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Abstract

Municipal solid waste management (MSWM) has become a crucial issue worldwide, not only because of the increase of waste generation, but also due to its improper disposal. Improper management of MSW, typically through landfills and open dumping, has caused serious environmental impacts. To evaluate the most appropriate MSWM system, several models have been developed to support a decision making process. These models were mostly practiced for large cities, while only a few were found for medium and small cities. It is, therefore, vital to evaluate the most suitable MSWM system for medium and small cities, as decisions made at an early stage can have significant impacts to MSWM in later phases as cities grow. Selecting the most effective MSWM requires consideration of various parameters. For instance, it is complicated for developing countries, such as Thailand, due to the lack of reliable data, including the status of MSWM, characteristics of technologies used and applied, and present and future MSW generation and composition.

Firstly, this study aims to assess the status of MSWM systems in Thailand to clarify existing decision making processes and to propose appropriate alternatives. Secondly, this study attempts to fill a gap where traditional forecasting models of MSW quantity (i.e., regression analysis, time-series analysis, and econometric models) are challenging to implement given their data requirements. The innovative models, grey models (GM), are developed by using limited data and consider influencing factors to achieve greatest accuracy. Thirdly, based on the outcomes obtained above, the MSWM systems for medium and small cities were evaluated involving relevant participatory stakeholders.

The dissertation deals with an assessment of Municipal Solid Waste Management (MSWM) Systems in Thailand and analysis of appropriate alternatives based on literature review, interviews, site visits, Analytical Hierarchy Process Evaluation. Eight systems consisting of composting, recycling, anaerobic digestion, incineration, gasification, landfill gas and refuse derived fuel (RDF) and landfilling were considered for evaluation. The study has revealed that the most suitable MSWM system is the mechanical biological treatment combined with composting for medium city and mechanical treatment combined with RDF for small city, while both landfilling and landfill gas were identified as the worst options. Stakeholders prefer the waste-to-resource (WTR) scheme than waste-to-energy (WTE) to achieve sustainable MSW management in Thailand. This also resulted that public acceptance is the most important criteria for sustainability of MSWM, followed by environmental impacts and diversion from landfills. The study has presented a systematic methodology for addressing the limited data in a developing country for MSW forecasting. It is expected that the results of the study will help decision makers to better understand the MSWM related issues in a systematic manner.

Keywords: municipal solid waste management, sustainability, MSW Forecasting, Analytic Hierarchy Process, Thailand