

Analisis potensi ekonomi daur ulang limbah elektronik (WPCB) di Pulau Sumatera serta rekomendasi fasilitas pengolahannya = Analysis of the economic potential of electronic waste recycling (WPCB) on Sumatra Island and recommendations for processing facilities

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Abstrak

Peningkatan konsumsi perangkat elektronik di Indonesia mendorong timbulan limbah elektronik (e-waste), khususnya Waste Printed Circuit Board (WPCB), yang mengandung logam-logam berharga seperti emas, perak, tembaga, dan platinum. Penelitian ini bertujuan untuk menganalisis potensi ekonomi dari daur ulang WPCB di Pulau Sumatera serta memberikan rekomendasi lokasi fasilitas pengolahannya. Metodologi yang digunakan meliputi pengumpulan data timbulan WPCB per provinsi (2025–2040), estimasi kandungan logam berharga berdasarkan literatur (UNEP, Umicore), dan analisis nilai pasar logam secara aktual. Perhitungan potensi pendapatan dilakukan melalui pendekatan excel-based valuation. Selanjutnya, penentuan lokasi fasilitas dilakukan menggunakan pendekatan Multi-Criteria Decision Making (MCDM) dengan Factor Rating Method, yang mempertimbangkan kriteria seperti luas lahan, legalitas, aksesibilitas, kapasitas pengolahan, dan jarak dari wilayah pelayanan. Hasil penelitian menunjukkan bahwa potensi ekonomi daur ulang WPCB di Sumatera mencapai nilai yang signifikan dan layak secara investasi. Lokasi yang optimal untuk fasilitas pengolahan diperoleh dari hasil pembobotan berdasarkan kriteria teknis dan spasial. Penelitian ini merekomendasikan pembangunan fasilitas pengolahan terpusat di provinsi dengan timbulan terbesar dan konektivitas terbaik untuk menunjang efisiensi logistik dan nilai ekonomi maksimal.The increasing consumption of electronic devices in Indonesia has driven the generation of electronic waste (e-waste), especially Waste Printed Circuit Board (WPCB), which contains precious metals such as gold, silver, copper, and platinum. This study aims to analyze the economic potential of WPCB recycling in Sumatra Island and provide recommendations for the location of processing facilities. The methodology used includes collecting WPCB generation data per province (2025–2040), estimating precious metal content based on literature (UNEP, Umicore), and analyzing the actual metal market value. The calculation of potential income is carried out using an excel-based valuation approach. Furthermore, the determination of the location of the facility is carried out using the Multi-Criteria Decision Making (MCDM) approach with the Factor Rating Method, which considers criteria such as land area, legality, accessibility, processing capacity, and distance from the service area. The results of the study indicate that the economic potential of WPCB recycling in Sumatra reaches a significant value and is feasible for investment. The optimal location for the processing facility is obtained from the weighting results based on technical and spatial criteria. This study recommends the construction of a centralized processing facility in the province with the largest generation and the best connectivity to support logistics efficiency and maximum economic value.