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# CAN INCINERATION BE A SUSTAINABLE OPTION FOR SOLID WASTE MANAGEMENT IN THE CITY OF NOVI SAD?

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## Abstract

In this work, the option of MSW incineration with energy recovery is proposed and examined for the city of Novi Sad. A sustainability analysis consisting of financial, economic and sensitivity analyses was done in the form of a cost-benefit analysis following recommendations from the European Commission. Positive and negative social and environmental effects of electricity generation through incineration were valued partly using conversion factors and shadow prices, and partly using the results of previous studies. Public aversion to MSW incineration was considered. The results showed that the incineration project would require external financial assistance, and that an increase of the electricity and/or a waste treatment fee is needed to make the project financially positive. It is also more expensive than the landfilling option. However, the economic analysis showed that society would have net benefits from an incineration project. The feed-in tariff addition of only €0.03 (KWh)<sup>-1</sup> to the existing electricity price, which would enable the project to make a positive contribution to economic welfare, is lower than the actual external costs of electricity generation from coal in Serbia.

*Keywords: MSW, incineration, energy recovery, financial analysis, economic analysis, sensitivity analysis, public aversion.*

## Introduction

In the majority of south-east European (SEE) and developing countries the most dominant form of municipal solid waste (MSW) management is landfilling with optional energy recovery. Landfilling is often the choice method for waste management owing to its low costs, its ready availability and its applicability to a wide range of wastes [1]. The landfill gas produced on-site can be used for energy recovery. However, landfilling consumes a lot of space, runs a high risk of leakages to air, water and soil, and makes less use of the energy content of waste compared with incineration [2]. MSW incineration produces steam or heat and/or electricity for sale, reducing the waste to about 10% of its original volume and to 30% of its original weight [1]. Incineration plants are, however, expensive to build [1]. Incineration also contributes to externalities, such as emissions to air and chemical waste residuals [2], and is usually followed by a strong public aversion. From an environmental cost perspective, if the pollution effects of an energy system in place are significant, waste-to-energy (WTE) plants are more attractive than landfill disposal [2-4].

Serbia is in the process of upgrading its MSW management, but there is still a practice of MSW disposal in non-engineered landfills operated by public utility companies or in uncontrolled dumps. The Law on Waste Management (2009 & 2010) [5] and the Law on Packaging and Packaging Waste (2009) [6] have been adopted, and are slowly being brought into practice. The only MSW management method

and requires that a new landfill or other waste management method be put in place sooner. Environmentally, incineration is the better option [31]. As the costs of cleaning and decontamination are included in the analysis, there are no environmental and social costs of the incinerator facility after closure. The land on which the incinerator was located could be used for different purposes. After the landfill closure, there are further costs and potential environmental and social impacts, in addition to limited options for land use at the location. According to the Serbian Regulation on Disposal of Waste in Landfills (2010) [8], landfill post-closure works include wastewater treatment and/or recycling, and groundwater and monitoring of surface and groundwater quality, gas emissions and land subsidence.

This work has shown explicitly how an incinerator project sustainability (financial, economic and sensitivity) analysis can be applied for countries with the same level of waste management as Serbia, such as other SEE and developing countries. This work can serve as a stepping stone for both the authorities and experts/consultants in the field of waste management when it comes to considerations of incineration as an integral part of waste management systems and alternative energy solutions.

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