Improvement of Municipal Waste Management Using Dynamics System and Zero Waste Index Approaches in Bandung City

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Keywords: dynamics system, municipal solid waste, zero waste index

Proper solid waste management (SWM) is one of the key components to achieve sustainable development. Indonesia has targeted 30% of waste reduction and 70% of waste handling from the total amount of waste generated by every municipality. As one of metropolitan city in Indonesia, Bandung must develop and implement a local policy in handling waste's problems, following the national targets as aforementioned. SWM master plan of Bandung was formulated as short-term (2017–2020), mid-term (2021–2025) and long-term (2026–2037) targets. To ensure its efficiency and to achieve the targeted goals, the existing performance of SWM practices of Bandung city needs to be measured objectively. This study aimed to identify and to evaluate the performance of the existing SWM in Bandung. It examined the performance of the municipal SWM system, which was conducted through the three steps, (1) development of a municipal waste management system model, (2) projection of the total reduction and handling of municipal solid waste within the different policies scenario and (3) measurement the performance of the municipal SWM system. This study proposed a hybrid approach to measure Bandung SWM performances using dynamics system and zero waste index (ZWI). At the first stage, the dynamics system was performed to project waste stream as it reduced by the formal, semiformal and informal sectors before disposal at landfill. Subsequently, these results were used as inputs of the ZWI to forecast the amount of virgin materials that were recovered from waste streams. The result showed that the efficiency of waste reduction was of 9.6% and waste handled by SWM system was of 83%. Total amount of waste handled by Bandung City is 540,526 tonnes/year with waste recycled at 28,732.3 tonnes/year. Furthermore, the ZWI of Bandung was found to be 0.05. The ZWI of Bandung showed that only around 5% wastes were recovered or potentially substituted between 2019 and 2020. In the future works, the combination between the dynamics system and the ZWI will be applied to identify them most important priority areas of SWM towards zero waste under different scenario.

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Sanitation Value Chain Vol. 5 (1) p.043, 2021
Published by Research Institute for Humanity and Nature
https://doi.org/10.34416/svc.00046