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AN ECONOMIC ASSESSMENT MODEL OF CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT BASED ON SYSTEM DYNAMICS: A CASE STUDY IN THE CITY OF SERRA – ES

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Abstract

The escalating generation of construction and demolition waste (C&DW) owing to the rapid increase in population and the per capita generation (PCG) index as an urban development metric has triggered numerous research endeavors aimed at formulating effective mechanisms and strategies to manage this waste stream. This study aims to assess the efficacy of economic instruments in promoting C&DW reuse and diverting waste from sanitary landfills using the System Dynamics (SD) tool and scenario simulations spanning the period 2020 to 2040 in the municipality of Serra, Espírito Santo (ES). Our findings reveal that the PCG index exerts a staggering 84-fold greater influence on C&DW generation compared to that of population growth. Additionally, we observe that the implementation of a public policy, such as a landfill tax, can substantially augment aggregate recycling by 124 times when comparing the highest tax rates (6%) to the lowest tax rates (2%). Nevertheless, even under the best-case scenario, our analysis demonstrates a potential rise of 76,000 tons of illegal dumping, leading to an approximate cost increase of 10 million dollars for C&DW management until 2040. To enhance future investigations, we suggest the inclusion of penalties and subsidies in the model to comprehensively evaluate their impact on C&DW management alongside the taxation applied to landfill disposal. This multifaceted approach can provide valuable insights for devising more effective waste management strategies.

Key words: construction and demolition waste, landfilling taxes, system dynamics

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