

Evaluation of Plastic Waste Management Options Using Life Cycle Assessment Approach for a Sustainable Future

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Abstract:

Plastic's discovery resulted in a profound shift in human lives, and it is now used in a wide range of critical applications. Despite its importance, the world is struggling to control plastic waste and prevent it from infiltrating the natural environment. This paper intends to evaluate the environmental burdens of various plastic waste management scenarios using life cycle assessment (LCA). This paper evaluated five options: landfill, incineration, mechanical recycling, pyrolysis, and combined mechanical recycling and pyrolysis. The CML-IA Baseline approach is employed in this study for all scenarios, with OpenLCA software. The data for this paper came from the Ecoinvent 3.9.1 database and public reports. The last scenario, which is combined mechanical recycling and pyrolysis was found to have the lowest environmental burdens, according to the LCA results. Furthermore, the combined scenario may absorb a greater range of plastic waste, improving the whole waste management system to transition to a circular economy. Therefore, it is advised to build a portfolio of plastic waste handling techniques that provide high quality recovered products to meet numerous consumer requirements. Since it was established in this study that renewable energy has a notable favorable environmental impact across all impact categories, using renewable energy for electricity generation was recommended.

Keywords:

Bibliography: