

Circular Economy of Waste and By-products: Innovative Case Studies and Climate-Forward Strategies for Sustainable Industrial Models

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ABSTRACT: The transition to a circular economy (CE) is essential for achieving sustainability in industrial park operations. This paper explores innovative strategies that utilize waste and by-products to create sustainable economic models. By examining multiple case studies, we highlight successful implementations of CE principles that not only reduce waste but also enhance resource efficiency and foster economic resilience. Through analysis of various industrial parks globally, we identify key practices such as waste valorisation, closed-loop systems and renewable energy integration, etc. These strategies show how industries can repurpose waste materials into valuable resources, minimizing environmental impact while maximizing economic potential. The case studies illustrate approaches to transforming industrial by-products into new materials for construction and manufacturing, addressing the demand for fresh materials. Furthermore, this paper discusses the roles of policy frameworks, stakeholder collaboration, and technological innovations in facilitating the shift towards a circular economy. Ultimately, the findings underscore the importance of adopting CE principles as foundational elements of sustainable industrial models, providing a roadmap for industries aiming for long-term sustainability while tackling pressing environmental challenges. This research contributes to the discourse on sustainable industrial practices and offers actionable insights for policymakers and business leaders.

Keywords: Reverse logistics, Climate change, Waste management, Circular Economy, Eco-practices.

Utilization of Dolochar an Industrial Waste in Cement Plants

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ABSTRACT: Dolochar is a by-product of sponge iron industry, produced in large volumes, for every 100 tons of sponge iron produced around 25 tons of dolochar is generated as a by-product in direct reduction of iron (DRI) type plants. And India being the largest producer of sponge iron, managing these waste by-products is a challenge, as it requires an effective disposal in accordance with the environmental guidelines. This study thus explores a sustainable solution by using dolochar as an alternative fuel (AF) in captive power plant (CPP) and for slag dryer in the cement plants, aiming to reduce both environmental impact and production costs in cement manufacturing by substituting traditional fuels. The dolochar as an AF was experimentally analysed through a trial for a year and the techno-economical sustainability of the process was gauged based on the substitutional benefits. The environmental sustainability was also gauged through measurement of different emission during the trial period. The findings showed that dolochar can be successfully integrated into cement plants without compromising the process or environmental safety. By using dolochar, cement plants consume less fossil fuel, leading to cost savings and a significant reduction in greenhouse gas emissions. During the study period around 18400 tons of dolochar was utilized in CPP and in slag dryer with savings of around USD 185113. Thus, the utilization of dolochar provides a sustainable way for reduction of carbon footprint of the cement plant while conserving resources and enhancing circular economy through resource re-circulation.

Keywords: Dolochar, Cement Plants, AFRs, Waste Utilization