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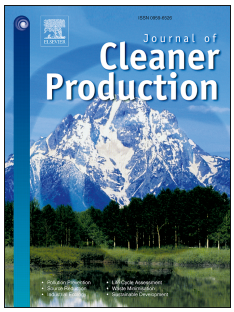

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Hanning Wang, Xian'en Wang, Junnian Song, Shuo Wang, Xiaoyu Liu

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Uncovering regional energy and environmental benefits of urban waste utilization: A physical input-output analysis for a city case

Hanning WANG [a,b], Xian'en WANG [a,b], Junnian SONG [a,b] *, Shuo WANG [a,b], Xiaoyu LIU [a,b]

[a] *Key Laboratory of Groundwater Resources and Environment, China's Ministry of Education, Jilin University, Jiefang Road 2519, 130021 Changchun, China.*

[b] *College of Environment and Resources, Jilin University, Qianjin Street 2699, 130012 Changchun, China.*

* Corresponding author: E-mail address: songjunnian@jlu.edu.cn. Tel.: +86 18243178810. Fax: +86 43185168429.

Postal address: Tang Aoqing Building C440, Qianjin Street 2699, Jilin University, Changchun, China, 130012.

Abstract:

A variety of urban wastes pertain to biomass bringing promising prospect for the transition of fossil to renewable energy sources. Increasing amount and irrational disposal of them are leading to health and environmental hazards. It is imperative to implement waste utilization for energy recovery for promoting urban energy security and environmental improvement. Considering the deficiency in the analysis of the regional energy and environmental benefits created by the utilization of multiple urban wastes from a holistic perspective, this study elaborates four kinds of waste-to-energy (WtE) applications, including combustible waste incineration, food waste biogas, organic wastewater biogas and livestock manure biogas for their industrial development. A physical input-output (I-O) model combined with the baseline method of Clean Development Mechanism methodology is developed to evaluate the overall regional energy and environmental benefits of waste utilization for energy recovery. In the city of the case study, power generation from energy recovery could amount to 1.6×10^{9} kWh, of which the largest is from waste incineration accounting for 50.4% by 2025. Total mitigation potentials for the accumulative greenhouse gases, sulfur dioxide and nitrogen oxide emissions are 85.6×10^{9} t (carbon dioxide equivalent), 1.6×10^{3} t and 2.9×10^{3} t, respectively during 2016-2025. The amount of wastes available for energy recovery, energy efficiency and environmental impacts of WtE technologies and regional I-O framework are major factors affecting the energy and environmental benefits. The methods and results presented are expected to provide local government with references for