



Hungarian University of Agriculture and Life Sciences

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Abstract

Title of thesis: Assessing the Potential of Waste to Energy Solutions for Vientiane's Landfills

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The management of municipal solid waste (MSW) in the Lao PDR's capital, Vientiane, is facing growing problems related to environmental and infrastructural issues. Rapid urbanization, population growth and rising consumption have resulted in a sharp rise in the generation of waste on a daily basis by an estimated 1,115 tonnes in 2023, a number that is expected to rise to 1,512 tonnes by 2030. The city's key landfill site at Km 32 is predicted to be full within a few years and open dumping and burning is still a major source of methane releases, air pollution, as well as health concerns. In this context, the thesis assesses whether the introduction of Waste to Energy

(WtE) technology can be a technical and economically viable alternative to the conventional landfilling method, in a contribution to national climate and sustainability objectives.

The study uses a kind of literature based analytical approach, involving the synthesis of the national reports, institutional publications (World Bank, JICA, GGGI, MONRE), and peer reviewed studies on the performance of WtE and its environmental impacts. Two scenarios were formulated and compared, which were Baseline Scenario (continuation of current landfill practices) and Scenario 2 (implementation of a WtE facility for mixed MSW). Feasibility was evaluated by important parameters like waste composition, calorific value, energy recovery potential, greenhouse gas (GHG) reduction and economical costs.

Findings show that the composition of the Vientiane's MSW, which is composed of approximately 67 percent organic and high moisture content, requires special pre drying or sorting treatment, but with modern moving grate incineration technology can still run well. The proposed plant which would treat some 700 tonnes of wastes per day could produce some 13 MW of electricity, or that being consumed by tens of thousands of households. Residual waste for landfilling would be reduced by 85-90 percent and lifespan of existing landfills areas would be prolonged by two decades. Environmental benefits, Significant reductions in methane emission and local air pollutants have been achieved, as long as some proper flue gas filtering systems are fitted on the units. Economically, although an upfront capital cost (USD 60-100 million) is high, but there are longer term savings in reduced landfill development costs, remediation costs and public health costs. Scenario 2 also provides room for jobs and perhaps access to concessional climate finance.

Institutionally, a WtE project would need more specific waste management legislation, public awareness campaigns and the coordination of national and municipal authorities. The comparative analysis with the examples of regional cities: Bangkok and Hanoi, confirms that WtE is technically and financially feasible for the case of Vientiane if it is embedded into existing recycling and composting programmes. The thesis concludes that the adoption of WtE technology, coupled with effective governance and community participation, would change the current waste management in Vientiane from a disposal based waste management system to one that focuses on resource recovery, in line with the Lao PDR Green Growth Strategy and Sustainable Development Goals.