## Climate and Environmental Risk Analytics for Resilient Finance (CERAf)

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<tr>
<th><strong>Closing date</strong></th>
<th>05 May 2020 (Outline Proposal)</th>
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| **Funding available** | Stage 1 (this AO) - Up to £4M (NERC)  
Stage 2 – Up to £6M (£1M NERC and £5M Innovate UK) |
| **Funding mode/stream** | Partnership & Opportunities |
| **NERC Core or UKRI/Collective Fund budget** | NERC Core |
| **Project duration** | Up to 36 months in Stage 1 |
| **Funding partners (if applicable)** | Innovate UK (Stage 2) |
| **Start date requirements (if applicable)** | By 31 January 2021 |
| **Call aims and objectives** | Activity funded under Stage 1 of this call (of up to £4M) will deliver research and innovation to support establishing a climate and environmental risk (CER) analytics capability and capacity in the UK. This programme will provide information to enhance the resilience of financial systems to the increasing impact of climate and environmental variability and drive more sustainable investment of capital. The programme objectives are to: |
| | • Deliver a step-change in the provision and analysis of CER information for a specific set of use-cases for financial services users (e.g. asset management, banking, pensions) that demonstrates impact from improved understanding and reporting of risk underpinned by robust science - for example from improved quantification and disclosure and more effective and efficient allocation of capital. |
| | • Contribute to the development of common CER information, taxonomies and reporting standards for use by financial services regulators and end users. |
| | • Establish an entity to manage the provision of open-access CER data and analytics for use by commercial enterprises and public sector bodies that is capable of enduring beyond the programme funding term. |

This call for a Lead Research Organisation to establish an entity for provision of open-access CER information will be followed by Innovate UK grant funding of up to £5M to commence in 2023/24. This Innovate UK funding will accelerate the development of an ecosystem of small, medium and large enterprises to deliver value-adding analytics and reporting products and services using the open-access CER information developed by the NERC-
funded research. Up to £1M will be available to the Lead RO recipient of Stage 1 funding from NERC to support the Lead RO in working with recipients of the Innovate UK funding in Stage 2.

### Eligibility criteria

Normal individual eligibility applies and is in Section C of the [NERC research grant and fellowships handbook](https://www.nerc.ac.uk/). This call is open to UKRI eligible research organisations. NERC research grants may be held at approved UK Higher Education Institutions (HEIs), approved Research Council Institutes (RCIs) and approved Independent Research Organisations (IROs). Full details of [approved RCIs and IROs](https://www.ukri.org/) can be found on the UKRI website.

IIASA will be eligible for funding as a Co-Investigator under this NERC Announcement of Opportunity as per rules outlined on NERC website.

Investigators may be involved in no more than two proposals submitted to this call and only one of these may be as the lead Principal Investigator.

### Call specific requirements

N/A

### Contact

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Climate and Environmental Risk Analytics for Resilient Finance (CERAF)

Announcement of Opportunity (AO) – Stage 1 Research Call for Full Proposals

AO Issued: 26 February 2020
JeS open: 13 March 2020
Outline Proposals deadline: 4pm on 05 May 2020
Full proposals deadline: w/c 21 September 2020

1. Summary

This call is the first of a two-stage investment by NERC and Innovate UK of up to £10m over the period 2020/21 – 2024/25 to create a step-change in the provision of scientifically-robust, open-access climate and environmental risk (CER) information to support the financial services sector to materialise these risks on the balance sheet. Overall the ambition of the programme is that decision relevant CER information based on the best available science will drive innovation and private sector investment in the development of new CER information services for the financial services sector. This will inform disclosure and decision-making to enable the more effective, efficient and sustainable allocation of investment, reduce climate and environmental change-related losses and stimulate economic growth in a UK CER services sector and related green finance products.

The Climate and Environmental Risk Analytics for Resilient Finance (CERAF) call will fund translational research and the development of an open-access risk data and analytics information infrastructure, rather than novel climate or environmental science.

Programme outputs should link together and integrate existing relevant data and information platforms, services and models to enable financial services sector users (and service providers) to access and use information and analysis on worldwide, location-specific climate and environmental hazard, vulnerability and exposure. This will support users in the assessment and disclosure of CER impacts on both sides of the balance sheet to inform decisions on future climate and environmental change-resilient investment.

Funding will be available in two parts: Stage 1 (this call) will involve a grant from NERC of up to £4m to a UK Research Organisation (RO) to lead a research and innovation programme to develop novel approaches to the provision of decision-relevant CER information for a defined financial services sector user base.

The development of innovative applications of the Stage 1 CERAF research programme outputs will be supported by Stage 2 funding of up to £5M for SMEs and larger corporates by Innovate UK. Stage 2 funding will stimulate the development of CER analytics and reporting services to generate and contextualise data, translating it into decision-relevant information
for the financial services sector. Stage 2 will be subject to a separate Innovate UK competition for businesses to apply for innovation grants or other forms of funding, e.g. innovation loans. Stage 2 will also involve a grant of up to a further £1M available to the Lead RO in receipt of Stage 1 NERC grant funding. This will support the Lead RO working with businesses in receipt of Innovate UK funding to use the open-access CER outputs from Stage 1 in the development of related products and services. The model for Stage 2 funding will be confirmed at a later date with funding anticipated to commence in 2023/24.

2. Background

Demand for improved CER data and analytic tools from the financial services sector is rising rapidly. Drivers include: mounting financial losses from extreme weather events (ca. £388 billion worldwide in 2017)\(^1\); (related) supervisory and regulatory pressure for improved disclosure of risks and management response (e.g. G20 FSB Task Force for Climate-Related Financial Disclosures (TCFD))\(^2\); increased focus from credit ratings agencies and shareholders (institutional and private). In a speech in October 2019, the Governor of the Bank of England confirmed the Bank’s supervisory expectations related to consideration of climate risks into governance frameworks and the use of scenario analysis to test strategic reliance and developing and maintaining climate risk disclosure.\(^3\) In December 2019, the Bank of England published a discussion paper outlining proposals for a stress test exercise to be conducted in 2021, into the resilience of the financial services sector to physical and transition risks from climate change.\(^4\)

Climate and environmental risks now exist at new levels of scale, likelihood and interconnectedness. Forecasts suggest that based on global population projections, an unprecedented $98 trillion is required in global infrastructure investment between 2014 and 2025\(^5\). Without effective preparation, much of this investment will be unnecessarily exposed to CER, resulting in the inefficient allocation of capital and higher (probability-weighted) expected losses related to both physical and transition climate risk\(^6\). Poor management of CER will lead to high levels of stranded assets and economic write-offs, with severe consequences for economic growth and the value of savings and pensions. Whilst improved analysis of climate risk has to date been the focus, there is interest in also quantifying financial impacts of other environmental risks including air, soil and water quality and security as well as risks to biodiversity.

As an example of the response from the financial services sector, banks are increasingly looking to assess the biggest physical risks to their business models including mortgage exposure to flood risk. They are also starting to consider exposure to climate change transition risks including exposure to carbon-intensive industries and consumer loans secured against high carbon goods and services, as are asset managers and insurers. The credit ratings sector is also increasingly looking to take CER information into account in rating decisions.

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\(^1\) [https://www.swissre.com/institute/research/sigma-research.html](https://www.swissre.com/institute/research/sigma-research.html)

\(^2\) [https://www.fsb-tcfd.org/](https://www.fsb-tcfd.org/)


In terms of meeting this increasing demand for CER data and associated models and tools, the provision of (and market for) physical climate risk and hazard information specifically designed for the re/insurance market is relatively well developed to the point that it has grown into a £2bn industry, albeit over a timescale of 20 years.\(^7\) This catastrophe (‘cat’) modelling activity has, to date, largely relied on observed historical hazard and exposure data to statistically formulate risk metrics focussed on short future time horizons i.e. average annual loss. Modelling is generally undertaken by specialist SMEs or re/insurance firms themselves using proprietary ‘black-box’ tools. The growing demand for scientifically robust longer term, multi-variate, predictive CER information cannot be satisfied by the traditional cat models, especially due to the lack of transparency of the majority of services and products currently on the market.

Although data to inform CER analysis is being produced at a limited scale - for example work by a small number of SME advisory and fintech firms to generate data sets on carbon emissions, future carbon pricing risk and water supply/security for investment valuation purposes - expertise is fragmented and methodologies and results are inconsistent. A number of recent reports have highlighted this gap in CER information provision:

- The Network for Greening the Financial System has noted that environmental and wider science disciplines are not producing CER data and information in a format and at a scale and granularity that is required by decision makers in other financial and commercial sectors.\(^8\)

- The Climate Finance Leadership Initiative in a report for the UN, claims that integrating and standardising CER information across risk management, strategy, and client engagement functions is currently challenging and represents a high transaction cost.\(^9\)

- A report by the Cambridge Institute for Sustainability Leadership for the G20 Green Finance Study Group identified a number of challenges to the mainstream integration of CER information and analysis, including:\(^10\)
  1. Lack of capacity: developing credible analyses on how environmental sources can create financial risks is complex and requires expertise that is often not found in one institution.
  2. Inadequate data: data is a critical input to risk analysis. The lack of comprehensive and consistent data dissuades financial institutions from investing in tool development.

Despite advances in earth systems science and higher resolution observation, modelling and simulation of climate and environment hazards, more research and innovation is needed. Advances are required in a wide range of disciplines including physical simulation of natural hazards and longer-term environmental change, data on and modelling of built environment infrastructure response, new approaches to modelling and quantifying financial and socio-economic impact and communicating and using risk analysis outputs.

\(^7\) https://www.earthmagazine.org/article/risky-business-modeling-catastrophes
\(^8\) https://www.banque-france.fr/sites/default/files/media/2019/04/17/synthese_ngfs-2019_-_17042019_0.pdf
There also a need for enhanced understanding of the decision-context and information needs of the financial services user base and work to translate outputs into decision-relevant information for these end users. This requires a multi-disciplinary approach that is anchored with a deep understanding of the specific needs of each main user-type from financial services seeking to understand, quantify, report and manage CER to drive more sustainable investment decisions.

In March 2018, the UK Green Finance Taskforce (GFT) recommended that private sector, academia and Government should establish an industry-led, user-focused and UK-based Centre for Climate Analytics to develop tools and metrics to translate science-based CER information into wider risk modelling frameworks that can be applied in mainstream corporate contexts. The UK Government Green Finance Strategy (GFS) published in July 2019 makes explicit reference to both the role of CER analytics in ‘greening finance’ - through ensuring that financial risks from climate and environmental factors are integrated into mainstream financial decision-making - and to supporting investment in green technologies and services. The Strategy sets the explicit ambition to position the UK ‘at the forefront’ of CER data and analytics. This CERAF programme will act as a catalyst for the development of leadership, institutional expertise and services to support achievement of these aims.

3. Scope

3.1 Programme objectives:

The overall vision for the CERAF programme is to drive research and innovation to support the establishment of a climate and environmental risk analytics capability and capacity in the UK aligned to the specific requirements of the financial services sector. Programme outputs will deliver information to enhance the resilience of the financial system to the increasing impact of climate and environmental variability and change and drive more sustainable investment of capital. The programme objectives are to:

- Deliver a step-change in the provision and analysis of CER information for a specific set of use-cases for financial services users (e.g. asset management, banking, pensions) that demonstrate impact from improved understanding and reporting of risk underpinned by robust science - for example from improved quantification and disclosure and more effective and efficient allocation of capital.
- Develop common CER information, taxonomies, governance and reporting standards for use by financial services regulators and end users.
- Establish an institutional and infrastructural entity to manage the provision of open-access CER data and analytics for use by commercial enterprises and public sector bodies that is capable of enduring beyond the programme funding term.
- Stimulate and accelerate the development of an ecosystem of small, medium and large private sector enterprises to deliver value-adding analytics and reporting products and services using open-access CER information.

3.2 Call Scope

It is anticipated that the activity funded under this Stage 1 call will include:

- Improved understanding of the needs of financial services practitioners for CER information and analytics based on specific use-cases. User sub-sectors could include asset management, banks, and credit rating agencies. This might include community-building activity to support understanding user needs and development of a user base for the purposes of trialling and testing programme outputs.

- Research on existing CER data and information services, frameworks or tools that demonstrates and builds upon best practice and identifies and resolves gaps that exist in relation to the delivery of existing CER information in a decision-relevant format for a defined set of financial services sector users.

- Development of an open-access CER information service and associated integrated, interoperable data and modelling frameworks, tools and infrastructure. The service would be expected to: be easy to navigate and use, translate existing data, knowledge, models and expertise into tools, methodologies and solutions that meet financial services user needs for decision relevant CER information. The primary objective is not to undertake fundamental research to deliver new climate and environmental risk data; rather the service should link with and integrate existing relevant data and information platforms, services and models.

- It is expected that research outputs would be based on clearly defined use-cases to determine, for example (a) quantifiable risk exposure at the asset or portfolio scale under different climate and environment change scenarios, and (b) the cost/benefit of incremental investment to improve resilience of the asset(s) or portfolio in question. Outputs might include decision-relevant scenarios for a range of geo-spatial scales and utilising location- and asset-specific data on: ‘Hazard’ (being spatially variable and often simulated to overcome observational limitations and future uncertainty to assess potential changes in likelihood and intensity); ‘Vulnerability’ (being the potential incremental or catastrophic damage of a particular asset, taking into account materials, engineering design, life etc.); and ‘Exposure’ (being the (economic) value at risk for that asset to allow for the estimation of risk impact).

- Development of a plan/roadmap to establish the institutional infrastructure, governance and operations to manage delivery of CER information and analytics as a service that is able to endure beyond the funding of this programme.

4. Programme requirements

4.1 Stage 1 funding

A grant of up to £4M (at 80% FEC) will be made under this Stage 1 call. Funded work under the programme will be required to start by 31st January 2021 and last for up to 36 months. Cross-institutional proposals are welcomed and can be submitted by a single Lead RO or via a Lead RO and component proposals as per the NERC Grants Handbook.

A further up to £1M (80% FEC) will be available for recipient(s) of Stage 1 NERC grant funding in Stage 2 of the programme, together with up to £5M Innovate UK funding for industry research and innovation projects. This Stage is expected to commence in 2023/24. Further details of Stage 2 funding, including levels and intensity of grants or other forms of funding for business-led R&D projects aimed at future commercialisation, will be confirmed at a later date.
Awards will be made under standard UKRI terms and conditions together with those conditions specified in this Announcement of Opportunity.

4.2 Implementation and delivery

The Lead RO will be a UK research organisation that has expertise, capability and capacity in depth (either solely or in collaboration with partner organisations) in the key disciplines required. Where programme activities are carried out by partner ROs, the Lead RO will be ultimately responsible for managing and reporting on these activities to the Programme Board and funders as required.

Where award of grant includes component grants, the named Principal Investigator for each component proposal will be responsible to the Lead RO Principal Investigator for overall programme delivery, governance and reporting.

4.3 Proposal Requirements

The proposal should:

- Demonstrate the applicant’s (and where applicable, partner’s) expertise in depth in the key disciplines required. These are expected to include finance and economics, earth systems science, systems science, mathematics and statistics, engineering, computer and data sciences and social sciences.
- Demonstrate the applicant’s strong existing reputation and relationships with financial services sector organisations (including relevant professional institutions and regulators) including evidence of research and innovation partnerships with these corporates.
- Explain how the applicant will work with the funders, CER information suppliers and users, regulators and other stakeholders, including through a suitable programme governance structure, to ensure that the programme outputs deliver against objectives and are in line with emerging guidelines, recommendations and future regulations regarding the monitoring, disclosure and application of CER information.
- Outline how the applicant will manage data, models and tools accessed and used for the purposes of the programme including management of commercial and IP issues.
- Outline how the applicant will identify and liaise with other relevant research programmes as well as corporate associations, and private and/or public-sector coalitions and climate services providers actively engaged with the development of CER data and disclosure to ensure where appropriate that activities and outputs are complementary and integrated. Examples include, inter alia:
  - the TCFD;
  - Climate Financial Risk Forum (PRA/FCA);
  - Network for Greening the Financial System;
  - Geospatial Commission;
  - Spatial Finance Initiative;
  - Geneva Association; and
  - Other relevant UKRI programmes and investments e.g. UK Climate Resilience Programme, Digital Solutions, NERC Environmental Data Service, and relevant Centres for Doctoral Training e.g. SENSE.

4.4 Knowledge Exchange and Impact

Knowledge exchange (KE) with the financial services sector, regulators and commercial providers of risk modelling services, is a key objective of the CERAF programme. Applicants must briefly outline within the case for support how they will work with these stakeholders through the research activity to understand and deliver against their requirements for
decision relevant CER information, and how this activity will deliver positive impact in CER quantification, disclosure and management.

4.5 Data Management

The CERAF programme is expected to involve access to and exploitation of large existing data sets and as such, applicants are required to submit an outline data management plan as part of their submission and comply with the NERC Data Policy. NERC will pay the data centre directly on behalf of the programme for archival and curation services, but applicants should ensure they request sufficient resource to cover preparation of data for archiving by the research team.

4.6 UKRI Facilities

Prior to submitting a proposal, applicants wishing to use a UKRI facility must contact the facility to seek agreement that they could provide the service required. Applicants wishing to use most UKRI facilities will need to submit a mandatory ‘technical assessment’ with their proposal. A list of NERC, BBSRC and EPSRC facilities are available on their respective websites. The costs for the service or facility (excluding High Performance Computing costs) must be included within the Directly Incurred Other Costs section of the Je-S form and within the facilities section of the Je-S form. Applicants wishing to utilise the NERC/EPSRC supercomputing facilities e.g. ARCHER should read and follow the guidelines available here before submission of their proposal.

Given the scope of the research anticipated under this call, requests for NERC ship or aircraft time are not anticipated. Please contact NERC before submitting if you expect to include use of these facilities within your proposal.

4.7 Programme management

The Lead RO will be required to convene a suitable programme governance structure, to include a programme board, for the purpose of planning and managing programme activity and oversight of delivery against programme objectives. The programme board will be convened and managed by the Lead RO and must include representation from NERC and Innovate UK as funders and UK Government representation (e.g. BEIS, Treasury). Representatives from the financial services user base and related stakeholders should also be included on the programme board e.g. Green Finance Institute, Bank of England / Prudential Regulation Authority, asset management, banking, ratings, re/insurance corporates.

Applicants should make an allowance within their resourcing plan and budget to comply with these governance requirements.

4.8 Reporting requirements

As with all NERC grant holders, there will be a requirement to report through the standard UKRI reporting system; this is required annually and continues for up to five years post grant end. Within their proposal applicants must briefly outline a suitable reporting process that includes the agreement of an appropriate programme plan including milestones and metrics with the programme board as well as reporting on programme activity carried out by partner ROs. The Lead RO will be expected to issue progress reports on an appropriate frequency to the programme board, highlighting progress against plan and any issues or risks to
programme delivery. The applicant should be prepared to respond to any other reasonable requests for additional information.

5. Application process

5.1 How to apply

This call comprises an initial outline proposal stage, followed by a full proposal stage. Following assessment of outline proposals by an expert panel including representatives of the financial services sector stakeholders, a maximum of 10 applicants submitting outline proposals will be invited to submit full proposals. Any sift of proposals will be made on the basis of the likely fit of proposals to requirements of the call. The panel will provide brief feedback to applicants summarising why their proposal was successful/unsuccesful. No further feedback will be available.

One outline proposal submission is required for each proposed project; this should be submitted by the lead Principal Investigator and cover all consortium components.

Outline proposals must be submitted using the Research Councils’ Joint Electronic Submission system (Je-S). Applicants should select Proposal Type – ‘Outline Proposal’ and then select the Scheme – ‘NERC Outline’ and the Call – ‘Climate and Environmental Risk Analytics for Resilient Finance (CERAf) Outline 2020’.

The call will close on JeS at 4pm on 05 May 2020 and it will not be possible to submit to the call after this time. Applicants should leave enough time for their proposal to pass through their organisation’s Je-S submission route before this date. Any proposal that is incomplete, or does not meet NERC’s eligibility criteria or follow NERC’s submission rules (see NERC Grants Handbook), will be rejected and will not be considered. Applicants are advised to read the full guidance on applications available on the NERC website before developing their application.

The Je-S outline proposal form must be accompanied by a Case for Support as one attachment. The Case for Support should include brief information on the following:

- The proposed research, and how it addresses the proposal requirements in Section 4 and assessment criteria in Section 6;
- A track record demonstrating expertise and institutional and research relationships with the stakeholders identified in Section 4.
- The contribution of project partners, where applicable.

The Case for Support must not exceed 4 sides of A4 in total in single-spaced typescript of minimum font size 11 point (Arial or other sans serif typeface of equivalent size to Arial 11), with margins of at least 2cm. Please note that Arial narrow, Calibri and Times New Roman are not allowable font types and any proposal which has used either of these font types within their submission will be rejected. References and footnotes should also be at least 11-point font and should be in the same font type as the rest of the document. Headers and footers should not be used for references or information relating to the scientific case. Applicants referring to websites should note that referees may choose not to use them.

The outline proposal form should include the expected Co-Investigators and their Research Organisations. If successful, some of the Co-Investigators would then become the Principal or Co- Investigators on the component grant proposals and not be named on the lead grant proposal.
Do not upload any other attachments. If submitted, they will not be sent to the panel. Please note that this is not intended to restrict detail in the final submission as minor changes will be allowed.

It is the responsibility of applicants to undertake sufficient planning at the outline proposal stage to determine that the full costs of research proposed (including any facility costs) can be accommodated. The resources indicated at the outline proposal stage are considered as estimates only and may be amended in a subsequent full proposal. No CVs or project partner letters should be submitted at the outline proposal stage.

Applicants should ensure that their proposal conforms to all eligibility and submission rules, otherwise their proposal may be rejected. More details on NERC’s submission rules can be found in the NERC research grant and fellowships handbook and in the submission rules on the NERC website.

Please note that on submission to council ALL non-PDF documents are converted to PDF, the use of non-standard fonts may result in errors or font conversion, which could affect the overall length of the document.

Additionally, where non-standard fonts are present, and even if the converted PDF document may look unaffected in the Je-S System, when it is imported into the Research Councils Grants System some information may be removed. We therefore recommend that where a document contains any non-standard fonts (scientific notation, diagrams etc.), the document should be converted to PDF prior to attaching it to the proposal.

No associated studentships can be requested under this call.

Applicants will be informed by 16 June 2020 if they are to be invited to proceed to the full proposal stage. Further guidance on the submission of full proposals will be provided to applicants who are successful at the outline stage.

5.2 Eligibility

Normal NERC individual eligibility applies and is in Section C of the NERC research grant and fellowships handbook. Any co-investigator rules from other UKRI Councils that differ from the NERC rules, do not apply to this call.

This call is open to UKRI eligible research organisations. UKRI grants may be held at approved UK Higher Education Institutions (HEIs), approved Research Council Institutes (RCIs) and approved Independent Research Organisations (IROs).

Researchers from the International Institute of Applied Systems Analysis (IIASA) are eligible to apply as a Co-Investigator under this call. IIASA researchers should enter eligible costs (up to 30% of the project value) as ‘Exceptions’ at 100% FEC in the Je-S form. See Research grant eligibility on the NERC website for further details on eligible costs for IIASA.

Investigators may be involved in no more than two proposals submitted to this call and only one of these may be as the lead Principal Investigator.

6. Assessment Process

Proposals will be subject to initial remit, eligibility and compliance checks by NERC and may be removed from consideration at this stage if they fail to meet any of the criteria detailed in the Announcement of Opportunity.
Outline proposals, that meet the eligibility and compliance criteria, will be assessed by an expert assessment panel. Any sift of proposals will be made on the basis of the likely fit of proposals to requirements of the call. The panel will provide brief feedback to applicants summarising why their proposal was successful/unsuccesful. No further feedback will be available.

The assessment criteria to be used to assess outline proposals will be as follows:

- **Fit to Scheme.** Proposals will be assessed against the degree to which they address the objectives, scope and proposal requirements as set out in this document together with the evidence provided of track record in delivering impactful research for the financial services sector. Proposals which do not strongly meet the fit to scheme criteria will not be invited to submit full proposals.

- **Potential for Excellence and Impact.** Originality and quality of the proposed research/innovation activities and the potential of the proposal to deliver original, high quality activities of national importance and international standing.

### 7. Timetable

- Announcement of Opportunity published: 26 February 2020
- Outline proposals deadline: 05 May 2020
- Outline proposal assessment: w/c 1 June 2020
- Invitation to submit full proposals: 16 June 2020
- Full proposals deadline: w/c 21 September 2020
- Full proposal assessment: w/c 12 October 2020
- Announcement of Stage 1 Grant award: 13 November 2020
- Stage 1 research to start: 31 January 2021

### 8. Contact

For all enquiries, please contact liz.rowse@nerc.ukri.org