

ABSTRAK

Peningkatan volume limbah plastik di Indonesia, khususnya di kawasan urban, menimbulkan tantangan serius bagi lingkungan. Salah satu solusi yang potensial adalah pemanfaatan limbah plastik sebagai bahan baku alternatif, misalnya dalam produksi *paving block*. Penelitian ini bertujuan untuk menganalisis dampak lingkungan dari proses produksi *paving block* berbahan limbah plastik di TPS 3R Baraya Runtah dengan menggunakan pendekatan *Life Cycle Assessment* (LCA). Metodologi penelitian mengacu pada standar ISO 14040 yang mencakup empat tahap utama, yaitu penentuan tujuan dan ruang lingkup, inventarisasi daur hidup (LCI), penilaian dampak (LCIA), dan interpretasi. Data primer dikumpulkan melalui observasi lapangan terkait penggunaan energi, air, transportasi, dan bahan baku plastik, sedangkan data sekunder diperoleh dari literatur dan *database* OpenLCA. Penilaian dampak dilakukan menggunakan perangkat lunak OpenLCA dengan metode TRACI, yang mencakup sepuluh kategori dampak, antara lain *global warming*, *acidification*, *eutrophication*, *fossil fuel depletion*, dan *ecotoxicity*. Hasil penelitian menunjukkan bahwa kategori dampak terbesar adalah *fossil fuel depletion* (74,83 MJ), diikuti *global warming* (51,74 kg CO₂-eq) dan *ecotoxicity* (25,51 CTUe). Validasi dilakukan dengan membandingkan perhitungan manual dan hasil OpenLCA pada kategori *global warming*, yang menunjukkan selisih hanya 0,046%, sehingga dapat dinyatakan valid. Temuan ini menegaskan bahwa konsumsi energi dan transportasi merupakan kontributor utama terhadap dampak lingkungan, sehingga strategi perbaikan diarahkan pada efisiensi energi, pemanfaatan energi terbarukan, dan pengelolaan plastik yang lebih ramah lingkungan.

Kata Kunci: *Life Cycle Assessment*, Limbah Plastik, *OpenLCA*, *Paving block*, TPS 3R

ABSTRACT

The increase in plastic waste volume in Indonesia, especially in urban areas, poses a serious challenge to the environment. One potential solution is the use of plastic waste as an alternative raw material, for example in the production of paving blocks. This study aims to analyze the environmental impact of the production process of plastic waste-based paving blocks at the Baraya Runtah 3R waste management facility using the Life Cycle Assessment (LCA) approach. The research methodology refers to the ISO 14040 standard, which covers four main stages, namely determining the objectives and scope, life cycle inventory (LCI), impact assessment (LCIA), and interpretation. Primary data was collected through field observations related to energy, water, transportation, and plastic raw material use, while secondary data was obtained from literature and the OpenLCA database. Impact assessment was conducted using OpenLCA software with the TRACI method, which covers ten impact categories, including global warming, acidification, eutrophication, fossil fuel depletion, and ecotoxicity. The results showed that the largest impact category was fossil fuel depletion (74.83 MJ), followed by global warming (51.74 kg CO₂-eq) and ecotoxicity (25.51 CTUe). Validation was performed by comparing manual calculations and OpenLCA results for the global warming category, which showed a difference of only 0,046%, thus confirming its validity. These findings confirm that energy consumption and transportation are major contributors to environmental impact, so improvement strategies are directed at energy efficiency, renewable energy utilization, and more environmentally friendly plastic management.

Keywords: Life Cycle Assessment, Paving block, Plastic Waste, OpenLCA, TPS 3R