



UK Research  
and Innovation

## **Landscape Decisions: Towards a new framework for using land assets programme - mathematical and statistical challenges grants - Second Call**

### **Announcement of Opportunity**

Issued on: 27 June 2019

Notification of Intent deadline: 4pm on 26 July 2019

Full Proposals deadline: 4pm on 10 September 2019

### **1. Summary**

UK Research and Innovation (UKRI) are inviting proposals to this call of the Strategic Priorities Fund (SPF) on Landscape Decisions: Towards a new framework for using land assets programme. This is a four-year multidisciplinary programme jointly delivered by: the Natural Environment Research Council (NERC); the Arts and Humanities Research Council (AHRC); the Biotechnology and Biological Sciences Research Council (BBSRC); the Economic and Social Research Council (ESRC) and the Engineering and Physical Sciences Research Council (EPSRC) on behalf of UKRI.

The programme will address the challenge of delivering better, evidence-based decisions within UK landscapes grounded in theoretical advances in understanding complex socio-ecological systems. This call aims to bring together a variety of research communities to address land use related research and policy questions, including researchers across the breadth of the mathematical and computer sciences and beyond. Applicants should note that the mathematical expertise required to address this call subject is not limited to those currently working with landscape decisions.

Funds of up to £1.3m are available for this call. Individual projects may request up to £300k (at 80% FEC) over two years.

A small grants call on this topic was published in March 2019. This second call will support research or wider activities that require greater resources or a longer timescale. Applications to this call will not be restricted to successful applicants in the small grants call.

Unsuccessful applicants from the first call are eligible to resubmit their ideas to this call if they are substantively different and can demonstrably deliver to this call.

Projects are sought that bring mathematical or statistical methods to decision-making approaches on how we use the environment. Supported activities could include developing new mathematics and statistics, building on existing models or developing new model solutions with the aim of setting a route to develop decision-making tools for end-users such as policymakers and landowners. It is anticipated the work would lead to better systems understanding of how we use the landscape, and new thinking that could lead to products which can provide improved measures of system state and prediction of system dynamics.

Projects will be required to engage with the Programme Coordination Team (PCT) and attend programme workshops developed and run by the PCT.

While it is not a requirement of the call, applicants are encouraged to make themselves aware of the Isaac Newton Institute for Mathematical Sciences (INI) programme '[Mathematical and statistical challenges in landscape decision](#)' and [associated workshops](#) to be held on 3<sup>rd</sup> to 5<sup>th</sup> July and 31<sup>st</sup> July to 2<sup>nd</sup> August 2019.

Projects must start by 1 February 2020 and last no longer than 24 months.

## 2. Background

The Strategic Priorities Fund (SPF) has been set up to build upon the vision of a 'common research fund' set out in Sir Paul Nurse's [independent review](#) of the Research Councils. The fund will drive an increase in high-quality multi- and interdisciplinary research and innovation, ensure that UKRI's investment links up effectively with Government departments' research priorities and opportunities, and ensure that the system is able to respond to strategic priorities and opportunities.

As individuals, communities and a country, we are required to make multiple and often complex polycentric decisions using landscapes. Making landscape-scale decisions now has a timely political imperative; about one third of the more than 800 pieces of EU environmental legislation that will be needed after EU-Exit could be difficult to transpose into UK law. At the same time, the UK Government is setting out ambitious, long-term aspirations for its management of the environment, for example through the 25 Year Environment Plan. Together these requirements and political developments provide a unique opportunity for the UK to think differently about a long-standing frontier challenge about how we use land.

A landscape and the ecosystem services it provides are the product of environmental processes, social and cultural requirements and values, economic practices and flows of people, ideas, commodities and the practices associated with them. Landscapes will change continually across multiple scales (of space and time) through changes to natural systems such as water, air, climate, and biodiversity, which are themselves influenced by multiple uses and users of the landscape. All have been changing over time and interact; many are now altering faster than ever before.

Research collaboration with policy and land management partners is required to deliver an interdisciplinary decision-making framework to inform how land is used in the UK for the benefit of the environment, society, and individual well-being.

**This programme will deliver new decision-making capabilities for policy makers and other users at landscape scales that integrate information across all relevant disciplines.** Current approaches to landscape decisions do not capture the complex ways in which we utilise landscapes nor the benefits we realise from these uses. To understand this

gap in thinking requires a whole systems approach, which addresses the competing demands on land use decision-making for multi-functional landscapes. These competing demands could include allocations at a regional scale between highly productive agriculture, and catchment water management, or natural areas with demands and multiple objectives imposed from policy, planners and land managers, and the need to supply quality housing and access as well as strong environment and living standards. **The primary output of the programme will be new understanding of landscape-scale decision-making frameworks that will be developed under future activities.**

To move towards a holistic decision-making framework requires activities that develop a new community from the diverse research base. Landscapes need to be considered as highly complex systems of flows (such as products, commodities, services, finance, people, ideas) that are subject to non-linearity, interactions, sensitivities, and uncertainty. Robust decisions need to be made at scales from regional to local, and from immediate to long term policy that will impact on the flow and quality of ecosystem services that benefit our economy, our societal health and well-being, and our livelihoods. Challenge lies in capturing the complexity of how landscape systems respond to decision points over multiple temporal and spatial scales (such as management or policy interventions) due to feedback loops between system components. Improved understanding of interdependencies between system components is needed to:

- (i) capture trade-offs between the quality of the environment and the needs of different social groups, their health and well-being, and the economy due to interventions; and
- (ii) consider the cultural, aesthetic and heritage consequences of interventions in the long-term

### **3. Objectives and Scope**

#### *3.1 Programme objectives*

Land is a key limiting resource in many regions of the world, including the UK. Society depends on land resources for many purposes, including residential settlement, employment and transportation, as well as a host of benefits we get from nature (ecosystem services) - food, timber, energy, recreation, and aesthetic benefits. Recognising these requirements, the 'Landscape Decisions: Towards a new framework for using land assets' programme as a whole will consider:

- How can land be managed to realise benefits for society, individual well-being and the environment, both now and in the future?
- How can research and innovation provide solutions to support effective (real world) land use decisions that deliver improvements to the environment, society, health, well-being and the economy?

The programme will be structured across three work packages: 1) Developing new mathematics; 2) Building new model solutions; and 3) Stimulating new thinking and communities. These work packages are inter-related and unified by overarching activities that together will provide the following programme deliverables:

- Modelling approaches, data, and tools, informed by new metrics and accessible to a broader discipline and user base.
- Coordination amongst multiple decision-makers at the scale of land-based assets to facilitate initial tool development that enables land users to make joined up decisions.

- Flow of knowledge and tools beyond the programme to enable the uptake of new ideas via feed through to users through programme alignments, publications, media activity, reports, and papers (academic and user facing).
- A community of academics and stakeholders across disciplines and interests versed in the current state and capability of polycentric, multivariate, multi-scale decision-making.
- Academic and stakeholder connectivity with the applied mathematics community to explore new mathematical applications to land use decision making.
- Development of a case for a future substantive programme, leading to a revised land use decision framework.
- Key decision-makers for the outputs of this programme include (but are not limited to) Defra, the Environment Agency and their equivalents in the Devolved Administrations.

### 3.2 Call Scope

This call falls under Work package 1 'Developing new Mathematics', which recognises the need to link the environmental, social, economic and cultural views in decision making under complex socio-ecological systems, in collaborative activities with broader expertise (for example, branches of mathematical or computer science), to understand new opportunities and methodologies.

The [first call](#) on this topic was published in March 2019. This second call will support research or wider activities that require greater resources than achievable in the first small grants call. Applications to this call will not be restricted to successful applicants in the small grants call. Unsuccessful applicants from the first call are eligible to resubmit their ideas to this call if they are substantively different and can demonstrably deliver to this call.

Supported activities could include developing new mathematics and statistics, building on existing models or developing new model solutions with the aim of setting a route to develop decision-making tools for end-users such as policymakers and landowners. It is anticipated the work would lead to better systems understanding of how we use the landscape, and new thinking that could lead to products which can provide improved measures of system state and prediction of system dynamics.

Projects are expected to explore and develop how we model multi-functional coupled human-environment landscape systems with improved model robustness and explicit quantitative treatment of uncertainties. There is a need to understand the weaknesses present in models and decision support tools from the mathematics that underpins them, and to address these weaknesses, or develop new approaches. Projects are likely to focus on (but are not limited to) the following:

- Understanding the varied non-linearities and sensitivities of different modelling approaches for complex systems;
- Mathematical theories and techniques for improving the performance of models working with 'big data' – both large, multiple, diverse, and complex data sets;
- Techniques for combining models to capture feedbacks and interdependencies, and
- Techniques for dealing with structural and process uncertainty, systematic and random error propagation in complex models.

The Isaac Newton Institute for Mathematical Sciences programme [‘Mathematical and statistical challenges in landscape decision making’](#) and associated [programme workshops](#) is being delivered whilst this call is live. Although not a requirement, applicants are strongly encouraged to build on the INI programme where possible in submitting to this call.

An important aspect of the programme in which this call sits is the integration of ideas across the packages and communities involved. The projects funded in under this call are therefore expected to engage with the wider programme through the Programme Coordination Team, and should resource activities such as workshop or meeting attendance.

#### **4. Programme requirements**

##### *4.1 Programme funding*

Funds of up to £1.3m are available for this call. Individual projects may request up to £300k (at 80% FEC) over two years.

##### *4.2 Implementation and delivery*

The expected latest start date for projects funded under this Announcement of Opportunity is 1 February 2020 and projects should last no longer than 24 months.

##### *4.3 Knowledge Exchange and Impact*

Knowledge exchange (KE) is vital to ensure that environmental research has wide benefits for society, and should be an integral part of any research.

All applicants must consider how they will or might achieve impact outside the scientific community and submit this with their application as a [Pathways to Impact](#) statement, with associated delivery costs where relevant. Sufficient resourcing of Pathways to Impact activities should be considered where appropriate. Any funds required to carry out any proposed, outcome-driven activities identified within the Pathways to Impact **must** be fully justified within the Justification of Resources statement.

The Pathways to Impact will identify those who may benefit from or make use of the research, how they might benefit or make use of the research, and methods for disseminating data, knowledge and skills in the most effective and appropriate manner.

An acceptable Pathways to Impact is a condition of funding. Grants will not be allowed to start unless unacceptable Pathways to Impact are enhanced to an acceptable level within one month of notification of the panel outcome.

All funded projects may also be required to engage with programme-wide KE activities led by the Programme Coordination Team (PCT).

##### *4.4 Data Management*

The [NERC Data Policy](#) must be adhered to, and an [outline data management plan](#) produced as part of proposal development. 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.

#### *4.5 NERC Facilities*

Prior to submitting a proposal, applicants wishing to use a NERC service or facility must contact the facility to seek agreement that they could provide the service required. Applicants wishing to use most 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 – Shiptime and/or marine equipment) and HPC. For NERC, this means a quote for the work which the facility will provide. A [full list](#) of the Facilities requiring this quote can be found on the NERC website. 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.

#### *4.6 Programme management*

The Programme Board (PB) will provide the strategic direction for the programme and will be the ultimate decision making authority. The PB will be chaired by a representative of NERC, and will include representative(s) from the other programme funders and relevant users/stakeholders as required.

The programme will have an independent Programme Steering Committee (SC) that will provide strategic advice to the Programme Coordination Team and PB to ensure the delivery of the programme objectives.

The [Programme Coordination Team \(PCT\)](#) will address the varied challenges and perspectives of the programme, and integrate its package of work with other new and ongoing activities within the programme in a cohesive way. All projects funded under the programme are encouraged to engage with the PCT and participate in relevant PCT-led coordination and integration activities such as workshops where possible.

#### *4.7 Reporting requirements*

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

Grant holders may also be asked to provide additional progress updates to the PCT, the Programme Board and Programme Steering Committee as needed.

### **5. Application process**

#### *5.1 How to apply*

##### *5.1.1 Notification of Intent*

*Closing date 4pm 26 July 2019*

To help NERC manage the call and coordinate the peer review process a mandatory Notification of Intent (NoI) to apply is required, using the [online registration form](#) by 4pm 26 July. This includes the names and institutions of the applicants (including project partners and collaborators) and brief summary of proposed research. The information provided in the NoI will not be used to assess their scientific merit and can be modified in the full proposal,

as the proposal is developed further. Full applications will not be accepted unless NERC has received a Notification of Intent.

Applicants should familiarise themselves with the call timetable (section 7). If there are factors which might prevent you from adhering to the timetable e.g. availability during the PI response period, please indicate this in the Notification of Intent.

### *5.1.2 Full Proposals*

*Closing Date: 4pm 10 September 2019*

Full proposal must be submitted using the Research Councils' Joint Electronic Submission system (Je-S). Applicants should select Proposal Type - 'Standard Proposal' and then select the Scheme – 'Directed' and the Call – 'Landscape Decisions Maths Large Grants'.

The mathematical and statistical challenges large grants call will close on JeS at 4pm BST on 10 September 2019 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 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 without peer review. 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.

Proposals for this call should be submitted in standard grant format following the requirements outlined in Section F of the [NERC research grant and fellowships handbook](#). In the Case for Support section, applicants should provide details under Description of the proposed activity the following:

- i. How the proposed activity would bring mathematical or statistical methods to decision-making approaches on how we use the environment;
- ii. How the proposed activity would lead to better systems understanding of how we use the landscape and new thinking that could lead to products which can provide improved measures of system state and prediction of system dynamics.

The expected latest start date for projects funded under this Announcement of Opportunity is 1 February 2020.

### *5.2 Eligibility*

Normal individual 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.

## **6. Assessment Process**

The proposals will be reviewed by a panel comprised of independent experts and members of the NERC Peer Review College where possible. Applicants will be given the opportunity to provide a written PI response to peer review comments prior to the moderating panel.

The assessment criteria to be used will be as follows:

- Research Excellence
- Fit to Scheme

Feedback will be provided to both successful and unsuccessful applicants.

NERC will use the recommendations of the moderating panel along with the overall call requirements and the available budget in making the final funding decisions.

## **7. Timetable**

- Announcement published: 27 June
- Deadline for submission of Notification of Intent: 26 July
- Deadline for submission of full proposals: 10 September
- PI response period: Mid to late November
- Moderating panel meets: Early December
- Latest start date for projects: 1 February 2020

## **8. Contact**

For all enquiries, please contact the Landscape Decisions programme team:

[landscapedecisions@nerc.ukri.org](mailto:landscapedecisions@nerc.ukri.org)