

Bridging Science and Practice: A Certification Protocol for CO₂ Uptake in Enhanced Rock Weathering

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The European Union (EU) has recently emphasized the importance of scaling carbon dioxide removal (CDR) techniques to achieve climate neutrality by 2050. Enhanced Rock Weathering (ERW) using olivine and other silicate minerals is a promising CDR technique that accelerates natural silicate weathering to sequester CO₂ in stable mineral forms. However, its large-scale adoption is limited by ongoing debates about quantification, while climate, society, and carbon removal projects are in urgent need of upscaling this novel method. Therefore, Oncra has developed a protocol that balances academic integrity with practicality to calculate the CO₂ removed through ERW. Ultimately, this enables reliable carbon removal certification and facilitates the scaling of ERW as a viable carbon removal strategy. The protocol provides a standardized approach for quantifying CO₂ sequestration, using a conservative and empirically validated model. It incorporates the Vink & Knops (2023) model, which employs a Shrinking Core Model (SCM) to simulate mineral dissolution rates while accounting for mineral composition, particle size distribution, and environmental conditions. Using this model, terrestrial ERW with olivine is estimated to sequester approximately 0.8-1.0 kg CO₂ per kg of olivine applied, depending on mineral quality and the duration of the weathering process. While this protocol marks an important step forward in enabling the reliable certification of ERW projects, several challenges remain. These include data limitations, regional variability, and the potential for environmental trade-offs, such as heavy metal release. Nevertheless, in alignment with the EU Carbon Removal Certification Framework (CRCF), this protocol contributes to establishing a practical and reliable certification process for ERW, emphasizing its potential as a scalable, nature-based CDR technique with permanent CO₂ removal.