with energy recovery from incineration. The results show that an increase of the recycled materials by 23 percent could be achieved if waste separation at the source is properly applied.

**Keywords:** Municipal Solid Waste Management, Recycling, Sustainability, Global Warming Potential (GWP), Life Cycle Assessment (LCA), Full Cost Accounting (FCA)