Irene M C Lo, J Fundam Renewable Energy Appl 2017, 7:4(Suppl)
DOI: 10.4172/2090-4541-C1-028

5th World Bioenergy Congress and Expo

June 29-30, 2017 Madrid, Spain

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Comparison of different options for converting food waste to biogas for energy uses using life cycle assessment

Food waste represents a major constituent of the municipal solid waste in urban cities while it can be used to produce useful products if well managed. In Hong Kong, the local Government has planned to employ anaerobic digestion to produce biogas from food waste. In consequence, the biogas produced can be converted into different forms of energy use, such as electricity and heat, city gas, and biogas fuel for vehicle use. It is essential to determine the best option for converting food waste based on their environmental performance so as to strive for a sustainable waste management system. In this study, life cycle assessment is conducted to evaluate the life cycle environmental performance of different food waste converting options (i.e., electricity and heat, city gas, and biogas fuel for vehicle use). The LCA is conducted using SimaPro 7.2.4 software with ReCiPe version 1.04 to evaluate both the impact and damage categories. For impact categories, climate change is the key impact category and it is found that biogas fuel as petrol substitute has achieved the best environmental performance compared to other converting options with -103.67 kg CO_2e/tonne food waste. If 1,080 tonnes per day of food waste can be converted into biogas fuel as petrol substitute, approximately 2% of greenhouse gas emissions can be reduced in the transport sector in Hong Kong.

Biography

Irene M C Lo is currently a full Professor in the Department of Civil and Environmental Engineering at The Hong Kong University of Science and Technology (HKUST) and has been joining HKUST since 1992. She received her Master's and PhD degrees in Civil (Environmental) Engineering from the University of Texas at Austin. She is an elected Academician of the European Academy of Sciences and Arts (EASA). She is the first Hong Kong scholar inducted into the EASA. She is an elected Fellow of the Hong Kong Institution of Engineers (FHKIE), and elected Fellow of the American Society of Civil Engineers (FASCE). She has held 2 patents, edited 9 technical books, and published over 270 SCI journal articles and conference papers. Her research areas include solid waste treatment and management; magnetic nanomaterial-based technology for water and wastewater treatment; soil/sediment/groundwater remediation; and fate and transport of nanoparticles.

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