Pathfinders Call III - Guidelines for Applicants

Greenhouse Gas Removal (GGR)

Enhancing durability of storage and realising GGR synergies

This is an invitation for proposals to research the agenda specified in these guidelines.

Please read these guidelines carefully before preparing your application.

The closing date for applications is 12.00 noon (UK time) on 26 March 2024.

Applications received after this date will be rejected.

Pathfinder initiative – third call for proposals

Enhancing durability of storage and realising GGR synergies

Summary

This third round of Pathfinders will fund projects of up to one-year's duration that either explore ways to enhance the durability of greenhouse gas storage, after its removal from the atmosphere, or which have the potential to realise beneficial synergies. Proposals should be focussed on early-stage research to inform basic principles and technological conceptualisation (for example, technology readiness levels 0-2).

We expect to fund in the order of four projects at a cost of £60,000 each.

Applications should be emailed to Pathfinder.applications@imperial.ac.uk and the closing date is 12.00 noon (UK time), 26 March 2024.

Introduction - Greenhouse Gas Removal, the Programme, Hub and Flexible Fund

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, accept that it only relates to CO_2 whereas GGR relates to all types of greenhouse gases (e.g., methane and nitrous oxide).

GGR should not be confused with carbon capture and storage (CCS). In brief, CCS stops the volume of greenhouse gases in the atmosphere growing. It entails capturing emissions at source (such as at a fossil fuel power plant, in a chimney or in a livestock shelter) and then storing them securely, for the very long-term. This practice is considered part of emissions reductions, 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 pollution in the first place (CCS).

It is important to note that **Pathfinders will not fund CCS projects**.

Critical to the success of GGR in our response to climate change is the durability of the greenhouse gas storage. If removed gases leak back into the atmosphere in the short or near term, GGR will have failed.

Techniques that store carbon in vegetation and through soil carbon management are only 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 gases for 10,000 years or more.

Why do we need GGR and the scale of the challenge and opportunity?

Critically, firstly we must reduce our greenhouse gas emissions rapidly and deeply. However, this alone is now insufficient to constrain warming to below 1.5°C.

Climate change is a threat to both human well-being and planetary health - the window of opportunity to secure a liveable and sustainable future for all is closing rapidly. We are currently on a trajectory that significantly overshoots the 1.5°C to 2°C Paris Agreement targets. The most recent United Nations Environment Programme (UNEP) Emissions Gap Report[1] reiterated how urgently we need to act. Even if countries all meet their currently stated targets and ambitions, **the world is on track to a 2.9°C average temperature increase since pre-industrial times.** Troublingly, historically not a single country has met its climate targets.

The need for action is now so great that, in 2023[2] The UN's Intergovernmental Panel on Climate Change (IPCC) affirmed that if we are to limit anthropogenic global warming, humanity will need to achieve *at least* net zero CO_2 emissions. To achieve this, unprecedented levels of both emissions reduction and greenhouse gas removal are now needed.

The Special Report on 1.5°C by the IPCC[3], concludes that we will require between 100–1000 billion tonnes (or Gigatonnes – Gt) of CO_2 removal (or its equivalent) by 2100

The scale of this challenge is huge, currently, only 0.002 $GtCO_2$ of GGR per year results from novel engineered approaches[4]

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[1] United Nations Environment Programme (2023). Emissions Gap Report 2023: Broken record Temperatures hit new highs, yet world fails to cut emissions (again). Nairobi. https://www.unep.org/resources/emissions-gap-report-2023

[2] IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001

[3] IPCC, 2018. Intergovernmental Panel on Climate Change, Summary for Policy Makers, Section C.3., Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C [MASSON-DELMOTTE, V., P. ZHAI, H.-O. PÖRTNER, D. ROBERTS, J. SKEA, P.R. SHUKLA, A. PIRANI, W. MOUFOUMAOKIA, C. PÉAN, R. PIDCOCK, S. CONNORS, J.B.R. MATTHEWS, Y. CHEN, X. ZHOU, M.I. GOMIS, E. LONNOY, T. MAYCOCK, M. TIGNOR, AND T. WATERFIELD (eds.)]. https://www.ipcc.ch/sr15/

[4] Smith, S. M et al, 2023. The State of Carbon Dioxide Removal - 1st Edition. The State of Carbon Dioxide Removal. doi:10.17605/OSF.IO/W3B4Z

Within the UK, the national Net Zero Strategy, Build Back Better[5], has set ambitious targets for GGR in which business must play a leading role. For example, the Strategy states that by 2050 between 75 and 81 million tons of CO_2 per year of residual emissions will need to be removed using engineered techniques (p.180). This means the equivalent of between 45 and 80% of the UK's current total annual greenhouse gas emissions will need to be removed, within the next 26-years.

The required GGR industry currently barely exists yet it will need to scale to multi-trillions in annual revenue globally, and multi-billions in the UK, within two decades. This is an unprecedented challenge. New technologies need to be discovered, developed and then fall in cost. Business models need to be established and economic policies and legal and regulatory frameworks put in place, in a manner that is acceptable to the public and socially robust.

The GGR delivery challenge is without exaggeration huge. The UK's Net-Zero Strategy notes that currently the UK is not removing any greenhouse gases meaning we must establish a new industry the size of the current oil and gas industry, from scratch.

Background - 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 greenhouse gas removal (GGR) techniques in its GGR Demonstrators Programme. Five interdisciplinary demonstrator projects and a central Hub have been established to conduct the research over a 4.5-year timeframe to inform and help shape government and others' decision-making about the most effective technologies to help the UK tackle climate change and meet its net-zero targets.

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 Greenhouse Gas 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

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Enterprise and the Environment at the University of Oxford, this is one of the largest GGR research programmes funded by the UK government to date.

As part of its programme of work, the Hub has a Flexible Fund, and it is this fund that will be supporting projects commissioned under this call for proposals.

What is the Flexible Fund (FF)?

The GGR Programme Hub's FF will support work to address research and engagement gaps by supporting:

- Pathfinder R&D to address gaps in GGR innovation such as this call (up to TRL2);
- programme and knowledge exchange and capacity building for example via our secondment funding scheme and the Future Leaders Network (FLN); and,
- engagement and collaborations with artists and the arts and humanities communities.

Pathfinder projects will fill research and innovation gaps by funding early-stage innovations with the potential for high impact, in particular addressing gaps in the wider GGR Programme. Funds will support studies to the point that they are well placed to apply for larger scale R&D sponsorship through other channels.

The FF is being managed by Imperial College, London on behalf of the Hub. Applications for Pathfinder projects are being invited annually (2021-2024), with new projects commencing in the first quarter of each year. A £600k total budget has been allocated to the Pathfinder mechanism.

Pathfinder projects will become part of the stakeholder family of the GGR Programme, and the Hub will help facilitate their engagement and participation. All the projects will report to the Hub, as a contribution to the Hub's knowledge base.

The Pathfinder mechanism will not support projects that would normally fit within Innovate UK's funding. Applicants should focus on TRL levels 0-2 (for TRL definitions, see Definitions of Technology Readiness Levels (ukri.org))

The Invitation for proposals (the 'call').

The research challenges

The first Pathfinder competition was open to applications to research any aspect of GGR. The second competition funded projects that explore new methods for ocean based GGR and methane GGR.

In September 2023 CO2RE held a sandpit bringing together stakeholders from the academic, business and policy communities to identify key gaps and opportunities in the UK GGR innovation landscape that the Pathfinder funding instrument could usefully contribute to (the report of this

sandpit is available on request). During that event two topics were identified and it is these that we are inviting applicants to address in their applications. Your application may address either or both agenda.

We are inviting applications that focus on:

- ways to **enhance the durability** of greenhouse gas storage, after its removal from the atmosphere, or
- approaches which may have some potential to **realise beneficial synergies** between more than one GGR approach, or other activities.

Enhancing the durability of greenhouse gas storage

Successful GGR requires that we both remove, but also permanently store significant amounts of CO_2 in perpetuity, isolating it from the atmosphere in environmentally safe ways. Whilst the number of techniques, and their potential to remove CO_2 at scale in economically, environmentally and socially viable ways has grown, progress toward the necessary sequestration capacity has been slower. It is hoped that projects funded under this competition may help accelerate progress toward the delivery of large-scale durable storage solutions.

To ensure clarity regarding the scope of this invitation for proposals, applications are invited that focus on research and innovation that may, in due course deliver safe and durable storage for at least 1,000 years.

It is noted that this 1,000-year timeframe will create important challenges for nature-based approaches to GGR in some circumstances. For example, afforestation management over such long timeframes may be difficult to guarantee given the future trade-offs that may be necessary. Further, it was noted that timber storage in buildings is likely to have a limited potential. One focus for applications could, therefore be, to explore how timber or timber products could be used or adapted to deliver durable storage.

Topics that applicants may wish to consider addressing include, but are not limited to:

- exploring new storage medium in the marine or terrestrial domain;
- proof of concept testing of new materials for storage, for example, coatings, films, absorbents or zeolites;
- developing catalysts to improve durability;
- approaches to durably storing biomass derived from Nature Based approaches to GGR; and,
- developing modelling techniques to better understand durability potential in diverse situations.

In addition to these topics, applicants are strongly encouraged to submit applications for any other 'enhancing durability' Pathfinder suitable project.

Applicants are reminded that their proposals should be presented with the potential environmental, economic and social costs and benefits in mind and how these could be managed should be

addressed in applications. Applications should also demonstrate how the project would make progress on enhancing durability of storage.

Realising synergies and collateral benefits

Applicants are also invited to submit proposals with a focus on realising synergies and collateral benefits. Applications seeking to address this topic should focus on synergies that create efficiencies, enhance GGR capacity (including both removals and/or storage) or create collateral benefits. Collateral benefits could include but are not limited to new materials, products or services, the more efficient use of resources or other economic, social or environmental benefits, above and beyond the benefits of delivering GGR.

Some examples of the types of synergies that projects might explore include:

- combining more than one GGR technique to realise efficiencies;
- efficiencies from combining infrastructure such as energy or water systems with GGR;
- working alongside industrial activities in mutually beneficial ways;
- using biochar or other resources to create carbon negative build materials or other materials which may also have other enhanced properties;
- using emerging technologies or materials to improve GGR efficiency, for example, AI; and,
- developing chemical kinetics using photobiology, or photochemistry to accelerate enhanced rock weathering rates.

It is important to note that applicants are not required to address these areas alone and we encourage applications for any other projects focusing on realising synergies.

As with the Enhancing Durability theme, applicants are reminded that their proposals should be presented with the potential environmental, economic and social costs and benefits in mind and how these could be managed should be addressed in applications. Applications should also demonstrate how the project would make progress on realising synergies and collateral benefits.

The allocation of funds across topics/themes

It is our intention to fund two projects under each topic/theme. However, we will only fund proposals of sufficient quality to satisfy the assessment criteria (see below). In a circumstance where we are unable to fund two projects under one of the topics, on the grounds of insufficient quality, we may fund more than two projects in the other topic, but only if the quality threshold has been met among applications to that topic.

Scope

Through this call for proposals, the Hub is keen to fund projects that not only have future GGR potentials but also innovations that may or will have a capacity to deliver GGR that has an added benefit to the environment, society or the economy.

Submissions from multiple disciplines are encouraged but not required, although applicants are advised to reflect on the public engagement section that encourages researchers to work across

boundaries, reaching out beyond disciplines to wider sources of expertise (see Responding to Publics below)

Studies will be at proof-of-concept, up to and including TRL stage 2, with the expectation of the early-stage innovations being supported to the point that they can apply for further research and development sponsorship through public or private channels.

Responding to publics

Social intelligence is understood to be a vital tool in the ethical and effective development of new technologies. Further, large scale GGR will directly affect people in their day to day lives. It is then, important that publics are given a voice in how GGR techniques evolve and are deployed. The Hub has therefore sought insights from the public about their interest and concerns regarding GGR generally and durable storage and enhancing synergies specifically.

Two focus-groups held to inform the design and peer review of this competition were held in October 2023 and applicants are required to respond to the outcomes of that research, addressing the conditions which participants thought applicants should consider when developing their research. These are set out below and must be addressed in Section 10 of the application form.

Applicants should consider and respond to the following:

- scientists should develop their ideas in the context of non-scientists views;
- consideration should include the public, whether they live close to a proposed GGR site or not;
- scientists should pay attention to unintended consequences and potential negative effects on the environment, and be honest about them;
- researchers should consider impacts on future generations when designing projects; and,
- scientists should collaborate and share knowledge as much as possible.

Administration

Introduction

At all stages of the competition our aim is to deliver a streamlined process to keep the timelines from application to award short, while maintaining a fair and robust peer review process.

Who is eligible to apply for flexible funding?

Pathfinder projects are open to higher education institutions, research council institutes, independent research organisations, industry, business and the public sector, if located and registered in the UK.

We are keen to support new researchers where they have the appropriate skills. Applicants do not therefore need to be currently employed by the intended host institution. However, in such a circumstance the host institution must undertake to employ the applicant for the duration of the award and provide all the support normal for a permanent employee.

We welcome applications from investigators who work on a part-time basis.

The submitting organisation will be accountable for the conduct of the research, the use of public funds and for ensuring the proper financial management of grants (see 'Decisions and awards' below).

We encourage collaboration across organisations where it will be beneficial to the delivery of a project. Two or more eligible organisations may submit a joint proposal that together makes a coherent project. In such circumstances, only one application should be submitted via the Principal Investigator's institution or company, and they will be responsible for the disbursement of funds to third parties. Where successful, collaboration agreements will be required to be in place before an award is issued or any funds are disbursed.

Individuals may submit or be named on more than one application. However, applicants must demonstrate that they will have the capacity to deliver all the obligations promised and this will be explored before the issue of any awards.

Members of the CO2RE Directorate Hub leadership team and other staff are not permitted to apply for funding nor to benefit from awards.

What are we expecting to support?

In this Pathfinders round, the intention is to issue in the order of four grants at a value of £60,000 each (up to £72,000 where a Removals in Residence Secondment to the project is being requested).

Projects will be no longer than 12-months duration. No further rounds of the Pathfinder initiative are currently planned.

Making a joint Pathfinders and Removals in Residence Secondment application

Pathfinder projects may be, **but are not required to be** linked to a CO2RE funded Removals in Residence Secondment project, allowing for an individual to be seconded to the Pathfinder project for up to 12-months. Such a Linked Secondment would be able to request up to £72,000 in total.

Should you wish to apply for a Linked Secondment please include a covering letter with your application alongside a Removals in Residence application form. In such cases, applicants are only expected to include a case for support for the Secondment of **up to three pages**. The Pathfinder case for support must however demonstrate how the two grants, if successful would comprise a whole.

The Pathfinder Panel will assess joint applications. There will be no double jeopardy – where linked applications are made we will only fund both or neither applications. We will not fund one part, but not the other. Neither will we seek to reengineer applications.

If you wish to submit a linked project you are strongly encouraged to contact Dr Paul Rouse, the Flexible Fund Manager at Imperial College, London in advance to discuss the application. His email address is P.Rouse@Imperial.ac.uk you may also telephone Paul on 07423695418.

Costs that you may apply for

We will fund 80% of the full economic costs of your project if based in a higher education institution, research council institute or independent research organisations recognised by UKRI or the public sector. For businesses or industry, we will support 100% of direct costs. The maximum value of any award will be £60,000 whether receiving 80% or 100% full economic costs. You may request funding for staff costs, equipment and other items required to carry out the project, costs related to impact, and travel and subsistence are also eligible (see Section 5, Finances below for further details).

The funds are considered as Secondary Funding by NERC (UKRI), and as the funding is for 'research activities', it will be passed on to businesses under non-aid/no subsidy rules. This means that the funding can cover business costs, including VAT, if a business does not seek to make profit from the award. Therefore, if the budgeted activity incurs VAT you should provide your 80% figures inclusive of VAT.

Equality, Diversity and Inclusiveness (EDI)

Excellence will be achieved through recognising the value of every individual. We commit to developing a strong and enduring culture of equality, diversity and inclusion and to promoting a positive culture, which celebrates difference, challenges prejudice and ensures fairness. Our ambition is to instill these values across the Hub and its activities, as well as promoting them to our partner demonstrator projects, and the developing GGR industry, including through this Pathfinders initiative.

We recognise that the research and stakeholder community is insufficiently diverse and that existing inequalities are significant, and we seek to help redress these shortcomings by pro-actively formulating an approach to our flexible funding which encourages and supports a diverse cohort of participants.

We particularly encourage applications from under-represented groups and our communications and stakeholder engagement teams will actively reach out to a diversity of groups and communities of interest to promote both this invitation for proposals and the wider programme of activity.

We will be taking a series of measures throughout this Pathfinders call to help achieve EDI.

- The composition of all assessment panels will aim to comply with EDI principles.

- The application processes and documentation have been designed, as far as possible for blind review (e.g., applicants' names, age and institutions will be withheld from reviewers).
- In the light of the *"Concordat to Support the Career Development of Researchers"* proposals from staff on fixed term contracts such as early career researchers are eligible to apply, allowing new researchers access to project leadership on merit alone.
- We request, but do not require that information related to the protected and other characteristics of applicants be provided, this information will be submitted separately from applications and monitored by the CO$_2$RE EDI team to track the Hub's EDI performance.
- Those assessing proposals and making decisions upon them will not have access to any EDI related information.
- Following separation of personal information from proposals, consideration will be given to the risk of accidental disclosure that can arise in small samples.
- After funding decisions are announced, award holders who choose to self-identify as members of under-represented groups, including early career researchers, will be availed of the opportunity of mentoring support.
- EDI will be reported upon to our funders as part of the overall monitoring, reporting and learning work that we will do.

All named applicants (Principal Investigators and Co-Investigators) are individually invited but **are not required** to provide information to help us work toward achieving EDI. **The Pathfinders Call III – Equality, diversity and inclusiveness (EDI) monitoring form is available here.** The form can be completed via PC or mobile phone and all responses are confidential and anonymous.

Please note that Principal Investigators must not complete forms on behalf of other named applicants - only one form should be submitted by one person.

Research integrity

Applicants and host organisations are expected to comply with the national framework for good research conduct and this expectation will be included in contracts issued to successful applicants (see 'Nature of Awards' below). The ways in which they are expected to meet these commitments are set out in the relevant sections of The universities UK concordat to support research integrity.pdf

How to submit your application

The application form

You must apply using the Pathfinders application form provided (Annex 1 and on the CO2RE website), we will **not** accept any other forms of application.

Your application should be emailed to Pathfinder.applications@imperial.ac.uk by 12.00 noon (UK time) on 26 March 2024.

You must only include the information requested. Any additional materials will not be accepted. Any **incomplete applications will be rejected**.

Your application should include:

- the completed application form (**submitted in Microsoft Word format**);
- the separate case for support: six pages maximum, setting out the scientific case (in a Pdf format);
- A workplan: one page (in a Pdf format);
- CVs: up to two A4 sides each only for named investigators (in a Pdf format);
- a letter of support from your institution in which it is confirmed they will accept and abide by the terms of the awards, as specified in these Guidelines (in a Pdf format);
- letters of support from all project partners (in a Pdf format).

A cover letter is optional unless you wish to apply for a linked <u>Removals in Residence Secondment</u>. Letters supplied alongside a Secondment application will be shared with reviewers. Where a Secondment application is not linked, covering letters will not be shared with any reviewers.

If you choose to submit a linked Secondment application. In addition to the above, you should also submit the following, attached to the same email as the Pathfinder material:

- the completed <u>Removals in Residence application form</u> (submitted in Microsoft Word format);
- the case for support: **three pages maximum**, setting out the case (in a Pdf format);
- A cover letter from the PI/Responsible Person explaining the contribution that the Secondment would make to the successful delivery of the linked Pathfinder project.
- A workplan: one page (in a Pdf format);
- a letter of support from your institution in which it is confirmed they will accept and abide by the terms of the Secondment award, as specified in the Removals in Residence Guidelines (in a Pdf format);
- letters of support from all project partners (in a Pdf format).

As Secondments are intimately related to the individual who will be seconded, applications for secondments cannot be assessed double blind, meaning Panel members will receive information about the individual supplied in the Removals in Residence scheme's application form.

All documents should be completed in single-spaced 11 font Arial or similar sans serif typeface. Paper size should be set at A4. Margins may be set to narrow.

Completing the application form

Introduction

Applicants should download and complete the Word document application form: this is designed to capture specific details of the project and for successful projects, it will form the basis for the award and completed projects will be assessed against the proposal.

Please carefully read the following information about completing the application form.

Section 1 - Applicant(s) details

There can only be one Principal Investigator. However, applicants may include more than one Co-Investigator. If you require additional pages, please add these using the same layout.

Principal Investigator (PI)
The PI will lead the research study if funded. They will be responsible for the day-to-day management of the project, ensuring the proper use of funds and all reporting.

The PI (and any other named applicants) must be resident in the UK and employed by the organisation submitting the application or have a written formal arrangement with the organisation that enables them to carry out research there and receive all necessary management and infrastructure support from the organisation to successfully deliver the research proposed. Successful applicants may be asked to demonstrate these requirements are met, prior to the issue of any award.

The PI must ensure that they have obtained the permission of any other person named on the proposal form (e.g., Co-Investigators or Project Partners) for the provision of their personal information to CO2RE and the processing of their data by CO2RE for the purposes of assessing this proposal, announcing any awards that may be made and any reporting about projects progress.

The PI commits on behalf of the organisation to take full responsibility for the research and its proper governance.

Only one award will be issued, to the PI's institution. If project members are from multiple organisations, it will be the responsibility of the host institution to manage the flow of funds and contractual terms to project investigators in third organisations.

Name, position, organisation, e-mail and telephone are required.

A contact person in the Finance / Research Office of the hosting institution is also required. If an offer letter is issued, this contact will be copied into the email.

Co-applicants (Co-I)
Co-Investigators must meet the eligibility criteria for a Principal Investigator as above.

CO-Is will have made a substantial intellectual contribution to the formulation and development of the project and will be engaged with the ensuing research.

Name, position, organisation, e-mail and telephone are required.

Support for PhD students
Please note, funds must not be used to support PhD students unless for a brief period, under a contract of employment and in compliance of any requirements of a student's funder such as a research council.

Name, position, organisation, e-mail and telephone are required.

Project Partners
Project Partners will not receive funding directly from the award but will play a role in the proposed research. They will be separate institutions to those submitting the proposal. Named Project Partners may include UK or overseas research or user organisations, but an organisation should only be named as a Project Partner if it is providing specific contributions (either in cash or kind) to the project (see section 5). There is no limit to the number of Project Partners. Any partners should be from an organisation with a research and/or innovation base.

Name, position held, email and telephone contacts, organisation name, address, company or other registration number and a URL for the organisation's website are required.

Section 1 will be removed from the proposal before it is passed on to reviewers as a measure to help deliver our EDI policy. **Please ensure there is a section break between Section 1 and Section 2 of your application.**

Section 2 - Project title

The project title must be no more than 40 words in length. Titles should be meaningful to an informed lay reader. Please avoid the use of acronyms in the title.

Section 3 – Summary of project

In up to 400 words, you should summarise your project, and show how it would fit into the wider GGR Programme, including the Hub, and contribute to its overarching objectives.

The text should be written in a manner that would be understandable to publics, demonstrating applicants' capacity to explain their research in ways that will be accessible to non-scientific audiences. The text should be referenced (see 'Case for Support' for guidance on referencing).

Section 4 – Project dates

Projects are expected to be for up to 12-months duration in normal circumstances. If you are applying for more than 12-months of support, for example where an applicant normally works on a part-time basis, the rationale for this must be given in the 'Case for Support' (see Section 11 below).

Please estimate your start and end dates. These should be reasonable, allowing sufficient time for award decisions to be taken and contracts issue. It is suggested this be at least three months after the closing date.

There may be some flexibility available in start and end dates following reasonable justification. In such cases, a written request for a delay, including its justification must be submitted to the Fund Manager (p.rouse@imperial.ac.uk) 1-month in advance of need. However, it is important that projects do commence in a timely manner and, given staff being supported by the award are expected to be in situ, within 3-months.

If you will be unable to commence within 3-months of the announcement of the decision to issue an award, please do not apply.

Section 5 – Finances

This section comprises four elements, a summary, justification for resources requested, value of any contributions and Annex 1 regarding staffing. They must all be completed.

Other than in exceptional circumstances, awards of no more than £60,000 will be given. If you wish to apply for more than £60,000 full details underpinning this request must be given in the Case for Support. It is very unlikely that projects costing more than £60,000 will be funded.

Summary
Complete the table embedded in the form. You are requested to detail the full costs of your project. In this competition, organisations recognised for funding by UK Research and Innovation (UKRI) will be eligible for 80% FEC and provide their costs at 100% of Full Economic Costs (FEC) and 80% FEC price. Other institutions may receive 100% direct costs, up to a value of £60,000. For a list of UKRI recognised institutions, see Who can apply for funding – UKRI

The total requested under each heading should be provided in the summary. This competition has adopted UKRI financial headings.

- *Directly Incurred* costs are costs that are explicitly identifiable as arising from the conduct of a project, are charged as the cash value actually spent and are supported by an audit record.

- *Directly Allocated* costs are the costs of resources used by a project that are shared by other activities. They are charged to projects based on estimates rather than actual costs and do not represent actual costs on a project-by-project basis.

- *Indirect costs* are non-specific costs charged across all projects based on estimates, which are not otherwise included as Directly Allocated costs. They include the costs of the Research Organisation's administration such as personnel and finances. If required, requests for minor consumables, such as postage and telephone costs should also be covered in the Indirect costs.

For further information about these cost headings, see sections NERC research grants and fellowships handbook: guidance for applicants – UKRI

Justification of resources requested

In this section, you should write a brief description of all the costs that are being requested and fully justifying them.

You do not need to justify investigators salaries. However, you must justify the time requested for working on the project. Acceptable activities for inclusion include time for research, project management and interaction with project partners.

HEIs and UKRI IROs do not need to justify estate and indirect costs. However, it may be necessary to justify these, prior to an award of a contract, if the proposal is successful.

You may find this example of a well written justification of resources helpful.

Value of any contributions
Please describe any contributions from partners in this section.

You should explain how the figure for the total contribution was calculated. You should include cash contributions or describe how any in-kind figures are calculated (e.g., daily rates for staff involved, travel costs etc.).

You should provide details about the role any partners will play in the project, and the benefit their participation will bring, in the Case for Support (see Section below), not in this section which is for financials only.

Annex 1 Staffing
This annex will be removed from the proposal before being passed on to reviewers.

Details of all staff for whom resources are requested should be included.

A 37-hour working week should be assumed.

Section 6 - Conflict of interest

You must declare whether there are any potential or actual conflicts of interest. For example, any financial or other interests with any partners named in the application must be disclosed (see comments above re Research Integrity).

Section 7 – Other funding or proposals

Awards will not be issued where there is a danger of double funding, applicants are required to disclose whether they have any other awards or any applications pending which do, or if successful would, support this project in part or whole.

If such projects or proposals exist, applicants must explain the circumstances and how any potential for double funding will be avoided.

Any non-disclosure of such funding would constitute a material breach of trust leading to the potential rescinding of any award that may have been made.

Section 8 – Technology Readiness Level (TRL)

Proposals for projects above TRL 2 are out of scope of this invitation and will not be accepted.

Explain and justify the current TRL and what the TRL is expected to be at the conclusion of the study (for TRL definitions, see Definitions of Technology Readiness Levels (ukri.org))

Please explain the rationale for your expected uplift in TRL because of the study.

Section 9 – Where did you learn about this call?

The Hub wishes to continually improve the promotion of its activities. Having a better understanding of where people learnt about the opportunity will assist the Hub in this end and, especially, delivering on its ambitions to reach out to new and diverse stakeholders.

Please indicate the media or other source (e.g., LinkedIn, learned society, the CO2RE web etc.).

Section 10 – Response to public engagement

As noted above, a public engagement exercise was conducted during the scoping of this competition to both help embed publics perspectives into research, and to inform project selection.

Applicants should respond to the following four points raised during the public engagement study.

- scientists should develop their ideas in the context of non-scientists views and that consideration should include the public, whether they live close to a proposed GGR site or not;
- scientists should pay attention to unintended consequences and potential negative effects on the environment, and be honest about them;
- researchers should consider impacts on future generations when designing projects; and,
- scientists should collaborate and share knowledge as much as possible.

You may use up to 500 words

Section 11 - Case for Support

The Case for Support sets out the scientific case for your project and forms **the most important element** of the proposal. It is your opportunity to convince peers that your research should be funded.

It is suggested that you set aside plenty of time to prepare your Case, and that you start work on it as soon as possible. You should write clearly, be concise and avoid jargon.

The Case may be up to, but no-longer than **six sides** maximum, including references. It should be presented in single-spaced 11 font Arial or similar sans serif typeface. Paper size should be set at A4. Margins may be set to narrow.

References must be included in Harvard style. Notes or annotations to the reference list are not acceptable. If you rely on unpublished work in your Case, it is essential that you provide sufficient evidence for reviewers to assess claims that are made.

If you are unable to provide data on the grounds of confidentiality, it is unlikely that the quality of your proposal can be properly assessed and it would, therefore, be unlikely to receive funding.

Please avoid disclosing your identity in the Case for Support. This will help protect against unconscious bias in the review process (see the Section, 'Equality, Diversity and Inclusion' above).

You should use the headings specified below so that your proposal can be reviewed against the assessment criteria (see 'Assessment criteria' below). You should cover all these headings – marks cannot be given where information is missing.

Description of proposed research and its context (quality of science = 50% of the total marks)
In this section you should introduce the proposal topic and its background context. You should explain the overall aims of the project and the measurable objectives. You should describe what work will be done, why and how, and explain its importance. Also demonstrate that the team is the most appropriate group of people to undertake the project.

Be clear what elements of the project are original, building on previous research is expected but this Pathfinders call will not support research that replicates or seeks to validate other studies.

The research hypothesis should be identified, and your research methods must be detailed and justified.

In brief, demonstrate that you have clearly thought though the proposed project and explain how it will succeed.

Relevance to the call for proposals and the GGR programme (10% of total marks)

Explain why the proposed project is relevant to and appropriate for the call for proposals. Explain how the work would deliver the calls objectives and contribute to the Hub and the wider GGR Programme's work.

Projects that are not directly relevant to the call for proposals, the Hub or the GGR programme **will not be accepted.**

Environmental, social, ethical and economic implications (10% of total marks)
Within the context of UKRI's Responsible Innovation policy, explain how you will identify and deal with potential economic, environmental, ethical and social impacts of the proposed research? What measures will be taken to maximise benefit and minimise the chance of harm.

Project management (10% of total marks)
Describe how the project will be managed. You should set out the roles of all partners on the project, identify critical milestones and deliverables, and explain the projects risk mitigation strategies. This section should relate to the one-page workplan (see below), but not duplicate its content.

Impact (20% of total marks)
Please describe the potential impact of your project. You should explain who you expect to have impacts upon and how they will be achieved. You should refence the potential for the project to lead to GGR and, where possible, how much GHG the technique may have the capacity to remove, if scaled up. **It is important that you demonstrate how your project would make progress on enhancing durability or realising synergies.**

Project workplan

You should submit a one-page project work plan which sets out the project schedule. You may wish to present this in a narrative form, or in a Gannt chart. The purpose of the Plan is to demonstrate that each step of the project has been accounted for in the planned delivery.

The inclusion of CV's

CVs of all named applicants should be submitted as a standalone document. CVs should be no longer than 1 side of A4.

The CV's will be checked to ensure applicants have the appropriate skills set and, where relevant, qualifications to receive funding under the scheme. These checks will be undertaken by the Flexible Fund Manager, Dr Paul Rouse. The CV's will not be passed on to those assessing the applications which will be judged solely on the information contained in the application. This measure is being taken to help protect EDI and forms part of the blind review process.

If any applicants are considered not suitably qualified/experienced to apply, they will be informed of this decision and the rationale for it within 10 working days of the closing date. Such applications will be rejected and will not be subject to further assessment. Any such applicants will be welcome to appeal their case and a final judgement will be taken by the Director of the CO2RE Hub, who will not be a member of the Assessment Panel. If an appeal is successful, the application will proceed to review and assessment. Panel members will not be informed of the initial decision to help ensure such proposals receive fair treatment.

If you are uncertain whether you, or a member of the team is suitably skilled, please contact p.rouse@imperial.ac.uk for advice.

Following submission of a proposal

Late applications

Any applications received after the deadline **will not be accepted**.

Assessment process

After the closing date of **12.00 noon (UK time) on 26 March 2024** the Flex Fund Manager will record all the received applications and review the proposals to ensure that they meet the eligibility requirements and address the research challenge. Applicants will subsequently receive a confirmatory email regarding receipt of the proposal. If there are any very minor problems with an application, the Flex Fund Manager will contact the applicant to request further information or changes. However, if this cannot be very easily remedied (within two working days) the application will not be accepted – the PI should be contactable during this time.

The Assessment Panel

In the light of the scope of received proposals, an expert independent panel will be appointed to review the proposals.

Panel members will be required to sign a non-disclosure agreement prior to receiving any applications.

Panel members will undertake a paper-based review of proposals, using the assessment criteria (see below) with two members reviewing each application, one acting as an assessor, the other as a discussant. Following paper review, the Panel will meet to discuss all the proposals, to agree a priority order and to make funding recommendations.

Recommendations will be made by the Panel to the Hub Management Board who will consider the fit of the proposals to the wider Programme, assessing the potential synergies with and benefits to the Programme, and the likelihood of added value. The Board will identify any measures that will facilitate this. **The Board will not re-review the proposals, nor change the priority order**. This layer of process will help ensure the projects make the best possible contribution to the Programme as a whole. The Hub Management Board will confirm funding decisions after which the PIs will be informed in writing by the Fund Manager and, subsequently, awards will be publicly announced and issued (see 'Notification of decision' below).

At the review stage only the case for support will be reviewed with the applicant remaining anonymous to the reviewer. The Panel will not receive the applicants' details (page 1) nor Annex 1 of application form (see Equality, Diversity and Inclusiveness above).

The assessment criteria

Projects will be independently scored out of 100 by the assessors and discussants during the paper-based review. At the Panel meeting, a joint decision will be reached and a final single score for each project will be agreed.

Successful proposals will demonstrate the following characteristics.

Relevance and fit to the call (up to 5 marks available)
The project will be unambiguously directly relevant to the call for proposals and set out a clear approach to how the team and research would contribute to the Hub's objectives and the wider GGR programme of work.

The case for support (up to 50 marks available)
A research agenda that has the capacity to deliver an in principle feasible approach to capturing and/or storing carbon. This will be demonstrated by the case for support and will show that the team has the requisite skills, knowledge and capacity to deliver the proposed research.

Project work plan and resources (up to 10 marks available)
Evidence of a clear and appropriate research plan. This will be demonstrated by the project management plan coupled with the costs requested and the justification of resources.

Potential to deliver GGR (up to 20 marks available)
The potential for impact will be demonstrated by evidence of the expected volume of GGR the technique is expected to achieve and the evidence regarding the route to implementation of the technique at a scale meaningful to the UK's climate objectives. A clear indication of how the TRL may advance in the future is expected.

Potential for other impacts (up to 10 marks available)
Strong proposals will present a compelling case for how potential economic, environmental, ethical and social impacts of the proposed research will be identified and managed. There will be clarity regarding measures planned to maximise benefit and minimise the chance of harm.

Response to the public engagement (up to 5 marks available)
Applications should present a carefully thought through response to the four issues flagged during the public engagement. The best responses will demonstrate:

- an understanding of the role working with publics can play in research;
- a coherent case for the choices that are being made in the project in relation to working across boundaries;
- that careful attention has been given to the risks/opportunities of unintended consequences; and,
- that the proposed technique will not have a net negative effect when considered in the round.

Successful Pathfinder projects will present a rounded case, addressing all elements of the assessment criteria to a satisfactory level. Therefore, **for each of the six characteristics listed above, a minimum threshold of 60% of the available marks are required before a proposal will be considered for funding.**

The Panel will only fund whole projects and will not seek to combine one or more projects.

Decisions and awards

Notification

All PIs will receive written notification of the outcome of their application and anonymised comments from the reviewers. The decisions will be final.

If you are successful
Congratulations! When informing you of the decision, we will include any comments or suggestions from the Panel. We may, although only in exceptional circumstances, request some elements of a proposal be revised. In such circumstances, we will inform you of those required changes, and set a deadline for response which would be in the form of a revised application form.

You will be required to confirm that you wish to accept the offer of award and confirm that no circumstances have changed since your application was made within 10 working days of the notification.

On receipt of your confirmation of acceptance, a contract will be prepared and issued by the University of Oxford to the host organisation.

We request that only named applicants are informed of the decision until such time as a formal announcement has been prepared.

Having commenced the project, award holders will be expected to contribute to the GGR Programme, including, but not limited to presenting the projects progress and findings to appropriate Programme and Hub colloquia and in its media. Where participation in such activities requires in person attendance, travel and subsistence costs will be met by the Hub.

Specifically, the successful projects will be required to engage with the Hub's GGR evaluation framework team to help inform their work on creating a coherent and harmonised multi-disciplinary evaluation framework to inform GGR scale up in the UK. The costs of participating in this engagement are likely to be for travel and subsistence only on a very small number of occasions, if any and these will be met by the Hub, in addition to the grant.

It is the expectation that awards up to value of £60,000 will be issued. However, in the very unlikely circumstance that an exceptional project costed at over £60,000 is selected, the UKRI Programme Management Board is required to sign-off the decision. This process will delay the announcement of the award. In such an unusual circumstance, applicants will be kept informed as the process is completed.

Nature of awards

Awards will be issued to the PI's host institution by the University of Oxford. The University reserves the right to undertake due diligence before issuing awards, as required by UKRI funding terms.

All intellectual property or know-how generated during the Project will belong to the awardees, although licence to use any IP will be given to the Hub for the purposes of its reporting requirements to UKRI and for academic purposes and teaching.

Award holders will invoice Oxford quarterly in arrears and payment will be made within 30 days of receipt of invoices.

Price deflators will not be applied to grants.

If UKRI were to terminate or rescind the GGR Programme, or its grant to the University of Oxford, the Pathfinder grant would be terminated accordingly.

Reporting

To comply with the Hub's reporting requirements to UKRI, Pathway award holders will be obliged to provide an end of award report. In addition, award holders will be required to participate in a brief quarterly review conversation with the Flex Fund Manager to feedback on progress and any issues or opportunities.

Projects will be required to produce a case study slide which will be published on the Hub's website and used in its other communications materials. This slide should be provided to the Flex Fund Manager withing 4 weeks of commencement of the award.

Data protection

Copies of applications will be available to the Assessment Panel, the Flex Fund Manager and members of the Hub Management Board. Copies of successful applications, including Section one and Annex 1 of the application will be available to staff in the Research Funding & Contracts Team at the University of Oxford to expedite the issue and management of awards.

To meet obligations of public accountability and the dissemination of information, details of successful awards, but not copies of the applications, will be made available on the Hub web pages and other media and will be reported to UKRI. Details of successful awards may also be reported in other publicly available databases, and in reports, documents and mailing lists.

Applications will be stored in a password protected database. EDI data will be archived separately from applications and used only for aggregated analysis. No individual level data will be reported or disclosed.

All unsuccessful applications and associated assessments will be permanently deleted within one-year of the closing date unless express written permission has been granted for the further retention by the Hub.

Successful applications and associated data will be stored until the end of the Hub's contract - October 2025 and its reporting to UKRI.

Enquiries

If you have any eligibility, remit or other questions of clarification, please contact
Dr Paul Rouse, Flex Fund Manager, Imperial College, London by email at p.rouse@imperial.ac.uk

If you are uncertain whether your project is appropriate for this invitation for applications, you may wish to send us a brief (500 words max.) summary of your idea, before preparing a full proposal. In this you should describe your research aims, plans and where you think the main novelty of the project lies. Do not provide detailed background information, research or other costings nor references. We will then be able to advise you on whether your proposal is a fit for the call. We **will not,** however, provide any comments and feedback on the potential quality of the proposal nor any drafting advice or other support of any kind.

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CO2RE THE GREENHOUSE GAS REMOVAL HUB

Exemplar Application Form for Pathfinders Call

1. Applicant (s) details *(this page will be removed from your proposal before the application is passed on for review to help protect against bias).*

Principal Investigator

Lead applicant's name:	
Position held:	
Organisation:	
E-mail:	
Telephone:	

Finance/ Research Office contact name:	
Position held:	
E-mail:	
Telephone:	

(This is the person who would be responsible for the financial administration of your award).

Co-investigator *(Further applicants/ partners may be added just copy and paste the blank box)*

Co-applicant's name:	
Position held:	
Organisation:	
E-mail:	

Partners *(Further applicants/ partners may be added just copy and paste the blank box)*

Name:	
Position held:	
Email:	
Telephone number:	
Organisation:	
Address:	
Company or other Registration Number:	
Organisation's website:	

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2. Project title *(40 words max)*

3. Summary of the project, including how this project fits within the scope of the Green House Gas Removal programme

This section must be written in a manner which is accessible to a lay audience and may be used by the CO2RE Hub and UKRI for public dissemination if the proposal is funded. 400 words max.

4. Project dates *Project duration may be up to 12 months.*

Start:	End:

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5. Finances

Please provide your requested costings for each item as applicable. *If your application is successful, you will be required to report against the costs requested. Please also complete the Staff costings table at Annex 1.*

Financial resources

Summary fund heading	Fund heading	Full economic Cost	Pathfinders' contribution	% Pathfinder's contribution
Directly Incurred	Staff			
	Travel & Subsistence			
	Other Costs			
	Sub-total			
Directly Allocated	Investigators			
	Estates Costs			
	Other Directly Allocated			
	Sub-total			
Indirect Costs	Indirect Costs			
Exceptions	Staff			
	Other Costs			
	Sub-total			
	Total			

Summary of staff effort requested

Staff	Months
Investigator	
Researcher	
Technician	
Other	
Visiting Researcher	
Student	
Total	

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Justification of resources requested:
Please detail and justify all the costs that are being requested.

Value of any Contributions (cash and in-kind) (£)	

Breakdown and explanation of any cash or in-kind contributions:

6. Conflict of interests? *Please declare any potential or actual conflicts of interests – see section 6 of the guidelines for conflict-of-interest guidance.*

7. Other funding or proposals *Do you currently hold any other awards or any applications pending which, do, or if successful would, support this project in part or whole? If so please explain the circumstances and how you will ensure against any double funding.*

8. Technology Readiness Level (TRL) *Please indicate your current TRL and what you expect the TRL to be having concluded the programme of research (see Guidelines, Section 8 for information).*

9. Where did you learn about his call? *Please indicate where you first heard about this call. This will help the Hub's understandings of which promotion activities are most effective*

10. Response to public engagement *Please respond to the four issues raised by the public engagement exercise for this competition, you may use up to 500 words (see Section 10 of the Guidelines).*

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10. Case for Support *up to **six** pages. Please read the guidelines.*

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Annex 1
Staffing

This page will be removed from the application prior to being circulated for panel review to help protect against unconscious bias.

Directly Incurred Posts

Role	Name /Post Identifier	Start Date	Period on Project (months)	% of Full Time	Scale	Increment Date	Basic Starting Salary	London Allowance (£)	Super-annuation and NI (£)	Total cost on grant (£)
			EFFORT ON PROJECT							
										Total

Applicants

Role	Name	Post will outlast project Y/N	Contracted working week as a % of full-time work	Total number of hours to be **charged** to the grant over the duration of the grant	Average number of hours per week **charged** to the grant	Rate of salary pool/ banding	Cost estimate

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Checklist

Please ensure all items are completed otherwise your application may be rejected.

✓	**Please read and tick to indicate you have done the following:**
	I have read the guidelines for the Pathfinders Flexible Fund
	I have attached my 6-page case for support
	I have attached a one-page work plan
	I have attached a letter of support from my institution in which it is confirmed they will accept and abide by the terms of the awards, as specified in the Guidelines.
	I have considered submitting the EDI monitoring form.
Reviewers Conflict	Is there any reason why any individual should not review this proposal? *Delete as appropriate:* YES – please describe in detail: NO conflicts

Equality, diversity and inclusiveness (EDI)

The Pathfinders Call III – Equality, diversity and inclusiveness (EDI) monitoring form is available here. The form can be completed via PC or mobile phone and all responses are confidential and anonymous.

Any questions regarding this call for proposals should be emailed to the Flexible Fund Manager, Dr Paul Rouse, at p.rouse@imperial.ac.uk