

Understanding ecosystem stocks and tipping points

Summary

1. The Natural Environment Research Council (NERC) is inviting proposals to contribute to addressing the goals of the Valuing Nature programme through a broader understanding of the tipping points of ecosystem services.
2. The Valuing Nature programme is a five year interdisciplinary research programme involving a variety of funders including NERC, the Arts & Humanities Research Council (AHRC), and the Economic & Social Research Council (ESRC), with broader input from the Biotechnological and Biological Sciences Research Council (BBSRC), Defra and Department of Health. The programme aims to better understand and represent the complexities of the natural environment in valuation analyses and to consider the wider societal and cultural value of ecosystems services by extending the concept of value beyond perceived market value. It is delivering this through a mix of research, network and cross-discipline and impact activities.
3. This NERC supported call is for UK focused research proposals to further understand:
 - i. the links between ecosystem stocks, ecosystem service flows and benefits that are delivered as a result, to enable identification of critical levels of ecosystem stocks that avoid abrupt and damaging change in the delivery of benefits (tipping points).
 - ii. how the values (including those broader than economics) of ecosystem services and the benefits they deliver change as tipping points are reached and exceeded.

Call opens: 8 March 2016

Call closes: 5 May 2016 16:00 BST

4. A funding pot of up to £1.1M (80%FEC) is available from NERC, which is expected to support three proposals of up to 30 months duration, and up to £370K (80% FEC).

Background

The Valuing Nature Programme

5. The overarching aim of the Valuing Nature programme is to deliver a better understanding of the complexities of the natural environment in valuation analyses, and to consider and question the wider societal and cultural value of ecosystems services.

6. The Valuing Nature programme has three main goals:
 - a. To improve our understanding of: (i) the links between ecosystem stocks, ecosystem service flows and benefits that are delivered as a result, to enable identification of critical levels of ecosystem stocks that avoid abrupt and damaging change in the delivery of benefits (tipping points); and (ii) how the values of ecosystem services and the benefits they deliver change as tipping points are reached and exceeded.
 - b. To improve our understanding of the role biodiversity and ecosystem processes play in human health and wellbeing, in three areas: (i) natural hazards and extreme events; (ii) the exposure of people to pathogens and aquatic toxins; and (iii) health and wellbeing improvements associated with urban ecosystems (green space)
 - c. To continue to provide time-limited support to the Valuing Nature Network (VNN).

7. The second and third goals have been delivered respectively through the “Understanding the Value of the Natural Environment for Improving Human Health and Wellbeing” call earlier this year, and the actions of the Programme Co-ordination Team. The first goal will be delivered through this call for research grants.

Context of this call

8. There is increasing recognition that global economic growth and development are depleting the planet’s natural resources, and doing so at an accelerating rate. Increasing population growth coupled with changing patterns of consumption is placing the very ecosystems that sustain human well-being under intense pressure so that environmental degradation and biodiversity loss have become among the most pressing challenges of the 21st century.

9. The Millennium Ecosystem Assessment (MA)¹ in 2005 highlighted the need to better recognise the values and benefits people derive from ecosystems by bringing together existing knowledge and in 2011, the UK National Ecosystem Assessment (NEA) published a comprehensive assessment of the services provided by UK ecosystems². This work developed a conceptual framework for linking underpinning natural capital stocks, flows of ecosystem services and benefits to human well-being, and conducted a more comprehensive assessment of the benefits people receive and the values placed on them than had been attempted previously.

¹ Millennium Ecosystem Assessment. 2005. *Ecosystems and human well-being: Synthesis*. Washington D.C., Island Press.

² UK National Ecosystem Assessment. 2011. *Synthesis of the key findings*. DEFRA.

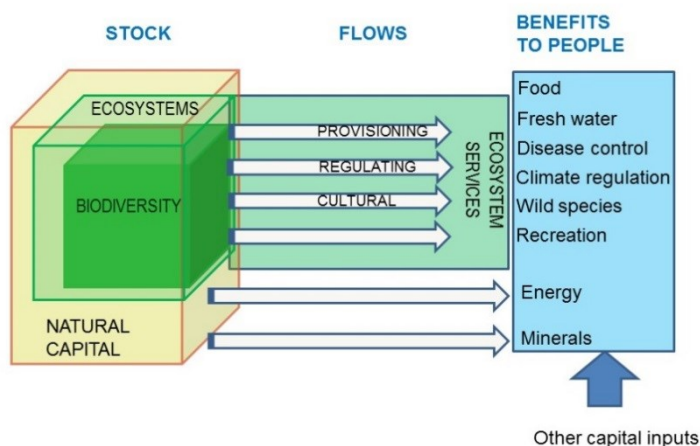


Figure 1

10. Natural capital is defined as the elements of the natural world that provide benefits to people (it does not include everything, but is bounded by utility). Ecosystems including their biodiversity are the biotic subsets of natural capital from which ecosystem services flow, delivering goods of benefit to people (figure 1). The focus of this call is on the nature of the relationships between the ecosystem stocks (the biotic part of the natural capital stocks), the ecosystem services flows and the delivery of benefits to people, in the context of whether there are critical levels of ecosystem stocks that avoid abrupt and damaging change in the delivery of benefits (tipping points).

11. The UK NEA clearly showed that taking into account the values of benefits for which there is no market would profoundly alter policies regarding land-use. The NEA has had a major impact on UK environment policy, playing a key role in shaping the Natural Environment and Water White Papers, and directly leading to the establishment of the Natural Capital Committee (NCC), which reports to the Treasury on the state of natural capital in England, and published its third State of Natural Capital report in January 2015³.

12. Despite the rapidly growing importance of valuing nature in the business and policy arenas, significant research challenges remain in this area. A major challenge is to characterise the relationships between the ecosystem stocks and the delivery of benefits, identifying any potential 'tipping points' where abrupt changes occur. This is the focus of this call. If the exploitation of an ecosystem service increases, ecosystem stocks often decline, reducing the capacity of the stock to support service flows in the future. Stock depletion can reach a threshold where there is an abrupt decline in service flows i.e. a 'tipping point'. A number of marine fisheries show this type of pattern - as mortality increases through over-fishing (i.e. as the exploitation of the ecosystem service increases), fish stocks can decline to the point at which catches collapse. Stock recovery can then take a very long time, or indeed systems can exhibit hysteresis and a

³ Please note that whilst the NCC website is being transferred to a different domain, information and reports can be found on the [Natural Capital Committee archive site](#).

different steady state may be reached. With the exception of these well-studied examples, our understanding of the relationships between stocks and services is patchy but improving.

13. The primary drivers of ecosystem degradation, stock depletion and tipping points are anthropogenic; they stem from economic systems and lifestyles resourced by excess consumption of finite natural resources. How societies can respond to these anthropogenic threats to ecosystem stocks, and do so at a spatial scale and timescale commensurate with the challenge, requires researchers to work both within and beyond their disciplines. Critiquing and challenging existing paradigms, as well as developing new methodologies will be integral to advancing science and policy to promote the sustainable use of natural resources.
14. Whilst some economic techniques are available for valuation and cost-benefit analysis, interdisciplinary approaches are required to refine and refashion these concepts and methodologies and to gain a broader view of the challenges around the relationship between environmental processes and stocks and how they are valued. For example, a better understanding is needed of the spatial and temporal variation in natural capital and ecosystem services including rates of change, potential thresholds and (ir)reversibility. These challenges are aligned to the priority research gaps identified by the Natural Capital Committee's second State of Natural Capital reports, and are also highly relevant to the work of the National Ecosystem Assessment Follow-on.
15. The Natural Capital Committee (NCC), in its third report identified a series of cases in that could form the basis of a natural capital investment programme. Several of these cases explore situations where tipping points have been exceeded, or are being approached (e.g. peatland restoration, wetland creation, restoring commercial fish stocks and intertidal habitat creation). Effective delivery of these examples requires understanding the linkage between ecosystem stocks and the services and benefits they deliver. Understanding these relationships for specific cases or in more general models will support a key recommendation of the NCC – the development of a strategy to protect and improve natural capital and the benefits it provides.

Proposal Requirements

Scientific scope

16. The purpose of this call is to support interdisciplinary research projects that, through a better understanding the complexities of the UK natural environment in valuation analyses, will seek to improve our understanding of:
 - iii. the links between ecosystem stocks, ecosystem service flows and benefits that are delivered as a result in the context of defining critical levels of ecosystem stocks that avoid abrupt and damaging change in the delivery of benefits (tipping points).
 - iv. how the values of ecosystem services and benefits change as tipping points are reached and exceeded
17. A number of programmes such as Biodiversity and Ecosystem Service Sustainability ([BESS](#)), Insect Pollinators Initiative ([IPI](#)), and [BiodivERsA](#), amongst others have begun

generating data on ecosystem stocks, ecosystem services and benefits. Data from these programmes are becoming increasingly available and represent sources which may be useful for identifying tipping points as well as the ability of ecosystem stocks to naturally recover and potentially reverse degradation.

18. Projects must be interdisciplinary, incorporating the range of disciplines necessary to fully tackle the challenge including the natural science to characterise the ecosystem stocks and service flows, and the socio-economics to characterise the values held for the benefits that result; however the primary focus and lead of the project should be environmental science as the call is centred on understanding the dynamics that link the ecosystem stocks to the benefits and identifying tipping points. Projects can be based around a specific challenge or issue, using that as a model to develop new broader understanding, or be more conceptual in scope. Research should focus on the UK, though reference to international examples may be appropriate.

Data Management

19. NERC believes that data generated from the research they fund is a valuable long-term, public good resource. To ensure the data can be fully exploited in support of the activities that they were collected for, and to enable them to be available for effective, longer term, post-programme exploitation, it is NERCs [policy](#) that data must be managed effectively from the time of generation onwards. NERC grant holders in academia are also required to offer to lodge with NERC a copy of the data resulting from the supported research when it is completed, together with documentation / metadata describing these data.
20. Applicants are required to submit an outline data management plan and are required to pay careful consideration to data management needs and discuss any extra ordinary needs with the NERC Environmental Information Data Centre (EIDC) and the UK Data Service. In particular, applicants should consider the following points:
 - What data are planned for collection and which of these data are perceived as having long-term value?
 - What existing data will be required? Who will supply these data and will there be a cost?
 - What level of data management support is going to be required from the EIDC data centre or the UK Data Service?
 - What, if any, specialist data and informatics skills will be required by the programme and from where will these be obtained?
21. There will be no charge to the project for a NERC Data Centre to accept and manage the agreed data sets at the end of the grant. However, any costs for data management activities internal to the project should be costed and clearly identified within the proposal.
22. There will be a programme-wide Data Management Policy and Plan developed, with which the projects will be expected to comply.

Pathways to Impact

23. Excellence with impact is a central goal for NERC, which aims to deliver maximum economic and societal benefits from our investments, to support UK economic competitiveness, to make public services and policy more effective, and to improve people's health and wellbeing.
24. To achieve this we need excellent impact activities, which anticipate and deliver the needs of the ultimate users of our science, whether they are in business, policy, the third-sector, the wider public or other groups.
25. The Research Councils' policy is that grant applicants are responsible for considering how their research will or might achieve impact outside the scientific community and submit this with their proposal as a 'Pathways to Impact' statement. The plan will identify those who may benefit from or make use of the research, how they might benefit and/or make use of the research, how they can be involved in project design and methods for disseminating data/knowledge/skills in the most effective and appropriate manner, from the outset.
26. Pathways to Impact activities do not have to be cost-incurring; it is not a requirement to include funded activities. However any funds required to undertake any proposed activities outlined in the Pathways to Impact Plan should be clearly identified and requested via the JeS form, and must be fully justified within the Justification of Resources statement.
27. Pathways to Impact submissions will be assessed but they are not used in proposal ranking; however grants will not be allowed to start without an acceptable Pathways to Impact statement.
28. Proposals submitted to NERC should adhere to the NERC policy and guidance detailed on the website and in the [NERC Research Grants Handbook](#).
29. A programme wide Impact Strategy will also be developed, and applicants will be expected to work with the Programme Coordination Team and Programme Executive Board, to maximise the impact of the programme as a whole.

Eligibility and funding

30. This opportunity is open to individuals and organisations eligible for RCUK funding, i.e. applicants based in UK Higher Education Institutions (HEI's), RCUK Research and Collaborative Centres, and Independent Research Organisations (IRO's) that are eligible to receive NERC Managed Mode funding. Please refer the [RCUK website](#) for more information.
31. Investigator may be named on a maximum of two different proposals but on only one of these as the lead Principal Investigator (PI). It is the responsibility of the lead PI to ensure that your proposal does not include ineligible Co-Is and Researcher Co-Is, or any applicants who are named on more than two proposals. Proposals which break this eligibility rule will be rejected.

32. A funding pot of up to £1.1M (80%FEC) is available from NERC, which is expected to support three proposals of up to 30 months duration, and up to £370K (80% FEC).

Application process

33. Full proposals must be submitted using the Research Councils Joint Electronic Submission system (JeS) by 4pm on the closing date of 5 May 2016.
34. To use this system, the applicant's Research Organisation must be registered as a JeS user. Full details are available on the JeS website. Further information can also be obtained by contacting the JeS Helpdesk by email at JeSHelp@rcuk.ac.uk or by telephone on 01793 444164.
35. Applicants should leave enough time for their proposal to pass through their organisation's JeS submission route before this date. Any proposal that is received after the closing date, is incomplete, or does not meet the eligibility criteria, will be returned to the applicant and will not be considered.
36. To create a new application in Je-S for this call, please select the following criteria:
- Research Council – NERC
 - Document type – 'Standard Proposal'
 - Scheme – 'Directed'
 - Call - 'Valuing Nature Tipping Points'.
37. 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 JeS 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.
38. All documents should be completed in single-spaced typescript of minimum font size 11 point Arial font or other sans serif typeface of equivalent size to Arial 11, with margins of at least 2 cm. References must now also be presented in minimum font size 11 point. Please note that Arial narrow and Calibri are not allowable font types as they are smaller and any proposal which has used either of these font types within their submission will be rejected. Applicants referring to websites should note that referees may choose not to use them.
39. 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.

Proposal Components

40. Proposals may be submitted as single or joint proposals. Proposals should include:

Document / attachment type	Requirements
Proposal Form	JeS proforma (all component proposals must use the same call as the lead proposal or the whole proposal (lead and components) will be rejected).
Case for Support	comprising <ul style="list-style-type: none"> • a common Previous Track Record incorporating all Research Organisations involved (up to 2 sides of A4); • a common Description of the Proposed Research (up to 8 sides of A4 including all necessary tables, references and figures)
Outline Data Management Plan (ODMP)	up to 1 side A4. http://www.nerc.ac.uk/research/sites/data/dmp/
Justification of Resources	Up to 2 sides A4 for all Research Organisations in the proposed grant, including justification for items of equipment between £10,000 and the OJEU threshold. It should also include full justification of all sea-time and facility costs (excluding HPC) included as estimates on proposals. Use of ARCHER should be included as an estimate in Million Allocation Units (MAUs).
C.V.	CVs are required for named research staff (including Researcher Co-Investigators), Visiting Researchers, all Principal and Co-Investigators named in the proposal (up to 2 sides A4 for each CV). There is a JeS validation requiring the same number of CVs as named investigators and researchers on the proposal. Note: Only CVs for the PI, any CoIs and named researchers will be sent out for peer review. Other submitted CVs e.g. from project partners should not be attached and will not be made available to reviewers or panel members.
Pathways to Impact	up to 2 sides A4
Project Partner Letter of Support	From any named Project Partners (up to 2 sides A4 each). There is a JeS validation requiring the same number of attachments as Project Partners
Letter of Support	Project Partners should provide letters of support and should be attached as above. No further letters of support are required, except in exceptional cases where permission has been received from the NERC Programme Manager. Letters of support can only be attached to the lead proposal. Applicants should ensure than any letter of

	support adds value to the scientific case e.g. where access to data is being granted. NERC reserves the right to not make letters of support available to reviewers and panel members where they do not add value to the scientific case.
Facility Form	Use only for application forms for Ship-time/Marine Equipment (SME), Antarctic Logistics Support (BAS should already have been approached before the proposal stage) and for High Performance Computing (HPC) when use of ARCHER exceeds 160MAU (in any one year).
Technical Assessment	Mandatory for any NERC Facility selected on the JeS proforma except those listed in the previous row. The full list of NERC Facilities is available. This attachment should be a quote from the relevant facility.
Equipment Section attachments.	Under the Equipment Section there is a JeS validation requiring three quotations and a Business Case (up to 2 sides A4) for each item of equipment requested over the OJEU threshold limit. For equipment over £25K and below the OJEU, up to three quotations can be attached, but these are optional.
Other attachment	This attachment does not go out to reviewers and should not be used, except where a Head of Department is required to confirm the eligibility of one or more of the Investigators (this will be an internal document for NERC). If the document does not fit within any of the attachment types above, it probably should not be submitted. Contact researchgrants@nerc.ac.uk if unsure.
Proposal Cover letter	This attachment does not go out to reviewers, so should not be used except to flag up a significant issue to the NERC Office (e.g. a request not to use a certain reviewer).

41. Please refer the [NERC Research Grants Handbook](#) for further information.

Assessment process

42. To meet the funders' strategic objectives for the Valuing Nature programme proposals will be subject to expert peer review by a specially convened expert Assessment Panel.
43. The Assessment Panel will assess and prioritise the proposals and make their recommendations.
44. Based on the recommendations of the Assessment Panel, NERC will, within the resources available, select a portfolio of projects that collectively best address the key requirements of the programme.
45. Applicants will receive feedback on their proposal.
46. Proposals will be assessed and scored against the following criteria:

- **Research Excellence**

A proposal that demonstrates excellence can be characterised by terms such as: novel, ambitious, timely, exciting, at the international forefront, adventurous, elegant or transformative, but need not demonstrate all of them.

- **Fit to Call**

Applicants should fully read this Announcement of Opportunity to ensure their proposal fits the call requirements.

47. Applicants are required to identify the potential societal and economic impact of their work and to outline the steps they can sensibly make to facilitate the realisation of this impact. **Pathways to Impact** submissions will be assessed but they are not used in proposal ranking; however grants will not be allowed to start without an acceptable Pathways to Impact statement.

Timetable

- AO published: 8 March 2016
- Deadline for proposals: 5 May 2016, 4pm
- Assessment panel: June 2016*
- Grants awarded: July 2016*
- Grants stated start date: 1 September 2016 (starting certificates must returned no later than 30 November 2016)

*tbc

Programme Governance and Reporting

48. NERC Head Office, on behalf of the funders, retains the overall executive authority for the governance and management of the programme. It will be responsible for the overall Research Programme budget, including the high-level budget management and allocation of resources, e.g. profiling of funds within the programme budget and awards for research and funds for procurement of services commissioning, delivery and management of key funding opportunities, including authorisation of funding decisions, issuance of awards, post-award administration and payments, and award completion.
49. The Programme Executive Board (PEB) is chaired by the NERC Head of Terrestrial Sciences, and includes representative(s) the other programme funders and relevant users/stakeholders as required. The PEB will provide the strategic direction for the programme and will be the ultimate decision-making authority.
50. The Programme Coordination Team will lead and coordinate activities within the Valuing Nature programme and link and develop synergies with other relevant initiatives of the funders; facilitate two-way knowledge exchange between researchers and policy/practitioner audiences; and maintain an oversight of the funded research activities, ensuring progress in delivery against the programme objectives. The successful projects will be expected to cooperate and work with the Programme Coordination Team in order to ensure a successful programme outcome and maximise its impact.

51. In order for the funders to manage performance against their Strategic Objectives and Delivery Plan and report to the Department for Business, Innovation and Skills (BIS) and the funders' Councils, suppliers of strategic research are required to report regularly on the outputs and outcomes they have been commissioned to deliver. The project PI will be required to submit the following:
- regular reporting on the outputs, outcomes and impacts of the project using ResearchFish; and
 - other reporting as required by the Programme Coordination Team and Executive Board, in order to enable them to monitor progress against the programmes objectives, and meet their own institutional reporting responsibilities.

Contact information

52. For further information about the programme please contact Rachel Leader 01793 411595 (valuingnature@nerc.ac.uk).
53. Further information on the JeS system can be found on the [JeS website](#) or be obtained by contacting the JeS Helpdesk by email at JeSHelp@rcuk.ac.uk or by telephone on 01793 444164. 12
54. Valuing Nature Programme Coordination Team enquiries info@valuing-nature.net