

## Engineering Economic Analysis of Implementing a Materials Recovery Facility in Jamaica: A Green Industry Approach towards a Sustainable Developing Economy

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**Abstract :** This paper assesses the design and feasibility of a Materials Recovery Facility (MRF) in Jamaica as a possible green industry approach to the nation's economic and solid waste management problems. Jamaica is a developing nation that is vulnerable to climate change that can affect its blue economy and tourism on which it is heavily reliant. Jamaica's National Solid Waste Management Authority (NSWMA) collects only a fraction of all the solid waste produced annually which is then transported to dumpsites. The remainder is either burnt by the population or disposed of illegally. These practices negatively impact the environment, threaten the sustainability of economic growth from blue economy and tourism and its waste management system is predominantly a cost centre. The implementation of an MRF could boost the manufacturing sector, contribute to economic growth, and be a catalyst in creating a green industry with multiple downstream value chains with supply chain linkages. Globally, there is a trend to reuse and recycle that created an international market for recycled solid waste. MRFs enable the efficient sorting of solid waste into desired recoverable materials thus providing a gateway for entrance to the international trading of recycled waste. Research into the current state and effort to improve waste management in Jamaica in contrast with the similar and more advanced territories are outlined. The study explores the concept of green industrialization and its applicability to vulnerable small state economies like Jamaica. The study highlights the possible contributions and benefits derived from MRFs as a seeding factory that can anchor the reverse and forward logistics of other green industries as part of a logistic-centered economy. Further, the study showcases an engineering economic analysis that assesses the viability of the implementation of an MRF in Jamaica. This research outlines the potential cost of constructing and operating an MRF and provides a realistic cash flow estimate to establish a baseline for profitability. The approach considers quantitative and qualitative data, assumptions, and modelling using industrial engineering tools and techniques that are outlined. Techniques of facility planning, system analysis and operations research with a focus on linear programming techniques are expressed. Approaches to overcome some implementation challenges including policy, technology and public education are detailed. The results of this study present a reasonable judgment of the prospects of incorporating an MRF to improve Jamaica's solid waste management and contribute to socioeconomic and environmental benefits and an alternate pathway for economic sustainability.

**Keywords :** engineering-economic analysis, facility design, green industry, MRF, manufacturing, plant layout, solid-waste management, sustainability, waste disposal

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