

Enhanced weathering of rocks, mining wastes and synergies: Upscaling field trials in Spain and Finland for the EU C-SINK project

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The EU/UKRI-funded C-SINK project investigates enhanced rock weathering (ERW) as a carbon dioxide removal (CDR) technology, through two distinct field trials in Finland (Kevitsa mine, Boliden) and Spain (David mine, Pasek), where Monitoring, Reporting, and Verification (MRV) is carried out *in situ* within active mine sites. Both trials test MRV under real, open-system conditions, focusing on transparent, scalable and long-term sustainable removals through atmospheric CO₂ conversion into stable carbonate forms.

At Kevitsa, an open-pit nickel, copper, gold, platinum and palladium mine, trials focus on the carbonation potential of ultramafic waste rocks and tailings under arctic conditions. Previous research has demonstrated CO₂ sequestration and acid mine drainage mitigation, and current work aims to optimise these processes at scale. In contrast, trials at David mine focus on the CDR efficiency of dunite waste produced in the quarry, compared with artificial soil and biochar synergies for maximising CO₂ capture and sequestration under a mild oceanic climate. Artificial soils contain bio-stabilised residues and construction/demolition wastes enhancing CO₂ capture and improving soil health, whereas biochar promotes stable carbon storage and other co-benefits in soil properties.

Preliminary data from both trials demonstrate that ERW carried out directly at the mine sites, is scalable as a part of mining operations in diverse climatic conditions and geological settings, avoiding extra energy, emissions and costs required for comminution and transport to agricultural sites. The use of ultramafic wastes and biochar blended with artificial soil, promotes ERW synergistic effects for maximising CDR and co-benefits at deployment. Finally, field trials findings are contributing to the need for more scientific evidence on sustainable ERW upscaling globally, but are also testing C-SINK MRV protocols, which aim to ensure standardisation, transparency and responsible deployment of CDR technologies tackling climate change in Europe and beyond.