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Life cycle assessment of clinker and cement production in Spain. Environmental assessment of decarbonisation measures

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Abstract-

This study examines the environmental impacts of clinker and cement production in Spain, focusing on the effects of current practices and future decarbonisation strategies through a cradle-to-gate life cycle assessment (LCA). Three scenarios were analysed: the baseline scenario, which uses global statistical data on the production and consumption of raw materials and energy in Spain in 2021, and two future scenarios for 2030 and 2050. The impact of implementing various decarbonisation measures proposed in the Spanish cement sector roadmap was evaluated and analysed in the future scenarios. These measures primarily include substituting fossil fuels with biomass- and waste-derived fuels, improving thermal efficiency, and reducing the clinker-to-cement ratio. The results showed that, in six out of the eleven environmental impact categories assessed, impacts were reduced, while increases were observed in the remaining five categories. Global Warming Potential stands out among the categories with reduced impacts, with reductions of 18 % and 36 % projected for cement production in 2030 and 2050, respectively. On the other hand, the categories that showed increased impacts are mainly associated with the greater use of biomass-derived fuels, suggesting the convenience of further exploring their potential implications on the sector's overall environmental performance.

Index Terms- Life cycle assessment; Cement production; Fuels from waste; Biomass fuels; Supplementary cementitious materials; Cement decarbonisation measures

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