Enhanced Rock Weathering

OPPORTUNITIES, BARRIERS AND LIMITATIONS | OCTOBER 2025

Overview

On the 18th September 2025, the LUNZ Hub hosted a 'Big Tent Event' in Venue Cymru, Llandudno. As part of the event a series of 'Ask the Expert' breakout sessions explored key topics for a sustainable and just land-use transition. This note outlines the key messages and discussion points from the breakout session on enhanced rock weathering.

The session covered the scientific principles behind enhanced rock weathering, the current scale of operations globally and in the UK, what uncertainties still need addressing and some common questions and misconceptions that our panellists often face when talking to landowners, businesses and the farming community.

Enhanced rock weathering is a rapidly emerging technology that has great potential for carbon sequestration, alongside co-benefits to soil and crop health. However, the scientific data is still developing, with results from large-scale, long-term UK field trials still being assessed. It's vital that a robust MRV processes are developed, with confidence in the realised carbon drawdown and while CDR data from UK field trials may not yet be available, there are encouraging signs linked to positive ecological indicators, reassuring communities that application of ERW onto land is unlikely to lead to unintended negative consequences for biodiversity and soil health.

EVIDENCE & INSIGHTS

Enhanced rock weathering (ERW) speeds up naturally occurring silicate weathering to drawdown atmospheric CO_2, converting it to bicarbonate and eventually locking it away as stable marine carbonate, turning the process from geological-scale to decadal-scale. In the UK, basalt is the most commonly used 'rockdust' but wollastonite is also used commonly elsewhere, such as in Canada by UNDO.

Modelled estimates suggest that the carbon drawdown removal (CDR) from ERW could reach up to 30 Mt CO_2 yr^{-1} in the UK by 2025[1], however more conservative estimates, which also account for sulphuric acid weathering, are around 4.5 Mt CO_2 yr^{-1}, which is still double natural weathering fluxes in the UK[2].

However, these estimates are primarily derived from data produced in laboratory studies, with large-scale UK field studies still ongoing. The Greenhouse Gas Removal demonstrator (GGR-D) programme is currently conducting field trials across lowland pastureland, arable croplands, and upland grassland across the UK and organisations like UNDO are working with many farms in the UK and across the world. Data from these field trials is vital in understanding how well modelled CDR rates agree with the realities if the complex, heterogenous natural environments, alongside providing key data into the associated co-benefits and potential side effects of ERW practices. For example, in US field trials yields of maize and soybean increased by around 16% with the addition of basalt and soil pH also increased[3].

A full biogeochemical assessment of ERW in UK field trials is currently ongoing, providing the evidence needed to determine the viability of using ERW as a tool for reaching the UK's net zero targets by 2050, while also having the potential to provide farmers with additional ecological and crop benefits.

OPPORTUNIITES & CHALLENGES

There is already a significant surplus of basalt in the UK as a by-product of quarrying, with an estimated 490 million tonnes stockpiled, enough to meet demand for many years without new extraction. Infrastructure for land application is largely in place, with spreading carried out by existing agricultural contractors using standard equipment, so farmers do not need to change machinery, although questions remain around optimal application rates and frequency.

For farmers, adoption would require minimal changes to current practices. Where material is provided at no cost (in return for carbon credits), it can be integrated easily and may deliver co-benefits for soil health, pH and crop yields. However, the supporting technology for monitoring and verification is still developing, and commercial activity has in some cases moved ahead of academic publications and clear regulation.

Costs remain relatively high, at around £100–200 per tonne of CO_2 removed, raising concerns about long-term viability. There are also wider social and environmental considerations, including the impacts of large-scale quarrying if rolled out widely, transport emissions to rural areas, and whether all quarry by-products are suitable for land application, particularly in relation to potentially toxic elements in some regions.

POLICY & PRACTICE IMPLICATIONS

Understandably, there is an urgency for insight into whether ERW should be adopted for widespread rollout, if this technological is going to have substantial impact on CDR and assist in reaching net zero targets then the faster we act, the greater the impact. However, there is also a need for some patience to ensure we have robust data into the realised CDR of ERW in UK systems.

ERW is still at an early stage globally, with adoption growing from a low baseline. In the UK, activity remains largely pilot-scale, while a small number of countries are moving faster due to stronger policy support, research investment and emerging carbon markets. Overall, the sector is expanding but is not yet operating at meaningful scale.

Substantial work is still needed to support wider uptake. Key priorities include the development of consistent and credible measurement, reporting and verification (MRV) approaches, and clearer rules around how carbon credits are generated and claimed, including reassurance that participation in ERW does not affect farmers' ability to claim credits for soil organic carbon. Additionally, better quantification of the co-benefits that farmers could expect would be valuable under the current model in the UK, where farmers are solely benefitting from the soil and crop improvements. Internationally, Brazil provides a more established example, where rock dust application has been embedded in policy through the 2013 Law of Remineralisation as part of a national food security strategy, alongside the emergence of certified ERW protocols and carbon credits.

A common question: how does ERW compare to liming?

Not a liming replacement – doesn't have the same neutralising capacity as it is silicate-based, rather than carbonate based.

But rather should be seen as a soil amendment that can assist with soil pH increase, over longer time periods.

SUMMARY

UK field trials of enhanced rock weathering are beginning to produce promising results, particularly in relation to biological indicators of soil change. These early findings suggest potential benefits for soil function alongside carbon removal. However, there is still a clear need for longer-term trial data to assess how well modelled carbon dioxide removal rates reflect real-world performance under UK conditions.

Current commercial models have typically involved the practitioner supplying ERW materials to farms at no cost and retaining the associated carbon credits, while farmers benefit from improvements in soil health and crop performance. While this approach has enabled early deployment, it reinforces the importance of robust evidence and transparent accounting as the sector develops.

Figure 1: Basalt less that 2mm in size is spread in UK field trials as part of the GGR-D project.

References:

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ABOUT LUNZ HUB:

The Land Use for Net Zero (LUNZ) Hub is a consortium of 34 organisations that aims to provide the UK government and devolved administrations with the rapid evidence they need to develop policies that will drive the land use transformation required to achieve Net Zero and other environmental and social targets by 2050.

LAND USE *for* NET ZERO >>> HUB

Partners include experts from research, farming and industry, working across issues including green finance, renewable energy, planning, soil health, afforestation and water management. LUNZ will play a pivotal role in supporting policymaker decision making and helping to communicate more widely the critical importance of land as a carbon sink or source.

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