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The potential of Volcanic Pozzolan from Iceland (VPI) in concrete production to reduce the carbon footprint

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The concentration of atmospheric carbon has overpassed 420ppm calling for urgent action to mitigate climate change and remain below the 1.5-degree warming agreed in the Paris climate agreement. The construction industry, with energy consumption included, is with about 40% a significant contributor to the global carbon emissions. Within concrete production, cement accounts for 90% of the emissions. Notably, cement production alone accounts for 8% of global carbon emissions.

Fly ash is amongst the most used of all Supplementary Cementitious Material (SCM). However, its availability is becoming an issue since many coal power plants are shutting down in Europe. Moreover, its environmental profile is questionable. Fly ash is a side product of a carbon intensive industry. Nonetheless, no environmental load has been allocated to it until now.

This study investigates how Volcanic Pozzolan from Iceland (VPI) in concrete compares to traditional concrete and VPI to fly ash, as well as the potential of reducing carbon emissions in concrete production by using VPI as SCM and substitute for cement.

To assess the environmental impacts of VPI and fly ash in cement production, we conducted a Life Cycle Assessment (LCA). For this purpose, we used the GaBi software and relied on primary data from the developers, Heidelberg Materials, and secondary data from the Ecoinvent database.

Our preliminary results reveal that the utilization of VPI as SCM yields an important reduction in carbon emissions compared to Ordinary Portland Cement (OPC) concrete. This notable decrease in carbon footprint positions VPI as a compelling alternative for sustainable concrete production. Two primary factors support this assertion: i) preliminary tests affirm the comparable properties of VPI concrete to OPC, and ii) the diminishing availability of fly ash in Europe necessitates alternative sources, often located at considerable distances, thereby escalating transportation-related emissions.

In conclusion, the integration of VPI emerges as a viable strategy to combat climate change and curtail the carbon footprint of the concrete and construction industry. This initiative aligns with global environmental objectives outlined in the Paris Agreement, United Nations Climate Change Conference, and the Nordic commitment to carbon neutrality by 2040. Embracing VPI as a

sustainable alternative in concrete production reflects a positive stride towards achieving these critical environmental milestones.