



HELP SHAPE THE GREENHOUSE GAS REMOVAL RESEARCH & INNOVATION AGENDA

PATHFINDERS INNOVATION SANDPIT

3 October 2022

The invitation

To help fill research and innovation gaps in the UK GGR landscape, the UK Greenhouse Gas Removal (GGR) Hub is hosting an event to shape a new funding opportunity for GGR research. Why not join us?

During a one-day sandpit on **3 October in Leeds**, participants will come together to identify key gaps in the UK GGR innovation landscape and design the research agenda for next year's Pathfinders competition (for background information about the objectives of the sandpit, GGR and the Hub see below).

Why participate?

Not only would participants be well placed to bid for one of the new grants, by participating they could also:

- connect with and learn more about the largest GGR research programme in the UK;
- help shape the UK innovation agenda;
- develop their network across the research, business and policy sectors;
- be part of the effort to drive forward essential GGR;
- form a nascent team to apply for Pathfinder funding;
- learn new things from other experts in an open, friendly, non-competitive environment; and,
- enhance their chances of success in the funding competition.

How do I get involved?

If you would like to participate in the sandpit, please email your details and a brief explanation of why you wish to participate, and what you would bring to the event to Dr Paul Rouse, Flexible Fund Manager: p.rouse@imperial.ac.uk.

BACKGROUND

What are Pathfinders grants?

The Pathfinders competition aims to fill research and innovation gaps in the UK GGR landscape. Pathfinders will support important research and innovation that will not, otherwise, take place. It does this by funding early-stage innovations with the potential for high impact.

Pathfinders' competitions are held annually with new projects commencing in the first quarter of each year. Grants up to £50k are available. [The first round of projects is now underway.](#)

Funds will support studies to the point at which they are well placed to apply for larger scale R&D sponsorship through other channels.

Pathfinder projects become part of the stakeholder family of the GGR Programme.

Shaping the agenda

The focus for the second round of Pathfinders is open. Participants will help shape it at the sandpit. They may, for example, identify innovation bottle necks in methane or nitrous oxide removal or ocean-based techniques as key agenda. Alternatively, participants may land on chemico-physical or land-based approaches, or indeed others. It is for the sandpit to decide.

We are keen to have researchers, policy makers, the public and private sector participating in the event when we will work together to:

- identify the most urgent unanswered scientific and technical questions, the solution to which would enhance UK capacity to deliver GGR; and,
- define the essential components of a research and development program which Pathfinders grants could address.

Following the sandpit, the call for proposals will be prepared and a call announced in the autumn.

What is Greenhouse Gas Removal (GGR)?

GGR is the removal of greenhouse gases that have already been emitted into the atmosphere, and then storing them away securely and for the very long-term. GGR reduces the total stock of atmospheric greenhouse gases, reducing their concentrations in the atmosphere. Carbon Dioxide Removal (CDR) is the same as GGR, except that it only relates to CO₂ whereas GGR relates to all types of greenhouse gases (e.g., methane, nitrous oxide and CO₂).

GGR methods vary in terms of their maturity, removal process, time scale of sequestration, storage medium, mitigation potential, cost, co-benefits, impacts and risks, and governance requirements (for more information see IPCC, 2022, Section C.11.1).

GGR processes are commonly categorised as biological, geochemical or chemical. Afforestation, reforestation, improved forest management, agroforestry and soil carbon sequestration are currently the only widely practiced GGR methods. Techniques that store carbon in vegetation and through soil carbon management are expected to securely store removed carbon for decadal to century timescales. Whereas methods that store greenhouse gas in the oceans or geologic formations may securely sequester the gas for 10,000 years or more.

GGR should not be confused with carbon capture and storage (CCS). In brief, capture and storage stops the volume of greenhouse gases in the atmosphere growing. It entails capturing emissions at source (such as at a fossil fuel power plant or in a livestock shelter) and then storing them securely, for the very long-term. This practice is considered part of cutting emissions, by avoiding new emissions. The difference between GGR and CCS could be seen as akin to cleaning up pollution (GGR), as opposed to not making more of a mess in the first place (CCS).

Why do we need GGR?

The IPCC's 2022 Working Group Three report states that *'The deployment of carbon dioxide removal to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO₂ or GHG emissions are to be achieved'* (IPCC, 2022, p40). The IPCC indicates that, if warming is to be limited to 1.5°C, up to 1,000 billion tonnes (Gigatons, or 1,000 Gt) of CO₂ (or equivalent) must be removed from the atmosphere within the next 80 years (IPCC, 2018, IPCC, 2021). Progress toward this target has been slow and, even if all the Nationally Determined Contributions (NDCs) under the Paris Agreement were implemented, the Earth is still expected to warm by 2.7°C by the end of the century (UNEP, 2021).

A Royal Society and Royal Academy of Engineering review of GGR (RS/RA, 2018) found that the UK will need to remove 130 MtCO₂e¹ per annum by 2050 to meet its net-zero and Paris Agreement obligations. Whilst, in 2020, the UK Committee on Climate Change's Sixth Carbon Budget (CCC, 2020) estimated up to 112 MtCO₂e per annum will need to be removed by 2050.

The UK's Net Zero Strategy (HM Government, 2021, p180) notes that by 2050 between 75 and 81 MtCO₂ per year of residual emissions will need to be removed using engineered techniques. This is the equivalent of between 45 and 80% of the total emissions that will require capturing across the UK by 2050 (HM Government, 2021).

The GGR Programme and Hub

As part of the Government's Strategic Priorities Fund, UK Research & Innovation (UKRI) has invested over £30 million to investigate the viability of large-scale GGR techniques in its [GGR Demonstrators Programme](#). Five interdisciplinary demonstrator projects and a central Hub, which is led by the University of Oxford, have been established to conduct the research over a 4.5-year timeframe to

¹ 1Mt = 1 megatonne or 1,000,000 tonnes. 130 MtCO₂e = 130,000,000 tonnes of CO₂ or its equivalent in other greenhouse gas.

inform and help shape government and others' decision-making about the most effective technologies to help the UK tackle climate change and reduce CO₂ emissions.

The demonstrator projects are investigating:

- management of peatlands;
- enhanced rock weathering;
- use of biochar;
- large-scale tree planting, or afforestation; and,
- rapid scale-up of perennial bioenergy crops.

The CO₂ Removal Hub (or CO₂RE Hub) co-ordinates the Programme and conducts solutions-led research to evaluate a balanced portfolio of economically, socially and environmentally scalable GGR options, with associated policy design, engagement and outreach.

The Hub seeks to enable the UK to lead internationally on achieving global net-zero emissions, consistent with the Paris Agreement. Backed by seven institutions and led by the Smith School of Enterprise and the Environment at the University of Oxford.

As part of its programme of work, the Hub has a Flexible Fund, and it is this fund that funds the Pathfinder projects.

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