

Pitching for a Cradle-to-Gate Carbon Footprint Calculator for the Marble Industry in Oman

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Abstract

The marble sector in Oman stands out as a resilient and flourishing industry within the country's mining sector, owing to the presence of extensive and seemingly inexhaustible marble deposits that boast high-quality stones in a variety of exquisite colors. Additionally, the sector benefits from a well-established quarrying infrastructure and holds the impressive status of being the third-largest exporter of stones globally. Omani marble production enjoys the advantages of cost-effective labor, locally developed machinery, a substantial domestic market, and a well-established distribution network in the Arabian region. Given the country's rich tradition of stone architecture and a rising demand fueled by construction activities and keen architectural awareness in the Arabian region, the sector possesses significant untapped export potential. Furthermore, globalization, a strategically advantageous location with international sea links, and an increasing demand for stone handicrafts and various dimension stones all contribute to its robustness.

Given the potential emissions from the expanding marble industry, it becomes crucial to establish and implement a carbon footprint calculator specifically tailored for this sector, serving as a pilot project. Such an initiative aligns with the nation's ambitious objectives to attain net-zero emissions in future following sustainable industrialization. In his address on the 53rd National Day on November 18, 2023, His Majesty Sultan Haitham bin Tariq Al Said emphasized the country's unwavering commitment to addressing climate change and achieving the target of net-zero carbon emissions by 2050.

The carbon footprint calculator for marble industry in Oman will facilitate in continuous monitoring and management of emissions. This will contribute to industry's sustainability goals and global climate mitigation efforts as per the Paris Agreement, 2015. For that, we propose a cradle-to-gate approach, a life cycle assessment (LCA) methodology that evaluates the environmental impact of a product from the beginning of its life cycle (cradle) to the point where it leaves the manufacturing facility (gate). In the marble industry, the main steps include the extraction of raw materials, transportation, manufacturing, and packaging, followed by the distribution of products to various outlets. The proposed pilot project will specifically target the development of a Python program focusing on calculating CO₂ emissions associated with various steps. This tool aims to empower the industry to monitor its advancements in reducing carbon footprint, enabling data-driven decision-making to enhance sustainability. For instance, if the analysis reveals that a substantial portion of emissions originates from transportation, the industry could consider replacing conventional gas-powered trucks with electric alternatives to achieve significant emission reductions.

We recommend the implementation of this pilot project within the marble industry due to our research team's ongoing reconnaissance studies, which explore the potential economic benefits of utilizing marble waste in other industries. Subsequently, similar projects can be introduced in sectors such as mining, manufacturing, energy, automotive, agriculture and food processing, as well as aerospace and defense.