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CIRCULAR PLASTIC WASTE MANAGEMENT IN INDONESIA: ENGINEERING MATURITY, POLICY INTEGRATION, AND SYSTEM PERFORMANCE

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Abstract

The problem of plastic waste in Indonesia has become increasingly complex due to rapid population growth, urbanization, and limited waste management infrastructure. The prevailing linear system of collection, transportation, and disposal has proven inefficient, resulting in environmental degradation and economic losses. This study aims to assess the maturity of Indonesia's retail plastic packaging management within a circular economy framework and to propose an integrated policy direction for the implementation of a closed-loop system. A descriptive qualitative approach was employed, supported by secondary data from the National Waste Management Information System (SIPSN) and analysis of policy documents from selected regions, including Surabaya, Blitar, and Yogyakarta. The analysis applies a five-level maturity model—initiation, developing, standardized, integrated, and sustainable—to evaluate performance across institutional and community-based waste systems, complemented by a quantitative indicator, namely the waste processing ratio (WPR). The results show that approximately 88.6% of total annual waste inflow is managed, though with significant intercity variations; cities with higher institutional coordination and digitalized systems demonstrate greater maturity. Strengthening cross-sector collaboration, enhancing data integration, and reinforcing extended producer responsibility (EPR) are essential to accelerate the transition toward a sustainable, closed-loop packaging system. The study contributes by offering a policy-oriented assessment framework that links technological, regulatory, and social dimensions of circular plastic waste management in Indonesia.

Key words: circular economy, plastic waste management, policy-oriented assessment, waste processing ratio

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