

## Characterization of Recycled Plastic Waste in Recycling Shops of Khulna City Through Waste Analysis Campaign

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**ABSTRACT:** Recycling shops (RS) in the Khulna City area have been playing an essential role in plastic waste management, especially aligned with informal practices. This study aimed to comprehensively analyze the recycled plastic waste in the RS to explore the abundance of specific plastic waste in the flow path of recycled plastics. To achieve this, a consecutive eight-day waste analysis campaign was conducted at five selected RS in Khulna City, chosen from a total of 35 RS. Preliminary findings suggested that waste collectors and recycling waste traders (RWT) collect recyclable plastic waste from sources like households, industries, business centers, institutions, and city streets subsequently selling these materials to RS. Particularly, these waste collectors and RWTs handle only recyclable plastic waste with favorable market value. Within the RS, these plastics undergo a series of processes, including sorting, cutting, washing, drying, coloring, molding, and manufacturing new end products. Most of the RS rely on manual labor for the segregation of plastic waste based on visual and tactile means. During the eight-day analysis, the study quantified the input and output flows of plastic waste within the RS, along with their respective purchase and selling prices. The five recycling shops collectively processed a total input material of 21 tons. Among this, 73.45% consisted of mixed plastics, while PET bottles made up the remaining 26.55%. Considering the input plastic waste, 15% was sourced from outside the city, while 85% originated within the city boundary. During the campaign period, these shops sold a total of 31.5 tons of recycled plastics of which 92% of the sold items were plastic flakes, 1.5% were plastic grains, and the remaining 6.5% comprised various other output items. This study also quantified the amount of non-plastic materials, process losses, non-recycled plastics, and the ultimate destination of all products and waste materials. The flakes are usually sold to the recycling industry in Dhaka and exported through EPZs. However, the new end products are sold to local markets. It was also observed that RS disposed of a considerable amount of non-recycled plastics in open dump site or open places which requires effective monitoring of recycling activities operated by RS in Khulna city.

**Keywords:** Waste; Plastic; Recycling; Recycling Shop; Khulna city.

## Life Cycle Assessment of Plastic Waste of Various Compositions end of Life Analysis using Openlca

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**ABSTRACT:** Bangladesh, being designated as a developing nation, is encountering significant challenges in effectively managing plastic waste. Khulna University of Engineering and Technology (KUET) is also a university campus in Bangladesh which provides to a great portion of plastic waste. The majority of these plastic waste in KUET disposed of by either landfilling or open burning methods. This study utilized life cycle assessment (LCA) to conduct a comparative analysis of the environmental impact associated with the end-of-life treatment of 1kg of plastic waste across the five fundamental types of polymer composition; PET, PE, PP, PS, and PVC in KUET. The treatment method selected for this study to address end-of-life (EOL) waste was open burning, open dumping and landfilling, which is widely practiced in Bangladesh. The study does not include recycling as a viable alternative for end-of-life analysis, as recycling does not signify the ultimate termination of the plastic's life cycle, but rather its reuse. The environmental factors under consideration encompass a range of categories, including acidification, land occupation, ecotoxicity, Eutrophication, Human Toxicity etc. The investigation has demonstrated that the burning of plastic materials significantly contributes to climate change, whereas the disposal of plastic waste in landfills is a primary factor in the occurrence of marine ecotoxicity. The findings of this study can be utilized to reinforce future investment decisions pertaining to plastic waste management policymaking.

**Keywords:** Plastic Waste Management, Environmental Impact, Life Cycle Analysis, Polymer Composition, End of Life Treatment.