



Highlight Topics 2019

Announcement of Opportunity

Issued on: 14 January 2019

Full Proposals deadline: 4pm 21 March 2019

The Announcement of Opportunity was updated and republished on 23 January to include instructions on submission of Antarctic Logistics Support forms in sections 4.5 and 7.

1. Summary

NERC invites proposals for the fifth round of highlight topics, a route for funding strategic research. Highlight topics focus strategic research on defined topic areas, and will be delivered through independent projects. The highlight topics in this call are:

- A. Marine noise pollution: Understanding chronic effects
- B. Understanding the likelihood and impact of UK wildfires
- C. Impact of experimental deep-sea mining in the Central Pacific: A new interdisciplinary challenge for UK environmental science
- D. Assessing large scale ecological responses to environmental change
- E. The impact of legacy waste in the coastal zone
- F. Advancing capabilities to predict UK and European weather conditions one season ahead
- G. The mineral systems approach to exploration and discovery of new sediment-hosted copper (Co,V) deposits

A [notification of intent](#) must be submitted by 21 February 2019 16:00. The closing date for proposals is 16:00 on 21 March 2019. Proposals must be submitted via the research councils' Joint electronic-Submissions (JeS) system.

The maximum value for proposals under each topic area are provided below. For this Highlight Topic call, NERC will consider exceptional cases for exceeding the £2.0m limit for proposals to Topics A, B and D to G . Refer to section 5.5 for more detail.

2. Background

NERC's vision is to place environmental science at the heart of responsible management of our planet. NERC's goals are to fund excellent, peer reviewed environmental science that helps us:

- understand and predict how our planet works
- manage our environment responsibly as we pursue new ways of living, doing business, escaping poverty and growing economies

NERC's strategic research funding supports research that addresses some major challenges of the 21st century: benefiting from natural resources, resilience to environmental hazards and managing environmental change.

NERC's funding streams for strategic research enable the environmental science community to play a role in setting priorities for research funding. Highlight topics are a funding stream that focuses strategic research on defined topic areas.

3. Scope

The following highlight topics have been selected for this call and are considered to be of equal priority. There are more highlight topics announced than available funding will support, so all topics will not, necessarily, result in funded grants. This is to ensure effective competition so that only the very best research is funded.

Proposals must address issues within a single highlight topic; proposals addressing more than one highlight topic will not be accepted. Where multiple proposals are invited within a highlight topic, they must be independent projects and coordination is not required between projects to achieve their aims.

A. Marine noise pollution: understanding chronic effects?

Objective

This highlight topic aims to characterise current levels of chronic ocean sound and increase our understanding of the effects on marine fauna of chronic exposure to increased marine noise.

Strategic context

Many marine animals rely on acoustics in navigation, finding resources, reproduction and communication. Over the last hundred years, and particularly in the last 30 years, human activities have altered the sound field in the ocean mainly through the introduction of industrial activities such as motorised shipping, oil exploration and offshore wind. Concerns about marine noise pollution from intense, short duration sounds created by piling or seismic surveys have increased in recent years due to the increase in anthropogenic activity and there is a growing evidence base demonstrating impact. In addition, chronic noise pollution, arising from the cumulative impact of multiple acute sources and/or repeated low level activities is also of concern but more cryptic in its effects with much less evidence setting out potential chronic environmental effects. These effects may be more prevalent in some areas and emerging research indicates they could be important to wildlife populations and have ecosystem consequences.

Scope

This highlight topic will address two main areas of research driven by these population and ecosystem level concerns. Firstly, there is a need to fully characterise the current levels of chronic ocean sound in terms of distribution, intensity and the different sources (both natural and anthropogenic). Robust baseline data is essential to monitor trends and highlight areas of concern. Secondly, the effects of chronic exposure to increased marine noise on marine fauna needs to be better understood. Without such an understanding, decisions about management and mitigation of activities will be more challenging, which could have economic and security implications.

Scientific advances

Growing concerns about the effects of underwater noise on marine ecosystems have been recently recognised through legislation and the introduction of several international initiatives. Whilst acute noise and its effects have received a large amount of attention, research into chronic noise pollution is still lacking. There is a small but growing body of evidence that chronic noise can have major impacts on marine fauna, such as increasing stress and therefore reduction in fitness. However, a lack of fundamental research means it is currently challenging to properly evaluate the effectiveness and adequacy of measures taken, and planned, for the protection of the marine environment against effects from chronic underwater noise. Therefore, an investigation of anthropogenic sound budgets is needed including behavioural and auditory studies, monitoring the distribution of both noise sources and relevant species.

This highlight topic will build on preliminary data and studies that aimed to provide a nationally coordinated effort to quantify underwater noise levels, in support of UK policy objectives under the EU Marine Strategy Framework Directive (MSFD). The work undertaken so far has provided a preliminary baseline for the North Sea, which still has a large amount of uncertainty associated with it. There is also a pressing need to investigate the chronic environmental effects of this noise budget.

This highlight topic will have a particular focus on UK Shelf Seas. These shelf seas are relatively shallow, which means that noise has less chance to attenuate than in the deep sea, and have a rich and complex biodiversity with significant areas of importance for birds, fish and marine mammals. By way of example, the North Sea is one of the busiest sea regions in the UK, with the Straits of Dover widely held to be the busiest shipping channel in the world.

Research area 1: Effects of noise on marine fauna

- Does chronic exposure to anthropogenic sound harm marine life?
- What are the mechanisms by which exposure to noise affects marine populations?
- How does it interact with other stressors on marine ecosystems?

Recent concern about impacts of sound have stimulated the development of experiments designed to quantify dose/response functions. This highlight topic will focus on applying these experiments to ecosystems and noise sources of priority (e.g. effects of off shore construction and renewable energy generation on harbour porpoise and their prey) and developing methods to study interactions between other marine stressors.

Research area 2: Monitoring and modelling UK Shelf Sea noise

- Understand the spatial and temporal distribution, and current levels of chronic ocean noise in UK Shelf Seas.
- Develop a noise budget for UK Shelf Seas: quantify how the ocean noise field is generated by human activities and natural processes.
- Use this to predict how proposed human activities will change the ocean noise field.
- Contributing to a system for long term monitoring of ocean noise to test the predictions.

Delivery

This highlight topic should be addressed by up to two projects, each up to the value of £2m at 80% FEC (£2.5m 100% FEC) and up to four years in duration. Individual projects are required to

address parts of both research areas and engage in the development of a system for long term monitoring.

B. Understanding the likelihood and impact of UK wildfires

Objective

This HT will provide underpinning science and model development to quantify wildfire likelihood, impact and risk for the UK and similar highly-populated, intensively managed regions. This scientific underpinning will enable development of tools for the effective management of fires, and will support risk assessment, wildfire resilience and climate change adaptation measures.

Strategic context

In the UK, wildfires can be spatially extensive, challenging to fight, and can threaten life, health, property, transport or other critical infrastructure, especially in the rural-urban interface. Annual response costs for vegetation fires in GB are ~£55M. Fire and Rescue Services (FRS) in England alone attend over ~70,000 vegetation fires annually. Many of these are small or have limited impact but this represents a potential for many larger fires if conditions become favourable; and wildfire likelihood is projected to increase under future climate change. An existing forecasting tool, the Met Office Fire Severity Index (MOFSI), was not designed to meet current needs and new underpinning knowledge and models representing the UK context is needed before a fit-for-purpose Wildfire Danger Rating System (WFDRS) can emerge.

Scope

This HT is intended to advance fundamental understanding of wildfire potential, fire behaviour, and requirements for prediction for UK ecosystems and landscapes. Research approaches including field studies, Earth Observation, land surface modelling, and fire risk modelling are all within scope.

Scientific advances

MOFSI forecasts extreme wildfire weather hazard up to five days ahead for England and Wales. It uses the Canadian Forest Fire Weather Index (FWI), which was developed for homogeneous forest landscapes and lightning ignitions. Research topics that must be addressed to develop a fit-for-purpose WFDRS include:

- (i) Understanding fuel characteristics and fire behaviour for heterogeneous UK fuels and complex land cover mosaics, especially at the rural-urban interface in European weather conditions. Knowledge of processes controlling e.g. flammability, spread rate, fire intensity and smoke production would underpin creation of fuel models and maps with which to consider historical and future fire activity.
- (ii) Developing a probabilistic understanding of human influence on ignition and factors influencing decisions on FRS response in areas of different socioeconomic status. Research to validate model outputs against real fire incidence would support understanding of the impact of human interventions.

- (iii) Incorporating assets and populations at risk to assess potential impact on critical national infrastructure, natural capital and communities (in terms of direct fire damage and public health impacts). Research advances here could include assessing the degree of vulnerability of UK-specific land cover types, housing materials and different communities to wildfires of different severity and duration, and assessment of how environmental, social and economic factors interact to determine risk. This would inform optimal risk management and response strategies.
- (iv) Developing fit-for-purpose model outputs. Research priorities include systematic calibration and validation of models against historical fire incidence, determination of appropriate wildfire hazard thresholds, and exploration of trade-offs to determine scientifically optimal and operationally practicable spatial resolution. Use of remote sensing (e.g. Fire Radiative Power, burn severity, fire perimeters), Fire Service records and stakeholder expertise is encouraged.

Delivery

This highlight topic should be addressed by up to two projects, each up to the value of £2m at 80% FEC (£2.5m 100% FEC) and up to four years in duration. Individual proposals should seek to include parts of each research topic but are not required to address the entire HT scope.

C. Impact of experimental deep-sea mining in the central pacific: a new interdisciplinary challenge for UK environmental science

Objective

This Highlight Topic aims to provide new insight into the actual impacts of deep-sea mining and provide a full assessment of ecosystem resilience.

Strategic context

Seafloor minerals have global economic potential, but the industry is still embryonic, and environmental and technical uncertainties hamper investment. The challenge is to address these critical scientific uncertainties to 'de-risk' and create an environmentally sustainable and commercial deep-sea mining operation.

The most active and promising region for deep-sea mining is in the central Pacific Clarion-Clipperton Zone (CCZ), where the UK is the Sponsoring State to two vast exploration regions rich in polymetallic nodule deposits at depths of 4000-5000 m. In 2013, the UK Government estimated that a single 3 megatonne (Mt) operation in just one of these license areas could be worth £1bn a year to UK industry for at least 30 years – leveraging the UK's offshore hydrocarbon and renewables expertise to create jobs across the country, and creating a potentially low-impact source of minerals for a range of emerging technologies. Following initial baseline assessments of biodiversity and function in the eastern CCZ, the greatest scientific challenge is to establish the environmental consequences of deep-sea mining at a regional and global level. This challenge can only be achieved with an inter-disciplinary effort that investigates the environmental response of the deep-sea to this emerging industrial activity.

Scope

This Highlight Topic will combine in situ studies, experimental studies and modelling approaches of short- and long-term mining impacts, to provide a full assessment of ecosystem resilience. It will take advantage of the opportunity to investigate actual mining impacts on the deep-sea environment over different temporal scales, by conducting research using NERC ship-time in the CCZ at the same time that planned UK Seabed Resources Ltd (UKSRL) collector vehicle tests take place, together with studies of UKSRL existing data and sites from 40-year old mining test sites.

Scientific advances

This Highlight Topic will focus on three main areas where current understanding is absent or not sufficient to evaluate deep-sea mining impacts:

1. Quantifying the physical impacts to the seafloor and water column of abyssal polymetallic nodule mining using a multi-disciplinary study that takes advantage of the test of a new seabed mining collector vehicle. The determination of the spatial and temporal distribution of suspended and redeposited particulates at a landscape scale is fundamental to evaluating the impacts of deep-sea mining. Redistribution of sediment will have physical, chemical and biological consequences for the deep-sea environment. This research area will quantify physical impacts to the sea-floor and also other associated impacts, including mechanical impacts of the collector to sediment systems and their geochemistry. Robust experimental evaluations of these coupled with evaluation of local hydrography and sediment structure will enable development and parameterization of a broadly applicable physical modelling framework to generalise the results and apply them elsewhere.
2. Evaluating the biological effects of these impacts on community structure, biodiversity and function over time scales from months to >40 years. NERC marine facilities, such as marine autonomous and robotic systems and other tools from the National Marine Equipment Pool, will enable advances in the evaluation of the biological response to specific types and levels of disturbance in space and time. This can now be realistically achieved for the first time and integrated across a range of scales of biological organisation from genes to ecosystems, as well as being linked to functional and biogeochemical changes.
3. Modelling, for the first time at a regional and global level, the resilience of deep-sea ecosystems to this emerging new industry. Using existing (e.g. ERSEM) and novel model frameworks, the results of the finer-scale evaluations can be integrated and better understood. This will enable extrapolation to evaluate regional and global scale impacts of seabed mining and their consequences to the ecosystem.

This Highlight Topic will provide new insight into the actual impacts of deep-sea mining, based on new and fundamental science in the abyss. It will be focused on a clear question and timely opportunity, but based on multi-disciplinary methods, including landscape-scale geochemistry and geology, physical oceanography, biodiversity, life-history and community ecology and genomic approaches to functional ecology and biotechnology. This Highlight Topic will deliver the understanding and data essential to the sustainable exploitation and safe exploration of the ocean floor.

Technological advances anticipated from the proposed research include innovations in techniques for experimental study using remotely operated and/or autonomous underwater vehicles, and genomic methods, likely to define the standard techniques and technologies for environmental impact assessment in deep-sea mining globally, potentially creating further opportunities for the UK subsea technology and environmental consultancy sectors.

Delivery

This Highlight Topic should be addressed by one project costing up to the value of £4m at 80% FEC (£5m 100% FEC) and up to four years in duration. Proposed projects will take advantage of both UKSRL planned collector vehicle tests and existing data – information on which is provided in the information sheet at this link. Proposed projects will be conducted independent research that takes advantage of both UKSRL planned collector vehicle tests and existing data – information on which is provided in the information sheet at the link. More information on planned UKSRL activities and available data can be obtained from Chris Williams, UK Seabed Resources Ltd (christopher.j2.williams@lmco.com). The start of a Highlight Topic grant will be subject to NERC ship-time being programmed at the time of the planned collector vehicle tests.

D. Assessing Large Scale Ecological Responses to Environmental Change

Objective

This highlight topic seeks to quantify and predict ecological stability across ecosystem types and scales, using quantifiable and transferable indicators of the persistence and resilience of ecosystems, and to identify the ecological processes governing resilience across ecosystem types. This will enable process understanding with which to relate environmental change with the dynamic nature, or ecological stability, of freshwater, terrestrial, marine and coastal ecosystems, necessary to predict such events at the large scale.

Strategic context

Most societies have been built to harness the benefits of functionally stable ecosystems including, for example, the provision of food, clean water for drinking, and to support recreation, industry and biodiversity. Ecological responses to environmental change can result in both desirable and undesirable effects in this context and changes can be rapid and gradual. However, the world's ecosystems can be profoundly altered by environmental change culminating in unexpected, and at times sudden, large scale ecological phenomena. Recent examples include the loss of insect and bird populations across Europe as a result of pesticide use, the decline of lake biodiversity globally in response to eutrophication, and the collapse of marine and coastal ecosystems as a result of over fishing.

The strategic and socio-economic need for this work is recognised through the requirement in wide reaching environmental legislation (e.g. Marine Protected Areas; Aichi Biodiversity Targets; Sustainable Development Goals, UK 25 Year Plan etc.) to stabilise sensitive ecosystems for the enhancement of biodiversity and ecosystem services. The need for preventative management is reflected also in environmental policies, for example, Aichi Strategic Goal C: 'To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity'.

There is a pressing need to quantify and predict ecological stability across ecosystem types and scales, using quantifiable and transferable indicators of the persistence and resilience of ecosystems, and to identify the ecological processes governing resilience across ecosystem types. It is now timely to address this problem given the access to contemporary (i.e. spatial, time series, and legacy experimental data) and historical evidence (e.g. sediment records and archived historical specimens), alongside advances in statistical approaches which can detect subtle changes in ecological stability across temporal and spatial scales.

Scope

This highlight topic will require approaches from a broad range of environmental scientists using a range of ecological and environmental spatial and temporal data for all ecosystem types of interest at UK and global scale. These data include past experiments with which retrospective analyses using novel approaches can be conducted. Collectively, these data represent an opportunity to examine multi-scale variation and patterns in ecological responses to common environmental stressors, a key knowledge gap in the field.

Scientific advances

It is anticipated that projects would address one or more of the questions working across a selected set of well-defined ecosystem types:

1. How does ecological stability vary between and within ecosystem types in response to environmental change and does this vary geographically?
2. What are the intrinsic processes and feedback mechanisms supporting ecological stability across ecosystem types and scales and how do they determine the forms and rates of ecosystem responses?
3. Do our ecosystems exhibit coherence in ecological stability across scales and what are the main extrinsic stressors driving this response (e.g. climate change and land use change)?
4. How will large scale ecological stability respond to future multiple stressor scenarios and in which areas of the UK and the world are our ecosystems most sensitive to future, sudden ecological change?
5. Can we manipulate ecological stability across scales by controlling intrinsic processes to achieve desirable ecological responses to environmental change?

Delivery

This highlight topic should be addressed by up to two projects, each up to the value of £2.0m at 80% FEC (£2.5m 100% FEC) and up to four years in duration.

E. The Impact of Legacy Waste in the Coastal Zone

Objective

This Highlight Topic aims to determine the impacts of solid waste in the coastal zone on coastal and marine environments and transitional waters, to enable the associated risks to be managed.

Strategic Context

Landfills and other legacy waste sites in coastal zones can be vulnerable to tidal flooding and/or coastal erosion, for example, there are c.2000 documented coastal landfills currently at risk in England and Wales. Often there are limited or non-existent records regarding the volume or nature of the waste they contain, and there are usually no management strategies in place to isolate waste streams from adjacent coastal and marine environments. Many 'historic landfills' are already eroding and releasing solid waste to the marine environment (CIRIA report C718) and future erosion and flood risk will increase due to climate change. By 2025, it is proposed that many Shoreline Management Plans will move from 'Hold the Line' to 'no active intervention' and more dynamic, cost-effective and sustainable coastal management approaches. Coastal managers therefore need better evidence to support such management decisions where legacy waste is present.

Scope

This Topic is concerned with solid waste in legacy waste sites in the coastal zones of the UK.

Scientific Advances

Currently there is no methodology to assess the potential impact of solid wastes entering the environment from legacy waste sites in coastal zones. New knowledge of the characteristics of the waste, and of the chemical, physical and biological transport mechanisms, pathways, and fate of solid wastes once released is required to develop risk assessment frameworks.

Research questions that could be addressed include:

1: Volume and characteristics of waste

- Can wastes be separated and characterized relative to their potential harm to the marine environment?
- How do different materials and pollutants interact within legacy waste sites and what are the risks associated with new substances and compounds that are created?
- How likely are coastal legacy waste sites to erode, how much waste might be released and over what time scales under different sea-level rise and climate change, scenarios and in different coastal settings?
- Can we prioritize legacy waste sites in terms of their potential hazard to the marine environment coupled to the risk of erosion and waste release, supporting more strategic management?
- What is the magnitude of the UK problem (number of sites, waste volume, and types) linked to their potential to cause harm if released into the marine environment?

2: Physical, chemical and biological pathways

- What are the mechanisms by which different waste particles erode, physically degrade, and are differentially transported in the sea and air within different geological, coastal and tidal settings (e.g. waves, currents and tides) around the UK?
- What is the chemical behavior of waste-associated contaminants as they are transported from potentially anaerobic terrestrial environments to aerobic, saline, marine environments?
- What are the impacts of saline intrusion and flooding on waste and contamination behavior?

- What are the biological (e.g. marine biota or plants) uptake mechanisms for solid waste (such as microplastics and asbestos)?

3: Impacts on surface waters, ecological and public health

- What are the impacts of currently eroding legacy waste sites on surface water quality, sediment quality and ecological health?
- What are the risks to users of the marine environment (e.g. recreation, fisheries)?

4: Remediation and management of coastal waste

- In what circumstances is remediation necessary, and what remediation options are available for different categories of waste and at what cost? Is remediation the best option or would targeted coastal management be more effective?

Delivery

This highlight topic should be addressed by up to two projects, each up to the value of £2m at 80% FEC (£2.5m 100% FEC) and up to four years in duration. Individual proposals are not required to address all parts of the highlight topic scope.

F. Advancing capabilities to predict UK and European weather conditions one season ahead

Objective

The aim of this Highlight Topic is to advance our fundamental understanding of the predictability of European climate on seasonal timescales and to ensure that these advances are translated into improved forecast capabilities.

Strategic Context

Providing skilful forecasts of weather conditions one season ahead is known as seasonal forecasting. The challenge of seasonal forecasting is internationally recognised through the World Climate Research Programme (WCRP) Grand Challenge on Near-Term Prediction and the World Meteorological Organisation (WMO) programme on Subseasonal-to-Seasonal Predictability. Improvements in seasonal forecasts will result in substantial benefits to sectors such as Agriculture, Energy, Health, Transport, and Water Resource Management.

Scope

Over the past few years the importance of seasonal forecasts for the UK and Europe has become increasingly recognised. Seasonal forecasts can now skilfully predict the wintertime North Atlantic Oscillation, which strongly impacts UK and European weather. Recent results have also shown that there is considerable potential for improving summertime seasonal forecasts. But despite this progress there are still fundamental knowledge gaps and challenges that need to be addressed to realise the full potential of seasonal forecasts for Europe.

Scientific Advances

There has been significant international investment in developing new multi-model seasonal forecast ensembles for i) the WMO Subseasonal-to-Seasonal (S2S) and Climate Historical Forecast Project (CHFP) databases and ii) the Copernicus Climate Change (C3S) Seasonal Forecast Service. These new international resources provide an excellent opportunity to robustly advance our understanding of climate predictability on seasonal timescales. The observational datasets and modelling capabilities developed under the North Atlantic Climate System Integrated Study (ACSIS) NC programme could be utilised in addressing this Highlight Topic.

The key research questions that this Highlight Topic should address are:

1. What are the key processes that govern European climate predictability on seasonal timescales?
2. Why do current European wintertime seasonal forecasts underestimate predictable signals?
3. Can the lower seasonal forecast skill found in spring, summer and autumn be improved upon?

Delivery

This highlight topic should be addressed by up to two projects, each up to the value of £2m at 80% FEC (£2.5m 100% FEC) and up to four years in duration. Individual proposals are not required to address all parts of the highlight topic.

G. The mineral systems approach to exploration and discovery of new sediment-hosted copper (Co,V) deposits

Objective

This highlight topic aims to integrate methods and approaches used in both minerals and petroleum search spaces to develop a new minerals system approach for mineral exploration in sedimentary basins.

Strategic context

Hydrothermal ore deposits are the principal source of the world's metals. They form within fluid flow regimes that extract metals from source rocks or magmas in the Earth's crust, transport them as complexes in solution, and precipitate them in a limited rock volume. Sedimentary basins are one environment in which such processes produce giant deposits, such as the Cu-Co deposits of Central Africa, which annually produce respectively 15% and 75% of the global supply of these key technology-enabling metals. Locating hydrothermal ore deposits, and especially large remarkably-endowed deposits is extremely difficult, currently relies on geophysics and drilling, and is largely model independent. For example, in 2015-2016, non-ferrous metals global exploration expenditure was over \$14 billion spread across more than 10,000 sites. On average, around 10 of these projects ultimately lead to viable new deposits. In order to reduce this effort and thereby reduce financial risk and the net economic and environmental cost of deposit discovery a new predictive, mineral systems approach is required, in which the factors and

processes, operating over a range of scales, that can lead to the formation of an ore deposit are identified and used to locate fertile basins, districts and deposits.

A key challenge to developing a new mineral systems approach is in linking the mineral systems paradigm to measurable geological observations that can act as proxies for critical process gates, without which ore formation will not occur. Such proxies can form the basis of practical, cost effective exploration tools that allow fertile basins, districts and individual systems to be rapidly and confidently assessed. Recent developments in theoretical, experimental and analytical techniques are yielding new insights into hydrothermal transport processes. In parallel, methods such as 3D seismics, multiphase flow modelling and sophisticated basin analysis models have revolutionized approaches in petroleum exploration.

Scope

This highlight topic will develop a minerals system approach to address the most important questions for understanding, predicting and locating hydrothermal ore deposits by bringing together recent developments in theoretical, experimental, analytical and exploration techniques to (i) develop reliable proxies for distinguishing fertile sedimentary basins; (ii) develop tools for identifying fertile hydrothermal systems on the district to deposit scale, and proximity to ore; (iii) test and refine current hypotheses for basin-scale fluid flow mechanisms and sediment-hosted ore formation.

Scientific advances

- (i) Why do few basins diverge from a “normal” basin evolution and become highly endowed in metal deposits?
- (ii) What is the timing of mineralization within such basins?
- (iii) What are the drivers for fluid migration in such basins?
- (iv) What controls the metal tenor of deposits, and what processes lead to the movement and often selective enrichment of critical metals such as Co and V?
- (v) What proxies can we discover, in the chemical or isotopic record locked up in alteration minerals, or in fluid inclusions, that can tell us whether a particular basin or district has intrinsic fertility, and are there gradients in such parameters that allow us to map out flow paths and develop targeting tools?
- (vi) How can our understanding be improved by taking on-board basin models developed by the petroleum industry?

Delivery

This Highlight Topic should be addressed by up to two projects, each up to the value of £2m at 80% FEC (£2.5m 100% FEC) and up to four years in duration. Individual proposals are not required to address all parts of the highlight topic scope.

4. Programme requirements

4.1 Programme funding

NERC has allocated £16 million to this call. Please refer to the individual highlight topic scope for

the maximum duration and budget limits per project. There are more highlight topics than funding is available for, so that all highlight topics will not, necessarily, result in funded grants. This is to ensure that only the very best research is funded.

4.2 Implementation and delivery

The expected start date for projects funded under this Announcement of Opportunity is no later than 6 January 2020, except for any projects subject to programming of ship-time.

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. Pathways to Impact activities do not have to be cost-incurring; it is not a requirement to include funded activities. 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.

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 a NERC facility will need to submit a mandatory 'technical assessment' with their proposal (including aircraft but excluding ships 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 here on the NERC website. The costs for the service or facility (except for NERC Marine Facility costs on £2.5m topics - see below) must be included within the Directly Incurred Other (DI-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.

Proposals to some topics may require ship time and other marine facilities. Applicants wishing to use NERC's marine facilities must 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 for any projects in this Highlight Topic call 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. Applicants intending to apply for NERC's marine facilities should also contact marineplanning@nerc.ukri.org to discuss shiptime and equipment needs.

Completed SMEs/ADFs should be submitted by **21 February**. Grant applicants for Topic C should submit their SME/ADF earlier than the deadline of 21 February if possible, as costs may change following submission and discussion with NERC Marine Planning..

Proposals to Topic C (£5m limit) must include all services and facilities costs including Ship-time and other marine facilities (including ADF) within the £5m total budget.

For proposals to the other topics, the Ship-time and marine facilities costs do not need to be included within the £2.5m limit. All other services and facilities should be costed and included within the DI-other budget line on the Je-S form. In exceptional circumstances, a case could be made to exceed the £2.5m limit - see section 5.5.

British Antarctic Survey Antarctic Logistics Support

Applicants requiring NERC British Antarctic Survey Antarctic Logistics Support must complete a Pre-award Operational Planning Support Questionnaire (OSPQ). This is an online form. Applicants must email the Polar Funding Office (PFO) at BAS (afibas@bas.ac.uk) stating their name, institution and proposal title. The PFO will set up a new, numbered Pre-award OSPQ and send the link to the applicant along with instructions for completion. The Pre-award OSPQ should be submitted to the PFO by **21 February 2019** and included as an attachment at the full application stage. Any funding applications that request Antarctic logistic support without having received prior logistic approval will not be accepted.

4.6 Programme management

Project PIs are responsible for the management and delivery of their projects. Coordination between projects within a highlight topic is not required.

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. As set out in Section G of the NERC Grants Handbook, successful projects are required to submit annual reports of Outputs and Performance Measures (OPMs) and a Final Expenditure Statement. For strategic research investments, including successful highlight topic grants, NERC additionally requires biannual progress reports.

5 Application process

5.1 How to apply

Applicants are encouraged to contact the NERC office at an early stage to discuss any questions on call procedures. The Funding Operations Team (researchgrants@nerc.ukri.org) acts as the first

point of contact for highlight topic grant proposals. Scientific and remit queries should be emailed to highlighttopics@nerc.ukri.org.

A [notification of intent](#) to submit must be submitted by 21 February 2019 16:00. Tell us the topic you plan to apply against, the institutions, investigators and project partners that are expected to be involved and include a title and abstract of your planned work. The abstract will not be assessed, but NERC will use the information to plan the proposal assessment. **Full JeS proposals submitted without a prior notification of intent will be rejected.**

5.2 Full Proposals

Closing Date: 4pm on 21 March 2019

Full proposals 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 – 'Highlight Topics 2019'.

The Highlight Topics 2019 call will close on JeS at 4pm GMT on 21 March 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.

Proposals for all topics except C (£2.5m grants) should be submitted in Standard grant format (10 page case for support – handbook paragraph 203). Proposals for topic C (£5m grant) should be submitted in Large grant format (21 page case for support – handbook paragraph 212). The full requirements are outlined in Section F of the [NERC research grant and fellowships handbook](#).

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.

The expected start date for projects funded under this Announcement of Opportunity is no later than 6 January 2020, except for any projects subject to programming of ship-time.

5.3 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 RCUK 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.

5.4 Maximum funding limit for proposals

The maximum value for proposals under each topic area is provided in section 3. Proposals to topics A, B, D, E, F and G can request funding up to £2.0m at 80% FEC (£2.5m 100% FEC) and any Ship-time and marine facilities (SME) costs do not need to be included within the £2.5m limit. Proposals to topic C can request funding up to £4m at 80% FEC (£5.0m 100% FEC) and must include SME/ADF costs, where applicable. All other services and facilities should be costed and included within the DI-other budget line on the Je-S form for all topics.

5.5 Exceptional permission to exceed the funding limit

For this Highlight Topic call, we will consider exceptional cases for exceeding the £2.5m limit for proposals to topics A, B, D, E, F and G. The process for applying for exceeding the £2.5m limit is the same as for Standard grants (see Section B, paragraphs 14 to 17 of the Research Grants and Fellowships handbook). The funding limit will only be extended in exceptional cases and any proposal, which exceeds the limit without permission, will be rejected. For this call, a case for exceeding the maximum limit must be submitted to researchgrants@nerc.ukri.org by **21 February 2019** at the latest and you should receive a decision within 10 working days.

6 Assessment Process

Full proposals will undergo expert peer review (see the pre-award assessment process and minimum/optimal review levels of grants). Applicants will have the opportunity to respond to reviewer comments before consideration by the highlight topic grants moderating panel, that will allocate final scores and rank proposals based on research excellence and fit to scheme of the scientific objectives (the appropriateness of the research proposed for the highlight topic). The moderating panel will also examine the strength of the management arrangements, resources and whether the pathways to impact proposed are appropriate.

The moderating panel will be comprised of Peer Review College members, augmented if necessary by relevant experts from outside the College. The aim will be to use at least half from the core membership of the Peer Review College (expertise and conflicts of interest allowing).

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. The highest ranked proposals will be funded, irrespective of the highlight topic to which they apply. However, the funding limit specified for each highlight topic will be applied, so a maximum of two proposals from topics A, B, D to G and one proposal from topic C could be funded. NERC will not fund two projects with overlapping research. In exceptional circumstances, where the top ranked projects in a

topic were overlapping, NERC may fund the third - ranked project instead of the second-ranked project.

7 Timetable

Summarise key dates e.g:

- Announcement published: 14 January 2019
- Notification of intent due: 21 February 2019 16.00
- Cases to exceed the funding limit 21 February 2019
- SME/ADF submissions 21 February 2019
- Antarctic Logistics support form 21 February 2019
- Deadline for submission of full proposals: 21 March 2019 16:00
- Moderating panel meets: September 2019
- Latest start date for projects: 6 January 2020

8 Contact

For eligibility, application process and peer review queries, please contact researchgrants@nerc.ukri.org.

For scientific and remit queries, please contact highlighttopics@nerc.ukri.org.