

Environmental Audit Committee inquiry: The Seventh Carbon Budget

Response from the CO₂RE Hub, 4th November 2025

About the CO₂RE Hub

- The [CO₂RE Hub](#) (The Greenhouse Gas Removal Hub) is pleased to provide this response to the Environmental Audit Committee inquiry on the Seventh Carbon Budget. The CO₂RE Hub forms part of the £31.5m UKRI Strategic Priorities Fund Greenhouse Gas Removal Demonstrators (GGR-D) programme which is investigating the potential for sustainable scale-up of greenhouse gas removal methods in the UK. The programme commenced in May 2021.
- The CO₂RE Hub coordinates across the GGR-D programme and carries out research on GGR technologies across the board. Areas of research include GGR evaluation and lifecycle analysis, legal and regulatory issues, economic policies, business models, monitoring, reporting and verification (MRV), public attitudes, socio-ecological systems and systems modelling.
- This response draws on evidence from the CO₂RE Hub and the five demonstrator projects that comprise the GGR-D programme, which include the [Biochar Demonstrator](#), the [UK Enhanced Rock Weathering GGR Demonstrator](#), [Perennial Biomass Crops for Greenhouse Gas Removal](#) (PBC4GGR), [NetZeroPlus](#) (woodland creation and management) and [GHG Removal by Accelerated Peat Formation](#) (GGR-Peat). These projects are researching individual GGR technologies and their potential GGR co-deployment. Research areas include scalability, co-benefits and trade-offs, and enablers and barriers, drawing on large-scale field trials, modelling, life-cycle analysis and research into public and stakeholder attitudes.
- The CCC has set out five routes through which the Seventh Carbon Budget will be delivered; two of these routes are particularly relevant to the greenhouse gas removal methods being demonstrated in the GGR-D programme: the ‘Engineered removals’ route includes biochar, enhanced rock weathering and bioenergy with carbon capture and storage (BECCS), while the ‘Nature’ route includes woodland creation and management, and peatland restoration.
- If you would like to follow up on any of the evidence provided in this response, please do get in touch with [REDACTED]
[REDACTED]

1. CCC's assumptions behind the budget

Q - How adequate and deliverable are the CCC's headline assumptions underpinning the 'balanced pathway' (e.g. sectoral reductions, technology deployment, economic circumstances, public behaviour) in ensuring compliance with the UK's statutory carbon budgets under the Climate Change Act, including in light of the new Carbon Budget Delivery Plan?

- The Climate Change Committee has laid out a scientifically-grounded and deliverable pathway, which we view to be sound. Arguably, it should be seen as a “floor” to UK ambition rather than a “ceiling”; in light of the conclusion of the Intergovernmental Panel on Climate Change which indicated that global CO₂ emissions must reach net zero by 2050 in order to keep global warming close to 1.5°C, and given the increasing frequency and severity of climate change impacts, the UK may wish to go further and faster, leading by example to raise global ambition.
- Commenting more specifically on the role of carbon removals, the CCC's Seventh Carbon Budget advice estimates that less carbon removals will be needed compared to previous analysis, from 57 MtCO₂/yr down to 36 MtCO₂/yr in 2050. The advice also points to a more limited need in the biomass supply for 2050, 130 TWh compared to the 250 TWh indicated in the Sixth Carbon Budget advice. Delivering this level of carbon removals will still require significant action across a number of areas but delivering this scale is expected to be more achievable and put less pressure on land-based resources.
- For the first time, the CCC's modelling and advice included a role for enhanced rock weathering and biochar as part of the mix of carbon removal options. Both are relatively new methods in the context of greenhouse gas removals and are the subject of field trials through two projects in the GGR-D programme. The projects provided evidence on these options and welcome their inclusion in the CCC's CB7 advice.
- Both biochar and enhanced rock weathering involve spreading material on land. Biochar is produced from biomass (from a range of different sources, including waste products) that has been burned in low-oxygen conditions. Enhanced rock weathering uses fine rock particles that react with CO₂. Studies indicate that the total removal potential from biochar and enhanced rock weathering could be up to 20 MtCO₂e and 30 MtCO₂e, although with substantial uncertainty (and, in the case of biochar, competition for biomass with other end-uses). Given this uncertainty as well as the potential value of these options, we consider that the CCC has made a reasonable choice by including them in small quantities for now (3 MtCO₂e in 2050)¹. Further deployment over the next five years will help to better quantify their potential.

¹ Climate Change Committee, Seventh Carbon Budget report, Section 7.12.2 The balanced pathway for engineered removals, p.273.

- Although included in CCC pathways, these methods are not yet reported in greenhouse gas inventories, and policy and regulatory frameworks are not yet in place.
- Further information on these GGR methods is available on the demonstrator project websites, [The Biochar Demonstrator](#) and [The UK Enhanced Rock Weathering GGR Demonstrator](#) and will also be available in the forthcoming report towards the end of November 2025: *The UKRI Strategic Priorities Fund Greenhouse Gas Removals Demonstrator Programme: an overview of key research insights and cross-cutting lessons*.
- The CCC has also advised a step-change in energy crop planting. Perennial biomass crops such as willow and miscanthus add carbon to soils as well as providing biomass for energy and industry. [PBC4GGR](#), a demonstrator project that also forms part of the GGR-D Demonstrator programme, has provided an evidence base on the greenhouse gas impacts of transitioning land to plant these crops and their scalability as a feedstock for BECCS. The research has indicated that there is land available in the UK but that increasing the deployment of these crops is subject to a suitable policy and delivery framework and advice for farmers being in place².
- Competition for land, biomass and other resources such as low-carbon energy could affect the scale to which land-based GGRs are delivered, although this could be mitigated in various ways. In relation to use of land, biochar and enhanced rock weathering (ERW) can be integrated into existing land uses (i.e. agricultural land). Different feedstocks could be used for different GGRs, for example.
- In addition, evidence on opportunities for co-locating or ‘stacking’ different GGR methods on the same land suggests there are ways to ensure more effective use of limited land resources and enhance the performance of GGRs. For example, the GGR-Peat demonstrator is investigating ways of enhancing lowland and upland peatland restoration to achieve GGR outcomes. This might include co-locating perennial biomass crops with peatland restoration (crops grown on rewetted lowland peat) or co-locating biochar with peatland restoration (applying biochar made from mown heather to suppress methane emissions on upland peat). Other types of co-location include ERW and forestry, or perennial biomass crops and biochar³.
- More broadly, location is an important factor for effective GGR deployment. Emerging evidence from the GGR-D programme demonstrators shows that for land-based GGRs, their efficacy and other characteristics vary spatially according to a range of factors

² GGR-D Programme report: *The UKRI Strategic Priorities Fund Greenhouse Gas Removals Demonstrator Programme: an overview of key research insights and cross-cutting lessons*. Due to be published November 2025.

³ See Table 4 ‘Opportunities for co-deployment’ in *The UKRI Strategic Priorities Fund Greenhouse Gas Removals Demonstrator Programme: an overview of key research insights and cross-cutting lessons*. Due to be published November 2025.

including soil characteristics, local climate, type of farmland (arable, pastureland or upland) or type of peatland, for example. The quantity of carbon removal and potential to deliver co-benefits also depends upon land management practices. Relative location of different parts of the supply chain is a further factor; for example, proximity of perennial biomass crops to BECCS plants, or proximity of sources of rock to agriculture (for ERW).

- It is vital that these GGRs are integrated into land-based policy – especially the Land-Use Framework for England – as well as other policy areas including energy, industrial policy, waste, nature restoration and transport.
- Evidence from across the GGR-D programme suggests that farmers and land managers are open to taking part in the deployment of GGR, but require policy stability, clear information on how GGR methods work and where, how they will benefit and best practice, in order to be confident about changing the way they operate. In addition, a clear regulatory framework, informed by emerging scientific evidence, needs to be in place for farmers to start or continue operations, or attempt to scale.
- Both farmer and local community perceptions vary according to local contexts and a place-based approach to siting GGRs is needed which is sensitive to local concerns; in addition, acceptance by either group is conditional on certain assurances being in place.^{4,5,6}
- Crucially, effective policy and regulation will be essential to promote the scale up of GGR from current modest levels of deployment to the level recommended in CCC's pathway, as well as policy stability to give confidence to farmers, businesses, investors and others involved in supply chains. The programme has identified a series of measures that would address barriers and enablers across the whole GGR portfolio (not just the land-based GGRs demonstrated in the GGR-D programme) including:
 1. Holistic frameworks and tools to guide decision-making.
 2. Business models and liability regimes that create value and share risk.
 3. Policies and partnerships tailored to suit individual GGRs.
 4. Measures to address regulatory gaps and barriers.
 5. Pragmatic MRV standards with sustainability considerations embedded.
 6. Responsible scaling by attending to societal concerns and preferences.
 7. Support to maintain an innovation pipeline.

⁴ For example: O'Sullivan, K., Pidgeon, N., Henwood, K. *et al.* (2025), Who pays for carbon dioxide removal? Public perceptions of risk and fairness of enhanced rock weathering in the UK. *Humanit Soc Sci Commun* **12**, 1010. <https://doi.org/10.1057/s41599-025-05384-9>

⁵ For example: Ingram, J., Mills, J. & Mackley-Ward, H. (2025), "For all kinds of reasons, it hasn't happened": A novel integrative perspective for analysing the barriers to biomass crops for bioenergy in the United Kingdom, *Energy Research and Social Science* 120, 103936. <https://doi.org/10.1016/j.erss.2025.103936>

⁶ For example, Price, C. & Morris, C. (June 2023), Biochar in the UK: Understandings from the Agricultural Sector, Biochar Demonstrator Report. <https://biochardemonstrator.ac.uk/wp-content/uploads/2023/06/Biochar-Farmer-Engagement-Event-Report-June-2023-final.pdf>

8. International engagement on GGR.

These are set out, along with details of the underpinning research, in the forthcoming GGR-D programme report.

- In addition, ERM and CO₂RE will be publishing a report on costs and TRLs for a selection of GGR methods across respective supply chains⁷, providing an update on similar information included in an earlier government report⁸.
- The evidence from the GGR-D programme paradoxically points to the need for both top-down and bottom-up approaches. A strategic national framework, clear objectives, policy frameworks, and coordination with other priorities are key enablers. Global engagement can align strategic goals and opportunities both within the UK and beyond. However, it is also clear that ground-up, place-based projects that deliver with and for local communities and farmers are fundamental for success.
- Throughout the GGR-D programme, researchers have engaged closely with officials from central and devolved governments, sharing evidence through consultation responses, bespoke evidence sessions and other types of engagement.

2. Technology choices

Q - What is the right balance between proven solutions (e.g. EVs, heat pumps) and emerging technologies (e.g. CCUS, engineered removals) to deliver both the scale of ambition required whilst being confident that the measures proposed are deliverable and realistic to meet the obligations of the Climate Change Act?

- As outlined in the response to Question 1 in this submission, the CCC's Seventh Carbon Budget advice estimates that less carbon removals will be needed compared to previous analysis, from 57 MtCO₂/yr down to 36 MtCO₂/yr in 2050, with a corresponding reduction in biomass supply needed for 2050. We believe that delivering this scale will be more achievable and put less pressure on land-based and other resources, compared to pathways set out in previous advice by the CCC. Delivering this level of carbon removals will still require significant action across a number of areas.
- Further reflections on the deliverability of carbon removals, including opportunities for co-location, perception amongst key stakeholders and areas requiring government action are outlined in our response to Question 1.

⁷ ERM and CO₂RE (2025), *Greenhouse Gas Removals 2025 Cost Updates* provides information on TRLs of different elements of the full supply chains for biochar, ERW and BECCS and projections of GGR costs in 2030 and 2050. In preparation.

⁸ DESNZ and BEIS (2021), [Greenhouse gas removal methods: technology assessment report](#).

3. Costs, policy choices and economic implications

Q - What are the costs of inaction across different sectors and how can these be factored into policy-making? What are the potential cost savings and positive economic impacts of tackling climate change in the long-term (up to 2042 under CB7)?

- As reported in the UK State of CDR report⁹, the UK has already seen the growth of a number of carbon removal companies, in London as well as across the UK. Overall, 108 companies are based or operating in the UK, with most companies operating at the pre-commercial or pilot stage of deployment, reflecting the sector's nascency. Biochar, BECCS, and direct air carbon capture and storage (DACCS) dominate in terms of the number of companies, while land-based carbon removals (e.g., afforestation, reforestation, peatland restoration, agroforestry) account for ~10% of the ventures.
- London leads as the hub for company headquarters, benefiting from a concentration of investors, institutions, and policy networks, but actual project deployment is more dispersed: for example, the North of England, which benefits from industrial hubs and proximity to geological carbon storage capacity, features a concentration of DACCS projects, while university cities such as Aberystwyth, Bangor, Cambridge, Edinburgh, Nottingham and Oxford are focal points for research-driven CDR innovation, particularly in DACCS, mineralisation and novel biological capture methods. More information on the nature, size, funding pattern and location of carbon removal companies is available in the UK State of CDR report.¹⁰
- Furthermore, there are opportunities for carbon removals to deliver co-benefits and many actors are experimenting with strategies to enhance revenue generation, with growing emphasis on co-benefits and co-products. For example, the biochar production process can yield biofuel and bio-oil as co-products. Biochar and enhanced rock weathering applied by farmers to agricultural soils can improve crop yield and reduce fertiliser use under certain conditions. Conventional methods, such as afforestation and peatland restoration, can offer biodiversity enhancements that could be subsidised or included in nature markets.
- Notably, the GGR-D Programme also revealed that geography is a critical factor, and the efficacy, co-benefits and impacts of GGRs vary spatially, with impacts ranging between positive or negative depending on where and how GGR methods are deployed, which call for careful consideration around optimal location. Further information on potential co-benefits will be available in the forthcoming report towards the end of November 2025: *The UKRI Strategic Priorities Fund Greenhouse Gas Removals Demonstrator Programme: an*

⁹ Lomax, C., Smith, S. M., Bellamy, R., and Wagle, A. The UK State of Carbon Dioxide Removal (July 2025), CO₂RE Hub Report. <https://co2re.org/wp-content/uploads/2025/07/UK-State-of-CDR-Report.pdf>

¹⁰ Lomax, C., Smith, S. M., Bellamy, R., and Wagle, A. The UK State of Carbon Dioxide Removal (July 2025), CO₂RE Hub Report. <https://co2re.org/wp-content/uploads/2025/07/UK-State-of-CDR-Report.pdf>

overview of key research insights and cross-cutting lessons, as well as on the demonstrator project websites.

5. Public engagement

Q - How can the Government engage the public in ways that build understanding, tackle misconceptions, and increase buy-in for the statutory action required under CB7 and Carbon Budget Delivery Plans?

- Effective public engagement will be vital in supporting delivery of carbon removals. Evidence published by researchers from the CO₂RE Hub provides insights on public opinion around carbon removals and points to a number of considerations that should underpin public engagement going forward. The findings are summarised in the CO₂RE Hub briefing [*Towards responsible innovation and societal engagement with carbon dioxide removal*](#) and detailed in the publications cited therein.¹¹
- Findings from UK nationally representative multicriteria appraisals of different kinds of carbon dioxide removal (CDR) options show that the public supports the inclusion of CDR in UK climate policy, but some CDR methods are appraised less highly than others. This suggests that societal engagement will be particularly important for these. The findings also suggest regional differences in how people appraise various CDR options.
- Crucially, while these findings point to public support for inclusion of carbon removals in the UK's climate policy, meaningful public engagement will be vital to ensure effective delivery of carbon removals going forward.
- Field trials will have significant consequences for public engagement with carbon removal. While they are unlikely to settle controversy, they will be crucial to understanding emerging public concerns and studying changing perceptions, as Consultative approaches are unlikely to anticipate place-specific impacts on everyday community life and the local environment. Public engagement must also explore disagreements over local impacts, e.g. between those initiating trials and the local community, and link trials with (existing) local climate action.
- Notably, public engagement and communication around CDR should take into account that the way people understand CDR depends on framing. Communication around CDR requires careful use of analogies, avoiding the 'nature-based' label, and should clarify that CDR can only help on the margins of substantial emissions reductions.

¹¹ Bellamy, R., Waller, L. & Cox, E. (September 2025), Towards responsible innovation and societal engagement with carbon dioxide removal, CO₂RE Policy Briefing, <https://co2re.org/wp-content/uploads/2025/09/Social-perceptions-pb.pdf>