Constructing a Digital Environment - Second Call

Announcement of Opportunity

Funding council: NERC

Open/ closed call: Open call

Issued on: 3rd April 2019

Full proposals deadline: 4pm, 23rd May 2019

1. **Summary**

NERC is inviting proposals to the second call of the Strategic Priorities Fund (SPF) Constructing a Digital Environment Programme. The focus for the Constructing a Digital Environment Programme is on creating more integrated networks of sensors (*in situ* and remote sensing based), together with methodologies and tools for assessing, analysing, monitoring and forecasting the state of the natural environment at higher spatial resolutions and allowing greater ability to explain and engage with stakeholders than previously possible. This would support responses to acute events but also inform our understanding of long-term environmental change. The programme is being led by NERC, but is supported by the Engineering and Physical Sciences Research Council (EPSRC) and the Department for Environment, Food & Rural Affairs (Defra).

The first programme call was a directed call for feasibility studies and was open to individuals with current NERC and/or EPSRC funding for sensor networks, data infrastructure and visualisation/ decision tools. The successful applicants are studying how these NERC/ EPSRC-funded sensor networks could be integrated across domains and how improvements could be made to the infrastructure to incorporate them into the digital environment.

This second programme call is an **open call** and is not limited to individuals with existing funding from a specific scheme or Research Council. This call aims to fund feasibility studies to scope out sensor networks technology and the associated infrastructure, in order to identify what will be possible in the near and far future in the Atmospheric, Earth and Ocean domains. It will also consider projects that will explore existing sensor networks and technologies and develop new infrastructure for integration of sensor networks, with built in storage, cleaning and integration of data produced. Projects will consider how any new networks would 'fit/integrate' with existing networks, and look at the possibilities associated with interpretation of the data and how the information could be accessed, visualised and used in a meaningful way to make decisions. Ultimately this will lead to an understanding of how newly developed and existing distributed and instrumented networks could be incorporated into or form part of a digitally enabled environment with benefits for policy makers, businesses, communities and individuals.

Up to £1.48million is available for this second round of funding. Projects should be no greater than £240k (at 80% FEC), with a maximum duration of 12 months. They will have a start date of no later than 15th Nov 2019. Successful projects will need to meet the aim of UKRI to increase multi-disciplinary and inter-disciplinary research and innovation (MIDRI).

The call will close at 4pm on 23rd May 2019

2. Background

The June 2018 Digital Environments Infrastructure Thinking Group Workshop highlighted requirements for observation, simulation and data infrastructure, including the desire for distributed networks of environmental sensors, additional forms of autonomous data collection, a cyber-secure infrastructure, and citizen-science. In addition, as part of its ambition for increasing data integration across its own Environmental Data Centres, NERC funded a study which highlighted needs from the business community for new multi-disciplinary data products, including those utilising environmental sensor technology.

Through the Strategic Priorities Fund (SPF) UK Research and Innovation (UKRI) seeks to better enable investment in cross-departmental research and innovation priorities across UKRI, thus increasing high quality multi-disciplinary and inter-disciplinary research and innovation (MIDRI) and positioning UKRI to be able to respond to strategic priorities and opportunities.

Advances in digital technology have led to a rapid and ongoing increase in the volume of data being captured, curated and managed on a daily basis. Alongside this, new technologies have enabled a step-change in global capacity for integrated monitoring, analysis, modelling and visualisation of the Natural Environment at potentially transformative spatial and temporal scales which could be used more efficiently to inform policy making and benefit businesses, communities and individuals.

By harnessing these advances in technology and the UK's leading position in both environmental, observational and computer/data sciences there is an opportunity to create a digitally enabled environment through: more integrated networks of sensors (in situ and remote sensing based), together with methodologies and tools for assessing, analysing, monitoring and forecasting the state of the natural environment at higher spatial resolutions and more frequently than previously possible. As such a 'Digital Environment' will deliver the capacity to improve the understanding, modelling of near real-time and longer term environmental change and the prediction of events over a range of timescales, which will benefit a range of public and private sector users, and provide evidence to support both decision-making, business model building and operational activities within government Departments and arm's length bodies.

This funding represents an opportunity to build on the UK's current capabilities to look at what is technically feasible with regards to constructing a 'Digital Environment'.

3. Objectives and Scope

3.1 Programme Objectives
The SPF Constructing a Digital Environment Programme will bring together environmental researchers and data and observational experts with researchers working on (but not limited to) informatics, data sciences, statistics, informatics and computer science. Together they will work on the end to end "data chain" from collection, to understanding the data, to improved ways of visualizing and presenting new and historical data for advancing environmental science and decision

making. To achieve this there will need to be focus on integrating complex systems-thinking about storage and computation, the distributed system architecture required including legacy systems and maintaining long running data series, and, the system-of-systems approach in terms of sensor networks, cloud infrastructure, and for example edge capability all as part of an integrated data architecture. There will need to be a focus on adaptability, scalability and inter-operability, to ensure that the digital environment can respond to changes in sensing coverage and capability, respond to changing business needs and can incorporate new technologies as they continue to emerge.

The programme will be delivered through a combination of synthesis reviews, feasibility studies and demonstration projects. Together these will help us to understand how we can meet the following objectives for a Digital Environment:

1. *To enable the unprecedented construction and access of integrated networks of (long term, high frequency) real-time and near real-time sensors across the natural environment from terrestrial (including freshwater and subsurface) to atmospheric and marine;*

2. *To develop new infrastructure to provide dedicated conditioning, storage and access to the many different data streams which will enable delivery of data that can be readily combined, interpreted and reused by research, policy and business;*

3. *To manage, manipulate, automate and interrogate big data utilising technology-enabled approaches to intervene intelligently in complex, multi-factor issues (helping government and businesses respond to the needs of local communities and individuals);*

4. *To model and visualise the natural environment at high resolution spatially, at a higher frequency, supporting short or long term applications (4 dimensional).*

5. *Leverage existing UK investments and enable a challenge-focused multidisciplinary community to work together*

The programme forms part of a wider strategic aspiration for harnessing the power of new technologies with increasing amounts of data across the whole NERC remit and under the focus area of 'Digital Environment'. Outcomes of the programme, together with development of longer term observational, analytical and modelling capability, will help us to innovate in the way that information is used and taken up by both technical and non-technical audiences to make decisions and evaluate the success of, for example, policy interventions to achieve strategic environmental goals.

3.2 Call Scope

This feasibility studies call is to scope what is possible for the future of the 'Digital Environment'. The focus of this call is for feasibility studies to identify what improvements could be made to sensor networks, using current and new technologies, infrastructure, computer science and/or data science techniques, to incorporate them into a Digital Environment. Requirements for the development of a digital environment both in terms of sensor networks, interoperability of data from across networks, the technology and /or infrastructure (required to stream, analyse, integrate and process data in near real time from potentially remote monitoring networks) and the tools required to then visualise and make use of the information will be identified.

Feasibility studies should consider the potential of forming a network of networks across environmental domains that could incorporate both new and existing networks and identify the issues or barriers that may need to be overcome to integrate these.

Outcomes from the studies could include (but are not limited nor mandatory to include) recommendations on:

- Sensor network technology and requirements (to incorporate them into a network of networks as part of the Digital Environment)
- Development of infrastructure for storage, cleaning, integration, visualisation and usage of network generated data; Infrastructure for the development of a digital environment
- The use of the current and/or forthcoming data and computer science techniques to enable access to multiple data streams and delivery of data
- The use of citizen science to evolve and expand the capability to monitor the environment and beyond, through taking part in data collection, data analysis and sharing of data
- New network integration with existing networks
- Integration of 'alerting' systems to sensor networks to enable faster and more informed response
- Use of modelling to better visualise environmental data to inform data usage/policy making
- How these developments could be used effectively by government, businesses and communities/individuals

Applicants are also invited to identify and make the case for scoping the potential "upgrading" of their existing distributed and instrumented networks (these can be in-situ or remote sensing based and could incorporate data streams from citizen science) and/or the integration of new networks and data processes. Upgrading of networks should include integration of the network and/or data with that of other networks securing continuity/comparability in time series data to observe and understand long term (decadal) responses and cycles, potentially linking in National data sets collected from others e.g. EA and Defra, from **across** environmental domains. Applicants should consider how the information gained could be accessible, visualised and used in a meaningful way for decision making.

In order to meet ambitions to increase Multi and Interdisciplinary Research and Innovation (MIDRI), proposals should extend beyond the existing teams and bring together combinations of natural environment, data, computational, statistical and social (citizen engagement) science expertise thus establishing the multidisciplinary community required to deliver novel approaches to the collection, integration and use of environmental data.

Applicants are encouraged to be creative and to push the frontier of computing applications, data and services to demonstrate what is efficient, technologically feasible, cost effective and of benefit to policy makers and communities/individuals in a digital environment.

Proposals should clearly state what benefits the project will bring to the environmental science evidence base and to citizens. Defra are supportive of this programme as outcomes could be of benefit to supporting the evidence needs in areas such as the 25 year environment plan (25YEP), Tree Health and Plant Biosecurity Initiative and Waste and Resources Strategy. In particular Defra are interested in:

- Exploring new approaches to tackling long-term evidence challenges through the best available data and enabling technologies
- Opportunities that new monitoring and data collection technologies can offer to increase the understanding of how complex environmental systems work and goals

interact, in terms of offering new opportunities to predict and evaluate interventions that they make at a range of spatial scales.

Defra have therefore committed to the provision of support for relevant projects, through access to data and evidence sources; facilitation of partnerships with the department and across its Arm's Length Bodies; access to departmental analytical advice and expertise; alignment to Defra research programmes and platforms. Proposals that meet these aims are welcome but it is not a requirement and proposals that are not of direct relevance to the 25YEP will not be penalised.

4. Programme Requirements

4.1 Call Eligibility

This call is an open call. It is NOT limited to individuals with existing funding from a specific scheme or Research Council. It is open to individuals and groups working on any distributed and instrumented network (these can be in-situ or remote sensing based and could incorporate data streams from citizen science).

However, normal individual UKRI eligibility applies and is in Section C of the NERC research grant and fellowships handbook. Research Organisation eligibility rules are in Section C of the handbook.

NERC research and fellowship grants for all schemes 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 can be found on the UKRI 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.
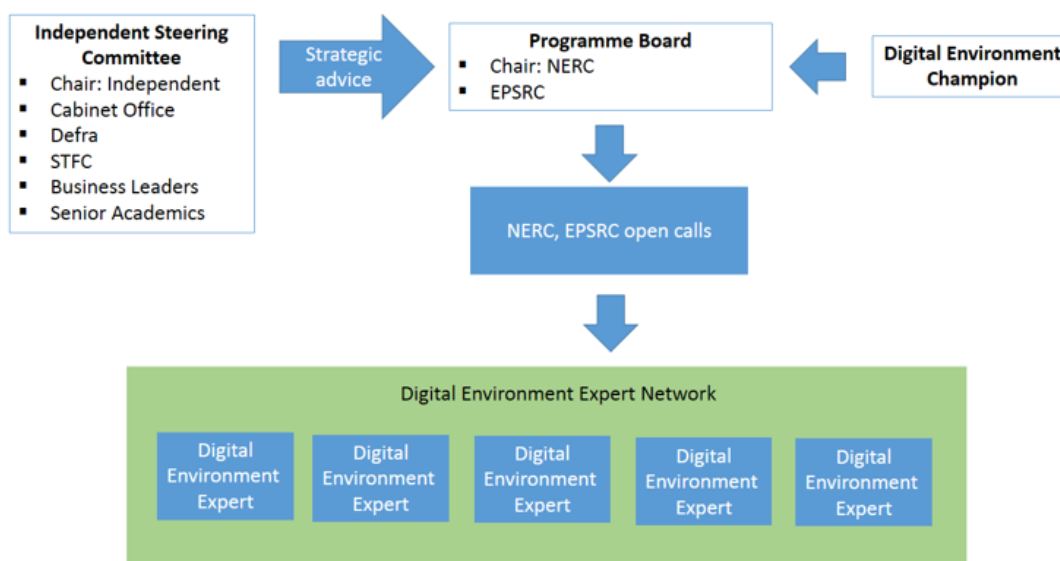
4.2 Programme Funding

NERC is inviting applications of up to £240k (at 80% FEC), but also expect to fund some smaller value proposals, with a maximum duration of 12 months. NERC will pay 80% FEC for UK Research Organisation costs.

Applications must be submitted through the Je-S. The call closes at 4pm (local time) on 23rd May 2019. Successful proposals are required to start by or before 15th November 2019.

4.3 Programme and Data Management

NERC will lead the programme, with support from EPSRC and Defra. The programme will be managed and overseen by a Programme Board, which will be advised by a Steering Committee. Successful applicants will be required to work with the Constructing a Digital Environment Co-Champions; Professor Ron Corstanje and Dr Stephen Hallett of Cranfield University, and the Digital Environment Expert Network.

Independent Steering Committee
- Chair: Independent
- Cabinet Office
- Defra
- STFC
- Business Leaders
- Senior Academics

Strategic advice →

Programme Board
- Chair: NERC
- EPSRC

← Digital Environment Champion

NERC, EPSRC open calls

Digital Environment Expert Network

| Digital Environment Expert | Digital Environment Expert | Digital Environment Expert | Digital Environment Expert | Digital Environment Expert |

We want to create a multi-disciplinary community around the Digital Environment and where appropriate share objectives and learning with other 'Constructing a Digital Environment' grant holders, NERC, the Programme Champion, the Programme Advisory Board and an Independent Steering Committee.

Successful applicants are expected to attend two meetings, one at the start and one at the end of their funding period. It is anticipated these meetings will be in NERC Head Office, Swindon and applicants should include costs to attend these meetings in their proposal.

4.4 Reporting Requirements

As with all NERC grant holders, there will be a requirement to report through the Research Councils' reporting system; this is required annually and continues for up to five years post grant end.

Applicants may also be asked to provide updates for the Constructing a Digital Environment Steering Committee and Programme Board as part of their meetings.

4.5 Research Council Facilities

As this call is for feasibility studies, it is not envisaged that there will be a requirement for use of Research Council Facilities, however if applicants feel that this would be of benefit to their proposal, they can include use of facilities and provide justification in the Justification of Resources.

Applicants wishing to use a NERC Service or Facility should, prior to submitting a proposal, contact the facility to seek agreement that they could provide the service required within the appropriate timeframe. The costs for the service or facility (excluding NMF and HPC costs) must be included within the Directly Incurred Other Costs section of the Je-S form and also within the facilities section of the Je-S form. Further information on NERC services and facilities can be found on the NERC website.

5. Application Process

Closing Date: 4pm (GMT) 23rd May 2019

Proposals must be submitted using the Research Councils' Joint Electronic Submission system (Je-S). Applicants should select Proposal Type - 'Standard' and then select the Scheme – 'Innovation' and the Call – 'Constructing a Digital Environment – Second Call'.

The 'Constructing a Digital Environment – Second Call' call will close on Je-S at 4pm GMT on 23rd May 2019 and it will not be possible to submit to the call after this time. Applicants must ensure that their proposal is submitted to NERC by 4pm on the closing date and 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 office rejected and will not be considered.

All attachments, with the exception of letters of support and services/facilities/equipment quotes, submitted through the Je-S system must be completed 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.

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.

Proposals for this call should complete the Je-S proforma and attach the following documents in the standard grant format outlined in Section F of the NERC research grant and Fellowships handbook:

1. **Case for support (up to 8 sides of A4 total)** – Please provide a case for support outlining the project and its desired outcomes, including previous track record (up to 2 sides of A4) and a description of the proposed work (up to 6 sides of A4).
2. **Pathways to Impact (up to 2 sides of A4 total)** – Description of how knowledge exchange and engagement with stakeholders (to understand how their needs and concerns could be incorporated in to a digital environment) might play a part in proposed work.
3. **CV (up to 2 sides A4 per CV)** – Please provide a CV for each applicant and named research staff involved in the project.
4. **Justification of Resources (up to 2 sides of A4)** - A full justification of the resources requested within the proposal. The Justification of Resources should explain how the resources requested (staff time, travel and subsistence costs, and accommodation) are appropriate for the proposal and represent value for money, in reference to the project objectives.
5. **An outline data management plan (up to 1 side of A4)** - Please identify data sets of long term value that should be made available to NERC data centres for archiving and reuse at the end of the grant.
6. **Letters of Support (up to 2 sides of A4 per partner)** – only IF included. Please provide a letter of support for each project partner.

Joint proposals are allowed (multiple JeS forms) where necessary and guidance is available in section F of the Grants handbook

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.

The required start date for projects funded under this Announcement of Opportunity is before or on 15th November 2019.

6. Assessment

6.1 Process
There will be a formal peer review process as part of this call. Please nominate reviewers on the Je-S application form. Proposals will be peer reviewed and applicants will be given the opportunity to respond to reviews ahead of the panel process. Proposals will then be assessed at a Panel meeting according to the assessment criteria. The Panel will involve both academic and end-user experts.

6.2 Criteria
- **Excellence** - in the context of this call, the excellence is based upon both the quality of the proposed feasibility study and its potential to enhance the selected network and bring it into the 'Digital Environment'.
- **Fit to Scheme** – applications to the Constructing a Digital Environment call must satisfy the objectives and scope of the call, specifically:
    - Include a multidisciplinary team, which extends beyond the currently funded team of researchers (and thus meet the aim of UKRI to increase multi-disciplinary and inter-disciplinary research and innovation (MIDRI))
    - Indicate the benefits that could potentially be realised for or from the network if it is included or forms part of a digitally enabled environment.

The Panel will make funding recommendations to NERC via a ranked list of the proposals. In making the final funding decision, NERC will take into consideration the environmental domain that the specified network is based and the potential beneficiaries of the feasibility study (this is so that NERC ensures a spread of funding across domains and beneficiaries). These decisions will be made in all cases according to the quality of the applications and financial limits of the call.

Applicants will be given feedback from the Panel summarising the reasons why the proposal was successful/unsuccessful. No further feedback will be available.

7. Call Timeline
Call opens in Je-S: 3rd April 2019
Call closes: 4pm, 23rd May 2019
Assessment panel: September 2019
Announcement of Awards: October 2019
Project start date: On or before 15th November 2019

8. Contact Information
Any queries regarding this call should be directed to Kirsten Dutton in the NERC Data Innovation team (email: DigitalEnvironment@nerc.ukri.org, Telephone: 07892700207 or 01793 411930)