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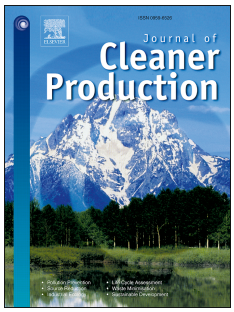

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Life cycle assessment of conventional and advanced two-stage energy-from-waste technologies for methane production

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Abstract

This study integrates the Life Cycle Assessment (LCA) of thermal and biological technologies for municipal solid waste management within the context of renewable resource use for methane production. Five different scenarios are analysed for the UK, the main focus being on advanced gasification-plasma technology for Bio-Substitute natural gas (Bio-SNG) production, anaerobic digestion and incineration. Firstly, a waste management perspective has been taken and a functional unit of 1 kg of waste to be disposed was used; secondly, according to an energy production perspective a functional unit of 1 MJ of renewable methane produced was considered. The first perspective demonstrates that when the current energy mix is used in the analysis (i.e. strongly based on fossil resources), processes with higher electric efficiency determine lower global warming potential (GWP). However, as the electricity mix in the UK becomes less carbon intensive and the natural gas mix increases the carbon intensity, processes with higher Bio-SNG yield are shown to achieve a lower global warming impact within the next 20 years. When the perspective of energy production is taken, more efficient technologies for renewable methane production give a lower GWP for both current and future energy mix. All other LCA indicators are also analysed and the hot spot of the anaerobic digestion process is performed.