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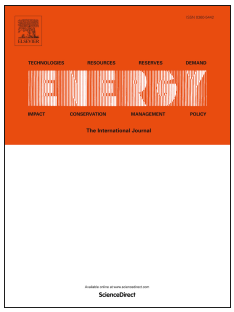

An emergy based sustainability evaluation on a combined landfill and LFG power generation system

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An emergy based sustainability evaluation on a combined landfill and LFG power generation system

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Abstract: Recovering the landfill gas from municipal solid wastes for power generation is one feasible approach to respond both climate change and resource depletion issues. Under such a circumstance, it is important to evaluate the overall performance of its production process. This study proposes an integrated evaluation method by integrating emergy analysis and eco-indicator 99 method. Key impact factors influencing the sustainability are uncovered by adopting Kaya identity and index decomposition analysis (IDA). One MSW treatment plant in Yunnan province of China was selected as one case study site. The results indicate that the overall performance of the MSW treatment plant has been improved after operating a power generation system. The emissions' impact has been reduced by 56.85% and 2.44gCO_2eq has been offset when generating 10^9sej of electricity. However, the low economic benefit, the increase of nonrenewable empower density and the low investment effectiveness are still key factors that hinder its sustainability. In order to address these issues, several suggestions are raised by considering the local realities.

Key words: Landfill gas; Power generation; Emergy analysis; Sustainability; Kaya identity; Index decomposition analysis

Nomenclature	
DALY	disability adjusted life years
D_i	impact factors of Eco-indicator 99 of pollutants
EA	emergy analysis