

LCA of sand aggregates production from a quarry in Cyprus

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Abstract

The present research study provides an overview of a Life Cycle Assessment (LCA) conducted to evaluate the environmental impacts associated with the production of sand aggregates from a quarry located in Cyprus. The LCA aims to provide environmental experts with valuable insights into the sustainability aspects of sand aggregate production and identify potential areas for improvement. The study investigates the gate to gate approach of sand aggregates, including processing and production. The functional unit (FU) used in the current LCA for the data collection and inventory formulation was 1t of sand aggregate. Initial data collection involved acquiring detailed information on the quarry's operational processes, energy consumption, water usage, emissions, and waste generation. Primary data was supplemented with secondary data from databases to ensure comprehensive coverage (OpenLCA software). Three environmental impact categories were calculated in the LCIA including: (i) acidification potential (AP) in kg SO₂-eq·FU⁻¹, (ii) global warming potential (100 years) (GWP) measured in kg CO₂-Eq·FU⁻¹, and (iii) terrestrial ecotoxicity (TAETP) measured in kg 1,4-DCB-Eq·FU⁻¹. Furthermore, in order to estimate the impacts associated with specific processes such as crushing, sieving and washing of aggregates a sampling campaign was performed to measure the concentration of particulate matter (PM_{2,5}). Results indicate environmental impacts associated with processing of sand aggregates. Key findings highlight the substantial energy consumption and associated greenhouse gas emissions during the processing stages. Through LCA potential mitigation measures and sustainable alternatives to minimize the environmental footprint of sand aggregate production are proposed.

References

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