

Energy and Carbon Footprint Analysis of Food Waste Treatment Alternatives for Hong Kong

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Abstract : Water, food, and energy nexus is a vital subject to achieve sustainable development goals worldwide. Wastewater (WW) and food waste (FW) from municipal sources are primary contributors to their respective wastage sum from a country. Along with the loss of these invaluable natural resources, their treatment systems also consume a lot of abiotic energy and resources input with a perceptible contribution to global warming. Hence, the global paradigm has evolved from simple pollution mitigation to a resource recovery system (RRS). In this study, the prospects of six alternative FW treatment scenarios are quantitatively evaluated for Hong Kong in terms of energy use and greenhouse emissions (GHEs) potential, using life cycle assessment (LCA). Considered scenarios included: aerobic composting, anaerobic digestion (AD), combine AD and composting (ADC), co-disposal, and treatment with wastewater (CoD-WW), incineration, and conventional landfilling as base-case. Results revealed that in terms of GHEs saving, all-new scenarios performed significantly better than conventional landfilling, with ADC scenario as best-case and incineration, AD alone, CoD-WW ranked as second, third, and fourth best respectively. Whereas, composting was the worst-case scenario in terms of energy balance, while incineration ranked best and AD alone, ADC, and CoD-WW ranked as second, third, and fourth best, respectively. However, these results are highly sensitive to boundary settings, e.g., the inclusion of the impact of biogenic carbon emissions and waste collection and transportation, and several other influential parameters. The study provides valuable insights and policy guidelines for the decision-makers locally and a generic modelling template for environmental impact assessment.

Keywords : food waste, resource recovery, greenhouse emissions, energy balance

Conference Title : ICEEESD 2020 : International Conference on Energy, Ecology, Environment and Sustainable Development

Conference Location : Miami, United States

Conference Dates : March 12-13, 2020