Waste management has become a critical issue in today’s world, particularly in the United States. The most common type of waste is Municipal Solid Waste (MSW), a byproduct of the urban lifestyle generated mainly by households. Popular waste management methods include composting, landfill disposal, incineration, and recycling. This study assesses the waste management system of a county based on economic, environmental, and sustainable aspects, using two methods: (i) the SSO composting operation, and (ii) the landfill with a gas collection system and an RNG plant.

**Abstract**

Waste management has become a critical issue in today’s world, particularly in the United States. The most common type of waste is Municipal Solid Waste (MSW), a byproduct of the urban lifestyle generated mainly by households. Popular waste management methods include composting, landfill disposal, incineration, and recycling. This study assesses the waste management system of a county based on economic, environmental, and sustainable aspects, using two methods: (i) the SSO composting operation, and (ii) the landfill with a gas collection system and an RNG plant.

**Problem Statement**

The municipality owned landfill has been operating since 1985. Both rural and industrial waste is fed into this landfill. The landfill will be based on current projections, the landfill is expected to reach its capacity within nine years. In this study, it is determined that whether the county should proceed with (i) the SSO composting operation or (ii) the landfill with a gas collection system and an RNG plant.

**Objective**

The Objectives of this project are

- Analyzing the cost-benefit ratio of both of the processes.
- Evaluating the environmental and economic benefits of the two approaches
- Proposing a suitable landfill gas reuse technology that will be cost-effective, profitable, and beneficial to the county.

Our company ReSTORE stands for Renovation for Sustainable Technology for Organic Waste Recycling toward Energy. The goal of our company is to maximize the utilization of a product by recycling waste into energy. To achieve maximum utilization of the waste from the given county, we need to consider a way where maximum benefit is reached without harming the environment and creating any problems in the process. Recycling and reusing is the primary motto of ReSTORE. In this study, the highest use of a product is ensured through recycling.

**Methodology**

For composting operation OrganEcs tool was used and 2 cases were considered depending upon the aeration. LFG Cost-Web tool and landGEM models were used for cost analysis in landfill with an RNG project and 4 cases were considered depending upon the variation in optional input values. All of the tools were created by the US EPA.

**Result Analysis**

The total revenue was higher than the total expenses only for the composting without forced aeration, even after the year 2045. Composting with forced aeration does not show any profit during the project timeline. Aeration requires extra cost.

**Comparison**

For composting operation OrganEcs tool was used and 2 cases were considered depending upon the aeration. LFG Cost-Web tool and landGEM models were used for cost analysis in landfill with an RNG project and 4 cases were considered depending upon the variation in optional input values. All of the tools were created by the US EPA.

**Recommendation**

After careful consideration, ReSTORE recommends the county to build a new RNG plant with landfilling gas collection system due to significant IRR and net income. Bioreactors are a profitable option, with benefits such as faster LFG generation and odor removal, but contingency plans are needed for leachate management and temperature monitoring to prevent fire incidence and also mining cost need to be included.