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Abstract (Doctor)

Title of Thesis	Advanced Waste Separation-Based System for a Better Solid Waste Management in Developing Country: Case of Padang City, Indonesia (途上国における都市固形廃棄物のより良い マネージメントに向けた先進的分別システム：インドネシア パダンの場合)
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Approx. 800 words

Waste separation system which has been relatively successful in developed countries is expected to be the solution for municipal solid waste's problems in Padang city, Indonesia. The changing paradigm from waste dumping into waste recycling has been already ruled by the Indonesia's Ministry of Environment regulation number 18 since 2008 for Indonesian citizens. However, the existing solid waste (SW) bank (a system for waste separation implementation in Indonesia) is claimed to be ineffective proved by the low percentage of waste that can be treated by it. This study aims to understand the social condition toward citizens' environmental behavior which brings to the conclusion of readiness of Padang citizen for plan of waste separation-based system application in the future and propose a new system that is appropriate for Padang city's social condition. The study conducted structural equation modeling (SEM) (including exploratory factor analysis (EFA) and confirmatory factor analysis (CFA)) and a scoring system of social evaluation by surveying 609 residents. This study showed that Padang citizens are not completely ready for the plan of modification of the solid waste management system and that the city needs to improve citizens' pro-environmental behavior. This study proposes the waste FUN system (improved system of existing SW bank) as a solution to improve the level of readiness of the citizens that has a high potential for application in Indonesia and other developing countries with similar social condition.

The sustainability and feasibility of the waste FUN system then be assessed on three aspects (social, environmental and economic) by strength, weakness, opportunity, thread (SWOT) analysis, material flow analysis (MFA), life cycle assessment (LCA), and financial feasibility analysis (FFA) methods. Those methods found that the waste FUN system is feasible to do considering by advantages given to society, environment and economy.

Furthermore, in order to see deeper about the sustainability and feasibility level of the waste FUN system, comparison study was conducted in this study which compared performance of the waste FUN system with current waste management system and other potential waste management system in Padang city. The other potential waste management system is incineration-based system called city-corporate incineration system. That is a system involving

cooperation of local government and the most influential company in Padang city with the concept of a mutually beneficial between the company and the city. The framework is arranged based on prior study of Ulhasanah and Goto (2012) which utilizes the existence of the largest cement company in Padang city toward its limited availability of raw material, high operating cost, high energy consumption, and bad emission factor. Based on the results of prior study, the city-corporate incineration system has high potency to solve MSW management problems of Padang city as well as gets benefits from energy and ash produced by waste incineration. Social life cycle assessment (S-LCA), environmental life cycle assessment (E-LCA), and financial feasibility analysis (FFA) were employed to evaluate the performance of those three scenarios (scenario 1 is baseline scenario (current waste management system), scenario 2 is the waste FUN system, and scenario 3 is city-corporate incineration system).

The results showed that scenario 2 has the best performance which got the most feasibility for implementation in every evaluation steps. The best scenario chosen could give innovative ideas, and diverse information to establish a better MSW management system in cities of developing countries with similar socio-enviro-economic circumstances. Because of dissimilarity condition and needs between developed countries and developing countries, the research plot or methodology of this study may give great contribution and stimulate further research for establishment of a sustainable MSW management in developing countries.