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Addition of Alkalinity to Rivers: a novel strategy for Ocean Alkalinity Enhancement

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Effective carbon dioxide removal (CDR) strategies are urgently needed to reduce risks of climate change. Here we propose a new strategy for Ocean Alkalinity Enhancement that targets the land-to-ocean component of the inorganic carbon cycle: river-based alkalinity and weathering enhancement (RAWE). RAWE adapts freshwater acidification mitigation technology to capture CO_2 through mineral weathering and by increasing rivers' capacity to retain and transport bicarbonate to long-term storage in the ocean. Field experiments in Nova Scotia rivers demonstrate the proof of concept, and global-scale modelling of RAWE indicates a potential millions of tonnes of CDR per year. Results suggest that RAWE meets CDR criteria, such as scalability, permanence, safety, and ability to simply quantify the CO_2 removed, whilst delivering ecological co-benefits.