

ENHANCED WEATHERING (TECHNOLOGY BRIEFING)

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Overview

Enhanced weathering (EW) is a set of theoretical proposals to remove CO₂ by spreading large quantities of selected and finely ground rock material onto extensive land areas, beaches or the sea surface. The hypothetical carbon dioxide removal (CDR) technology aims to mimic and accelerate the natural weathering processes of silicate and carbonate rocks, a slow carbonation process that is estimated to consume and absorb about one billion tonnes of CO₂ from the atmosphere every year.

The acceleration of the weathering process would theoretically be achieved by mining and crushing large amounts of suitable rocks to increase the amount of weathering rocks as well as their reactive surface. 1 Accelerating the CO₂-consuming weathering process is associated with great expenses, and also with impacts on poor communities, environmental damages, and high water and energy consumption comparable to coal mining. Suitable rocks, particularly silicate and carbonate minerals rich in Calcium and Magnesium such as olivine-rich ultramafic and mafic rocks or basaltic rocks, need to be mined, crushed, transported and dispersed.

Other proposals suggest the use of waste materials, such as mine tailings or industrial by-products from iron and steel production, for example steel slag or cement kiln dust, which may release pollutants with harmful effects. ² The dispersion of minerals and waste materials able to absorb CO₂, is proposed for terrestrial, coastal and marine environments. On land, the application is usually proposed for agricultural fields, based on the argument that addition of stone meals may increase soil fertility and therefore crop yields.

Although stone meals are regularly used as fertilisers or soil conditioners to correct deficiencies in soil nutrients or soil structure, it is unlikely that the amount required for an optimum supply of nutrients would have substantial effects on the global concentration of atmospheric CO₂: the average amount of finely ground rock needed to absorb 1 tonne of CO₂ is 2 tonnes.

Enhanced weathering in marine environments is also referred to as ocean alkalinity enhancement (OAE) and involves adding ground minerals directly to the ocean or dumping them on beaches where wave action disperses them into water to theoretically increase alkalinity and therefore CO₂ uptake. The effects of OAE on biochemical processes or the marine food chain are unknown.

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