

Constructing a Digital Environment – Demonstrators

Announcement of Opportunity

Funding council: NERC

Open/ closed call: Open call

Issued on: 7th November 2019

Full proposals deadline: 4pm, 30th January 2020

1. Summary

NERC is inviting demonstrator project proposals to the most recent call of the Strategic Priorities Fund (SPF) Constructing a Digital Environment Programme. The focus for the Constructing a Digital Environment Programme is to develop the digitally enabled environment which benefits policymakers, businesses, communities and individuals. It envisions the creation of more and enhanced integrated networks of sensors (*in situ* and remote sensing based), together with the development and demonstration of methodologies and tools for assessing, analysing, monitoring and forecasting the state of the natural environment at higher spatial and temporal resolutions and allowing greater ability to explain and engage with stakeholders than previously possible. This will support responses to acute events but will also better inform our understanding of long-term environmental change. The programme is led by NERC and is supported by the Engineering and Physical Sciences Research Council (EPSRC) and the Department for Environment, Food & Rural Affairs (Defra).

The first two calls were directed calls for feasibility studies aimed to scope out sensor network 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. Funded projects focus on both existing sensor networks and technologies as well as new sensor networks and how these ‘fit/integrate’ with existing networks.

This third call for demonstrator projects is open for anyone eligible to apply and is not restricted to those in receipt of funding from the call for feasibility studies.

This call will fund demonstrator projects which fully illustrate the capacity of emerging sensor and data integration technologies and methodologies. This will harness the UK’s leading position in environmental, observational and computer/data sciences to create a digitally enabled environment. NERC will consider demonstrator projects which integrate sensor networks and technologies with new and existing data systems infrastructure to store, clean and integrate the data produced, for subsequent analysis and decision making support. Projects must consider novel methods in data analysis and interpretation, and the means by which the information can be accessed, visualised and used in a meaningful way to support decisions. Ultimately, these projects will demonstrate how a digitally enabled environment benefits policy makers, businesses, communities and individuals.

Up to £6.22million is available for this third round of funding. NERC is inviting applications of up to £960k (at 80% FEC), but also expects to fund some smaller value proposals, with a maximum duration of 24 months. Projects will have a start date of no later than 14th August 2020. Successful projects will



need to meet the aim of UKRI SPF to increase multi-disciplinary and inter-disciplinary research and innovation (MIDRI).

The call will close at 4pm on 30th January 2020.

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, data systems and data science.

Through the Strategic Priorities Fund (SPF) UK Research and Innovation (UKRI) seeks to better enable investment in cross-discipline research and innovation priorities, 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. It is widely recognised that multidisciplinary and interdisciplinary approaches are key to enabling successful decision making, particularly where this involves developing effective digital approaches.

By harnessing these technological advances and the UK's leading position in both environmental, observational, computer and 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, nowcasting 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, private sector and third sector 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 demonstrate technical capability with regards to constructing a 'Digital Environment'.

3. Objectives and Scope

3.1 Programme Objectives

The SPF Constructing a Digital Environment Programme draws together environmental researchers and data and observational experts with researchers working on (but not limited to) informatics, data sciences, statistics, informatics, computer science and social science. Together they aim to work on the end-to-end "data chain", from collection, to processing and understanding the data, to improved

ways of visualising and presenting new and existing data for advancing environmental science and decision making. To achieve this there needs to be focus on integrating complex systems-thinking about data storage, transport 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 needs 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 wider Constructing a Digital Environment Programme is being delivered through a combination of feasibility studies and demonstrator projects. Together these will help us to understand how we can meet the following objectives for Constructing 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 adopted by both technical and non-technical audiences to help make decisions and evaluate the success of, for example, policy interventions to achieve strategic environmental goals.

3.2 Call Scope

Demonstrator projects funded through this call should show how improved sensor networks, new and existing data technologies and infrastructure, computer science and/or data science techniques, can be incorporated into Constructing a Digital Environment. There should be a specific focus on the requirements for a Digital Environment including 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), data sciences, statistics, modelling and AI tools and the tools required to visualise and make use of the information. Issues or barriers that may need to be overcome to integrate new or existing networks should be identified.

Outcomes from the demonstrator projects could include a combination of the following (but it is not mandatory to include all of the below):

- Sensor network technology and requirements (to incorporate them into a network of networks as part of the Digital Environment);
- Integration of existing and new systems (data/sensors) and scoping the potential to upgrade existing systems;
- 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 existing and/or emergent data and computer science techniques to enable access to multiple data streams and delivery of data across systems of systems;
- Adoption of emerging technology approaches able to combine streams of data, support classification and prediction tasks, and represent any uncertainties arising from the 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;
- Active engagement to establish how these developments could be used effectively by government, businesses and communities/individuals.

In order to meet ambitions to increase Multi and Interdisciplinary Research and Innovation (MIDRI), proposals should extend beyond existing research groups and bring together combinations of natural environment, data, computational, statistical and social (including 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, as well as how the applicants will work with the end-user community to ensure the benefits are achieved. 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. Defra have a series of strategic priorities of relevance to the programme which can be found [here](#).

Defra have 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 align with these strategic priorities are welcome but it is not a requirement and proposals that are not of direct relevance to them 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 call, scheme or Research Council.

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. This call is open to [UKRI eligible](#) research organisations and PSREs fitting the criteria below. UKRI grants may be held at approved UK Higher Education Institutions (HEIs), approved Research Council Institutes (RCIs) and approved Independent Research Organisations (IROs). Public Sector Research Establishments (PSREs) with 10 or more researchers with PhDs (or equivalent) are eligible to apply. If PSREs wishing to apply have not previously applied for UKRI funding and are not currently designated IRO status they will be required to complete an [eligibility form](#) to ensure they have the required research capacity, systems and controls in place to manage the research and grant funding. PSRE applicants should contact avril.allman@nerc.ukri.org at the earliest opportunity to discuss their interests in applying.

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.

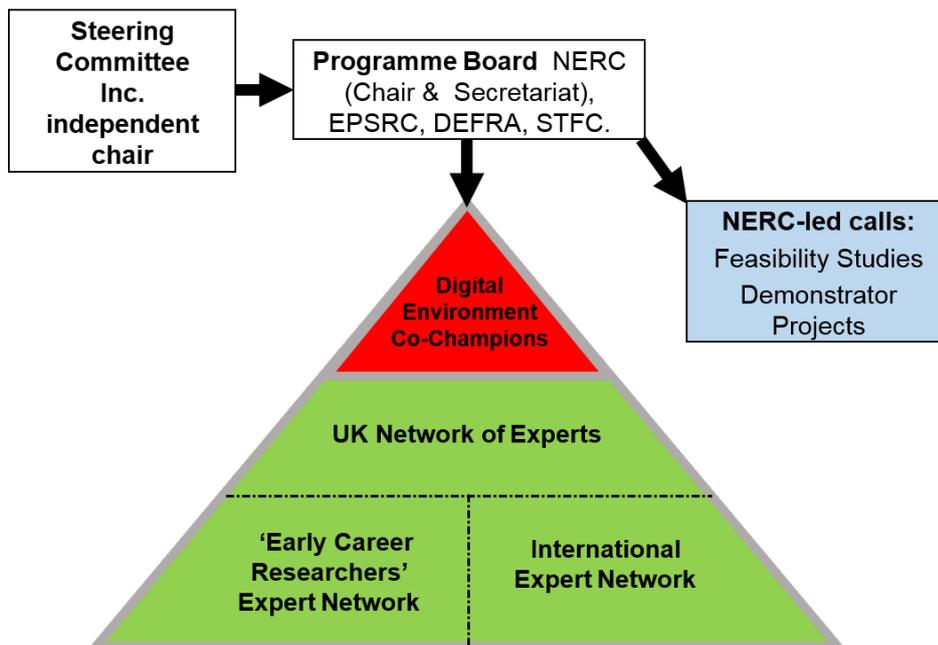
4.2 Programme Funding

NERC is inviting applications of up to £960k (at 80% FEC), but also expect to fund some smaller value proposals, with a maximum duration of 24 months. NERC will pay 80% FEC for UK Research Organisation costs.

Applications must be submitted through the Je-S. The call closes at 4pm (UK local time) on 30th January 2020. Successful proposals are required to start by or before 14th August 2020.

4.3 Programme and Data Management

The programme is being led by NERC, with support from EPSRC and Defra. The programme is managed and overseen by a Programme Board, which is 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.



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 Champions, the expert network, the Programme Advisory Board and an Independent Steering Committee. Projects will be expected to demonstrate how learning and outcomes can be shared with these parties and the wider community.

Successful applicants are expected to attend two meetings, one at the projects midway point 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.

The [NERC Data Policy](#) must be adhered to, and an [outline data management plan](#) produced as part of proposal development. Applicants are responsible for costing data management for their project within the proposal, this includes project specific data management activities, including project specific data management support from the NERC data centres and the cost of archiving the data. Unlike most NERC calls, NERC will not pay the data centres directly for these costs. Therefore, *for this call, applicants should contact the relevant [NERC Environmental Data Centre](#) and include an appropriate estimation of costs within your 'Data Management Plan' and within the Other Directly Incurred Costs section of the JeS form.* Successful projects will need to agree the full data management plan with the relevant Data Centre within 6 months of the grant start date.

4.4 Reporting Requirements

There will be a requirement to report through the Research Councils' annual reporting system and through NERCs bi-annual processes for the duration of the project and continues annually 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. It is expected they will have a close working relationship with the Programme Champions and Expert Network.



4.5 Research Council Facilities

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. Applicants wishing to use NERC facilities will need to submit a mandatory 'technical assessment' with their proposal. This technical assessment is required for aircraft but not for NERC Marine Facilities (NMF) or HPC. For NERC, this means a quote for the work which the facility will provide. Note, if more than 150 MAU is required in any one year for HPC facilities, the NERC HPC application form must be completed. A [full list](#) of the Facilities requiring a quote can be found on the NERC website. The costs for the service or facility (excluding 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. A justification must be included in the Justification of Resources section of the application. Further information on NERC services and facilities can be found on the NERC website.

Applicants wishing to use NERC's marine facilities must contact NERC Marine Planning (marineplanning@nerc.ukri.org) by 6th December 2019 to discuss feasibility of useage. Note that NERC shiptime cannot be requested through this call. Following discussion with Marine Planning, applicants wishing to use other NERC marine facilities should complete an online Shiptime and Marine Equipment (SME) or Autonomous Deployment (ADF) application form on the [Marine Facilities Planning](#) webpage. The SME/ADF number should be included on the Je-S grant proposal form under Services and Facilities. SME/ADFs must be submitted and approved by NERC Marine Planning by the time the proposal (Je-S form) is submitted, so that a pdf of the SME/ADF can be attached as a facility form. Failure to do so may result in the request not being included in the NERC Marine Facilities Programme. The costs for the marine facility 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. Completed SMEs/ADFs should be submitted and approved by Marine Planning by 6th January 2020.

5. Application Process

Closing Date: 4pm (UK local time) 30th January 2020

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 – Third Call'.

The 'Constructing a Digital Environment – Third Call' call will close on Je-S at 4pm (UK local time) on 30th January 2020 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 10 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 8 sides of A4). Please include a Gantt chart.
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. This should include a quote from the relevant data centre for data management costs. Project teams are encouraged to interact further with the NERC data centres, who are able to provide advice and guidance on data-related matters and facilitate access to specialist computational facilities.
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 14th August 2020.



6. Assessment

6.1 Process

There will be a formal peer review process as part of this call. Please ensure you 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 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 a proposal 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 proposal is based within and the potential beneficiaries of the 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: 7th November 2019

Call closes: 4pm, 30th January 2020

Assessment panel: June 2020

Announcement of Awards: July 2020

Project start date: On or before 14th August 2020

8. Contact Information

Any queries regarding this call should be directed to Kirsten Dutton in the NERC Digital Environment Team (email: DigitalEnvironment@nerc.ukri.org, Telephone: 07892700207 or 01793 411930)