

NATURAL ENVIRONMENT RESEARCH COUNCIL

EVALUATION PANEL REPORT

**Evaluation of progress with delivering
NERC's Biodiversity Theme**

October 2010

*This document reports the conclusions of a Panel of experts.
The views expressed are entirely those of the Panel.*

EXECUTIVE SUMMARY

This document reports the findings and conclusions of a Panel convened in October 2010 to evaluate progress in delivering NERC's Biodiversity strategy theme.

Main Findings

As shown by the range of high quality outputs, NERC has an extremely strong biodiversity research portfolio that has made and will continue to make major scientific advances of international importance. NERC's new investments such as ESPA, IPI and BESS are generating significant interest and excitement amongst the research community, user organisations, and internationally.

Topic	Conclusions
INPUTS: The extent to which each challenge and the whole theme is being addressed (ToR 1a&b)	Overall, the investment portfolio for this theme looks to be on track and set to deliver substantial contributions towards the challenges and theme as a whole. NERC's National Capability also underpins the theme, for example in technology development, long-term surveys and data provision. Challenge 1 is particularly well covered. There are some gaps, particularly on addressing mitigation (converting knowledge into action). Partnership and cross-disciplinary working will be vital to delivering aspects of the theme, and the recent excellent progress in developing these approaches (e.g. RELU, IPI) should be continued.
OUTPUTS: The extent to which each challenge, and the whole theme has been achieved (ToR 2a&b)	At this stage, two years into implementing the theme, the outlook is promising. Pre-existing time limited funding (including PG&P, CPB, UKPopNet and RELU), although designed to meet previous strategic drivers, has produced major outputs of relevance to the current challenges and theme. The new investments look set to deliver major shifts in scientific understanding and hence major contributions towards the challenges and theme. There have also been substantial outputs from Centres, particularly from the marine Centres and CEH. Challenges 1 and 2 are more advanced than 3 and 4.
PERFORMANCE: The extent to which investments are being effective in meeting theme challenges and delivering outcomes (ToR 1c and 2c)	The larger mature investments relevant to this theme have been very effective in delivering outcomes, many of which are highly relevant to the current theme and challenges. Apart from a concern about the slow speed from idea generation to award of funding, the development of the larger new investments relevant to this theme has been effective in that they look on track to deliver major contributions to the theme and challenges.

Proposals

Whole theme

1. If NERC wishes to achieve the theme's first overarching outcome "*Reducing the rate of loss of biodiversity*", it should through strategy delivery planning processes consider ways to increase its focus on the mitigation side of the agenda.
2. Delivery of aspects of the theme, particularly challenge 2 (prediction and mitigation) requires interdisciplinary and partnership working. NERC has made excellent recent progress with partners, but needs to strengthen this area further. Suggestions include:

- a. Further developing and directing strategy and effort on the mitigation side of the portfolio (as set out in proposal 1);
 - b. If NERC wishes to maintain the interdisciplinary communities built up by previous programmes that are now coming to an end, it should consider supporting the expertise and partnerships that have been developed through these programmes; and
 - c. To enhance delivery of strategic research, NERC should consider working ever more closely with partners in this area (e.g. BBSRC and ESRC with respect to food security, LWEC with respect to environmental change more generally).
3. To address the risks associated with the long time between the generation of an idea and award of funding, NERC should consider ways in which it could adopt a more flexible, less process-focussed approach to implementing strategic investments.

Individual challenges

4. Challenge 1 (resilience of ecosystems) - the range of ecosystems covered in TAPs 1 and 2 is not as broad as it could be. NERC should consider ways of addressing this through strategy delivery planning processes. The Panel notes that the proposed TAP3 actions will improve the range.
5. Challenges 3 (value and benefits) and 4 (new approaches and technologies) - theoretical approaches to enable both upscaling and downscaling in understanding ecosystem function, biodiversity dynamics and predicting ecosystem responses to change is a current gap. NERC should consider ways of taking this area forward through strategy delivery planning processes.
6. Challenge 4 – to increase impact in this area, NERC needs to work with other Research Councils to facilitate the biodiversity community's uptake of technologies developed elsewhere, and to encourage peer review panels to be more open to the risks associated with using technologies in a novel way.

Other proposals

7. If NERC wishes to retain a goal-focus in strategy delivery, the 'key outcomes' identified in the Science Theme Reports should be given more prominence.
8. If NERC wishes to judge performance against challenges, the wording of the challenges needs to be adjusted to make them more specific and measurable.
9. If it is considered to be a priority that retained Research Programmes at Centres are aligned to NERC strategy, NERC should consider how to better manage the link between Centre research development and TAP delivery during the ramp down to RP funding through open competition.
10. NERC is encouraged to consider whether strategic relevance should be one of the assessment criteria for responsive mode proposals, especially when they are otherwise equal in science quality and at the funding borderline.

INTRODUCTION

1. This evaluation was commissioned by NERC's Director for Science Delivery (DSD) to meet a high priority need for evidence on progress with implementing the science themes set out in NERC's strategy. The Biodiversity theme is the second theme to be evaluated, following a pilot evaluation of the Climate System theme in June 2010. The intention is to evaluate each theme is every 2 years via a rolling programme.
2. The Biodiversity theme is one of seven science themes in NERC's strategy Next Generation Science for Planet Earth¹. Two high level overarching outcomes desired from research in this area were identified:

- i. Reducing the rate of loss of biodiversity; and
- ii. Quantifying and communicating the benefits of biodiversity to the economy and society to influence policy².

3. To work towards to these outcomes, the overarching challenge for the theme is '*To improve understanding of biodiversity's role in ecosystems: processes, resilience and environmental change*'. To achieve this objective, four scientific challenges were defined³:

1. Improve understanding of how biodiversity affects the resilience of different ecosystems in the face of environmental change
2. Enable society to predict and mitigate effects of biodiversity change on processes and services that sustain life
3. Develop integrated tools for assessing the value and benefits of biodiversity and associated services, from very small to very large scales and across different ecosystems
4. Develop new approaches and technologies to describe, understand and quantify biodiversity and associated functions

4. The evaluation was designed to meet the evidence needs of DSD (the main customer for the evaluation) and other key stakeholders including the Science and Innovation Strategy Board (SISB) and the Head of Strategic Management. The design incorporated lessons learned from the pilot, climate system theme evaluation.
5. The customer and stakeholders requested evidence that will:
 - Provide information to SISB and Council on progress with delivering the Biodiversity theme;
 - Inform strategy and investment planning, including future Theme Action Plans and refreshes of NERC strategy, and decisions on management of current investments;
 - Provide evidence of achievements and highlights for publicising to external audiences, including government, the research community, and research users.
6. The evaluation was conducted by a Panel comprising representatives from key stakeholder groups (Annex B), and met for one day in October 2010. The Theme Leader and Science and Innovation Manager for Biodiversity attended *ex officio*. The Panel's objective was:

To undertake a high-level overview of progress with delivering the biodiversity theme at this stage, 2 years into implementing the strategy

¹ <http://www.nerc.ac.uk/publications/strategicplan/nextgeneration.asp>

² <http://www.nerc.ac.uk/about/strategy/documents/theme-report-biodiversity.pdf>

³ These challenges are slightly different from the original challenges set out in NERC's strategy, following a refresh of the strategy in early 2010

7. The Panel's Terms of Reference are included at **Annex A**. They covered:
 - Inputs: the extent to which each challenge and the whole theme is being addressed;
 - Outputs: the extent to which each challenge and the whole theme has been achieved; and
 - Performance: the extent to which investments are being effective in meeting theme challenges and delivering outcomes.

8. The scope was limited to investments current at or planned since July 08, when implementation of the strategy commenced with the approval of the first Theme Action Plans. The Panel were provided with information on the major investments relevant to the theme⁴ and a written submission from Professor Andrew Watkinson (Director of the Living With Environmental Change partnership, LWEC), and held brief discussions at the meeting with Professor Lloyd Peck (Biodiversity Theme Leader until early 2009) and Professor Paul van Gardingen (Director of the Ecosystem Services for Poverty Alleviation programme, ESPA).

9. This report summarises the Panel's findings against their ToR, and their proposals for ways in which delivery of the theme might be strengthened. The report will be considered by SISB, and copied to Council along with a management response from the evaluation customer setting out any actions in response to the Panel's proposals. Both report and response will be published on NERC's website.

⁴ including Research Programmes managed by Swindon Office, Research Programmes managed by NERC Research Centres, and responsive mode grants

TOR 1: INPUTS

10. The Panel was asked to evaluate the extent to which the theme is being covered by current and planned investments, in the three ways presented below. In addition to the investments presented, the Panel also noted that much of the data and technology that underpins this theme is provided by NERC's National Capability (NC). Examples include long-term datasets, earth observation and technology development.
11. The Panel undertook its task in the context that continued support for biodiversity research is needed: it has immediate relevance to society, it underpins other areas of NERC strategy, and it is an internationally-recognised UK strength. The Panel's overall view is that NERC has an extremely strong biodiversity research portfolio that has made and will continue to make major scientific advances of international importance. The new investments are generating significant interest and excitement amongst the research community, user organisations, and internationally. The issues identified and proposals made are intended to maintain and strengthen this level of performance.

1.a The extent to which each challenge is being addressed by relevant investments

Challenge	Panel comments (<i>acronyms – Annex B</i>)
1. Improve understanding of how biodiversity affects the resilience of different ecosystems in the face of environmental change	This challenge is well covered by a number of investments both through Swindon Office and at Centres, and consortium grants. This reflects the UK research community's strength in this area. The integrated approaches pursued both by the Biodiversity and Ecosystem Service Sustainability programme (BESS) and the Ecosystem Services for Poverty Alleviation programme (ESPA) are likely to yield major contributions to delivering this and other challenges, as well as major advances in the field that will be of international importance. The range of ecosystems currently covered is not as broad as it could be.
2. Enable society to predict and mitigate effects of biodiversity change on processes and services that sustain life	This challenge is very broad and extends beyond NERC's remit, which means that external partners are required. The Panel is pleased to see the effort being made in this area, reflecting the fact that the need for cross-disciplinary approaches is now widely accepted. There is currently reasonable coverage of this challenge. Mature investments that will soon end, such as the Centre for Population Biology (time-limited centre, CPB), the Post-genomics and Proteomics programme (PG&P) and the UK Population Biology Network (UKPopNet), have made significant contributions, as have Centres (e.g. the Centre for Hydrology and Ecology's (CEH) work on predicting biodiversity change in response to climate change). New investments such as BESS, the Insect Pollinator Initiative (IPI) and the Ocean Acidification programme look set to contribute further. However, the area generally needs more development and direction. In particular, improvements are required in modelling capacity and testing mitigation capacities. The Panel recognises that partnership working is challenging, but that the results make it very worthwhile. It is therefore welcome that NERC now involves partners early in programme development as well as in implementation. IPI, for example, has been very successful both in involving key stakeholders and in bringing together different disciplines.

Challenge	Panel comments (<i>acronyms – Annex B</i>)
3. Develop integrated tools for assessing the value and benefits of biodiversity and associated services, from very small to very large scales and across different ecosystems	This challenge also requires cross-disciplinary working, and a good start has been made. PG&P and the cross-Council Rural Economy and Land Use programme (RELU) have made some progress towards this challenge. The Valuation Network is a key investment that is fostering integration of science, social science and stakeholders, and is also a good example of NERC responding to societal pressure. This area will be a challenge for ESPA and BESS, but based on the range of bids received so far, they have the potential to make a strong contribution. Development of the theoretical tools to enable prediction of ecosystem dynamics and both upscaling and downscaling is a current gap. Although it will be addressed to a small extent by the Valuation Network, this is a broader issue and a risk to the delivery of this challenge.
4. Develop new approaches and technologies to describe, understand and quantify biodiversity and associated functions	There has been a good amount of developmental work in this area. This has mostly been undertaken in Centres and through responsive mode grants, which is appropriate as new approaches and technologies take time to develop and do not always come to fruition. NERC's NC is also crucial, both in developing new technologies and providing the data to underpin delivery. Examples include Earth observation and habitat mapping. There are no new large investments targeted to this challenge, but this is not a cause for concern, as a) the challenge will continue to be addressed by Centres, consortium grants, and some aspects of new investments such as Ocean Acidification and IPI; and b) there is a major opportunity for NERC (and other Research Councils) to make a substantial contribution through facilitating the biodiversity community to use technologies developed in other areas. This needs both cross-disciplinary working to identify potentially useful technologies, and openness from funding panels and referees to the risk of using a technology in a new way. One example is the need to strengthen links between the Earth Observation and biodiversity communities. The development of data management and statistical approaches, and systems-based modelling are a particular challenge.

Proposal 4: Challenge 1 (resilience of ecosystems) - the range of ecosystems covered in Theme Action Plans (TAPs) 1 and 2 is not as broad as it could be. NERC should consider ways of addressing this through Strategy delivery planning processes, noting that the proposed TAP3 actions will improve the range.

Proposal 2a: Challenge 2 (prediction and mitigation), and other interdisciplinary aspects of the theme - NERC should further develop and direct its strategy and effort on the mitigation side of the portfolio.

Proposal 5: Challenges 3 (value and benefits) and 4 (new approaches and technologies) - theoretical approaches to enable both upscaling and downscaling in understanding ecosystem function, biodiversity dynamics and predicting ecosystem responses to change is a current gap. NERC should consider ways of taking this area forward through Strategy delivery planning processes.

Proposal 6: Challenge 4 – to increase impact in this area, NERC needs to work with other Research Councils to facilitate the biodiversity community's uptake of technologies developed elsewhere, and to encourage peer review panels to be more open to the risks associated with using technologies in a novel way.

1.b The extent to which the whole theme (sum of challenges) is being addressed

12. Overall, the investment portfolio for this theme looks to be on track and set to deliver substantial contributions towards the challenges and theme as a whole, as discussed above in some detail.
13. There is one concern at the level of the whole theme: the first overarching outcome identified by the Biodiversity Theme Strategy Development Panel “*Reducing the rate of loss of biodiversity*”⁵ is not sufficiently covered by the investments, and by the challenges themselves. This is partly a wording issue: it is not NERC's role to reduce the rate of loss, but to provide the science to enable society to act to reduce the loss. However, even with this alternative wording, if NERC still considers this to be a key outcome of the theme, the mitigation side of the agenda (i.e. the impact of the science) is a major gap.
14. Interdisciplinary working will be crucial to delivering the aspects of the theme that are beyond NERC's remit. When assessing progress, it should be recognised that this requires a culture change, which will take time. Where NERC has reached out to work with partners, there have been very clear benefits including scientific breakthroughs, research outputs relevant to users, and additional investments/add-on activities. However, there are a couple of issues:
 - With many major investments in this area coming to an end, the slow speed of starting new investments, the gaps discussed above, and the perception that interdisciplinary proposals are less likely to be successful through responsive mode, the interdisciplinary communities developed through RELU, CPB and UKPopNet could be lost unless TAP funding comes on stream quickly.
 - To strengthen the mitigation portfolio and enhance the delivery of LWEC objectives, NERC should consider working more closely with the Biotechnology and Biological Sciences Research Council (BBSRC) and Economic and Social Research Council (ESRC) as appropriate, particularly on the food security agenda. IPI has shown the benefits of this approach, where the NERC community have benefited significantly from co-investments by BBSRC and the Department for Environment, Food and Rural Affairs (Defra).

Proposal 1: If NERC wishes to achieve the theme’s first overarching outcome “*Reducing the rate of loss of biodiversity*”, it should through Strategy delivery planning processes consider ways to increase its focus on the mitigation side of the agenda.

Proposal 2b: If NERC wishes to maintain the interdisciplinary communities built up by previous programmes that are now coming to an end, it should consider ways of supporting the expertise and partnerships that have been developed through these programmes.

Proposal 2c: To enhance delivery of strategic research, NERC should consider working ever more closely with partners in this area (e.g. BBSRC and ESRC with respect to food security, LWEC with respect to environmental change more generally).

1.c The extent to which new investments are being effective in meeting theme challenges

15. Based on the evidence presented, discussion with the director of ESPA, and the Panel’s knowledge, the major new investments relevant to this theme (ESPA, IPI, Valuation Network, BESS) are looking good so far. With continued investment and effort, they should deliver major aspects of the challenges and theme, including continuing the culture change discussed above.
16. BESS and ESPA in particular are novel and risk-taking, and look set to deliver groundbreaking achievements and international impact. BESS will deliver large scale activities that will be a

⁵ <http://www.nerc.ac.uk/about/strategy/documents/theme-report-biodiversity.pdf>

community resource, will help to bring different research communities together and to encourage the use of new technology, exploits the UK's advantage in this area, and will be at a scale that could not be delivered through consortium grants. Delivery of the theme would be at risk if these programmes were not able to progress to fruition.

17. The Panel has a more general concern about the time that elapses from the generation of ideas within TAPs to the award of Research Programme grants. This presents a significant risk that by the time funds are awarded, the field has evolved and the investments lose value as they are no longer at the cutting edge of the field, the key researchers have gone elsewhere/changed direction, and/or that another country will have initiated the research. While understanding that there are some constraints e.g. legal tendering requirements, NERC is encouraged to be innovative, and to adopt a more flexible, less process-focussed, and less risk averse funding mechanism for strategic investments.

Proposal 3: To address the risks associated with slow delivery, NERC should consider ways in which it could adopt a more flexible, less process-focussed approach to implementing strategic investments.

TOR 2: OUTPUTS

18. The Panel was asked to evaluate the extent to which the outputs of the relevant investments have achieved the theme objective. The Panel noted that it is challenging to judge outputs at this early stage in theme implementation.

2.a The extent to which each challenge has been achieved

Challenge	Panel comments (<i>acronyms – Annex B</i>)
1. Improve understanding of how biodiversity affects the resilience of different ecosystems in the face of environmental change	Programmes such as RELU, UKPopNet and CPB have made significant achievements in this area, for example CPB's work on understanding ecosystem stability and resilience under global change. There have also been substantial outputs from Centres, particularly from the marine Centres and CEH, e.g. the National Ecosystem Assessment and the Countryside Survey. Newer investments look set to make significant progress towards this challenge, in particular the Ocean Acidification programme on the marine side.
2. Enable society to predict and mitigate effects of biodiversity change on processes and services that sustain life	Some of NERC's mature investments have made substantial contributions towards this challenge, both in research outputs (e.g. RELU's work on agroecosystems and UKPopNet's upland work) and in developing the multidisciplinary researchers and communities needed to deliver the research. RELU, CPB, UKPopNet and CEH have developed a strong interdisciplinary community ready to address the new agenda.
3. Develop integrated tools for assessing the value and benefits of biodiversity and associated services, from very small to very large scales and across different ecosystems	There have been some good outputs, but in general this challenge is less advanced than challenges 1 and 2. Examples include tools developed through PG&P (e.g. the bioinformatics and data analysis conducted by the NERC Environmental Bioinformatics Centre), and CPB's progress in bringing together different disciplines and kick-starting modelling. Achievements towards this challenge are underpinned by the work of NERC facilities such as the Biomolecular Analysis Facility, isotope facilities, and the CEH-based Biological Records Centre.

Challenge	Panel comments (<i>acronyms – Annex B</i>)
4. Develop new approaches and technologies to describe, understand and quantify biodiversity and associated functions	As for challenge 3, there have been some good outputs but this challenge is less advanced than challenges 1 and 2. Recent achievements that have made major contributions to the field of biodiversity include the development/improvement of microassemblage mapping and real-time analysis, metagenomic analysis and real-time measurement of nutrient and gas fluxes (PG&P), modelling (CPB, responsive mode grants), and statistical methods for analysis of long term datasets (CEH & UKPopNet). As discussed above, NERC has the potential to achieve much more through facilitation and partnership working.

2.b The extent to which the whole theme (sum of challenges) has been achieved

19. Two years into implementing the theme, the outlook is promising. Pre-existing investments, although designed to meet previous strategic drivers, have produced major outputs of relevance to the current challenges and theme. The investments now coming on stream look set to deliver major shifts in scientific understanding and hence major contributions towards the challenges and theme. The new investments have also generated excitement (and additional financial support) from the research community, user organisations, and internationally e.g. the National Science Foundation in the US.

2.c The extent to which larger investments have been effective in delivering outcomes

20. As shown by the achievements discussed above, the larger mature investments relevant to this theme (PG&P, CPB, UKPopNet and RELU), plus the significant activity at Centres (research and NC) have been very effective in delivering outcomes, many of which are highly relevant to the current theme challenges. Apart from the concern about slow speed (paragraph 17), the development of the larger new investments has been effective in that they look to be on track to deliver major contributions to the theme and challenges.

OTHER COMMENTS

21. The Panel made a number of other comments:
- User organisations and international funders appreciate the long-term perspective of NERC's themes, which makes collaboration far more straightforward and attractive than the previous more sporadic programmes. Early engagement in designing the programmes is especially valuable in ensuring that they meet the needs of research users;
 - A goal-focus is a vital part of a strategy-driven organisation. However, since the strategy Science Theme Reports were published, there seems to have been little focus on the 'key outcomes' that were each Panel's starting point for designing the theme. They do not, for example, appear in the Theme Action Plans (TAPs), or the theme 'grand challenges';
 - The challenges as worded cannot be demonstrably achieved (e.g. 'increase', 'improve');
 - Given that Theme Leaders are not allowed to bid into Research Programmes, they should be involved in programme design to ensure that TAPs are implemented as originally envisaged. The Panel is pleased to learn that this is now starting to happen;
 - There is currently no mechanism for TLs to help to shape or align retained Research Programmes in Centres;
 - Although there is considerable responsive mode funding in the biodiversity area, it is difficult to assess how it has contributed and will contribute to the challenges, particularly as the subject markers are assigned by PIs themselves often without full understanding of the context; and

- A considerable proportion of NERC-funded research in the biodiversity area is delivered through responsive mode. Delivery of the theme could therefore be enhanced by greater alignment between RM and strategy delivery. This could include, for example, emphasising the strategy to the research community, encouraging researchers to undertake research that is strategy-relevant, and/or using strategic relevance as a ranking criterion for borderline equally-scoring proposals at panels.

Proposal 7: If NERC wishes to retain a goal-focus, the ‘key outcomes’ identified in the Science Theme Reports should be given more prominence.

Proposal 8: If NERC wishes to judge performance against challenges, the wording of the challenges needs to be adjusted to make them more specific and measurable.

Proposal 9: If it is considered to be a priority that retained Research Programmes at Centres are aligned to NERC strategy, NERC should consider how to better manage the link between Centre research development and delivery and TAP delivery.

Proposal 10: NERC is encouraged to consider whether strategic relevance should be one of the assessment criteria for responsive mode proposals, especially when they are otherwise equal in science quality and at the funding borderline.

PANEL MEMBERSHIP

Position	Name	Organisation
SISB member (Chair)	Tim Benton	Leeds
Member of original Strategy Development Panel	Richard Bardgett	Lancaster
NERC Centre representative	Mark Bailey	CEH
HEI representative (member of NERC's Peer Review College Pool of Chairs)	Graham Underwood	Essex
User representative	Peter Costigan	Defra

Attending *ex officio*

Ken Norris, Biodiversity Theme Leader

Andy Impey, NERC Science and Innovation Manager for Biodiversity

Panel secretaries

Fiona Goff, Evaluation Team Leader, NERC Swindon Office

Will Thomas, Evaluation Project Manager, NERC Swindon Office

PANEL TERMS OF REFERENCE**Purpose**

Based on the evidence presented, the Panel is asked to undertake a high-level overview of progress in delivering NERC's Biodiversity strategy theme at this stage, two years into implementing the strategy.

Objectives

1. Inputs: Evaluate the extent to which the theme is being covered by current and planned investments

a) The extent to which each **challenge** is being addressed

b) The extent to which the **whole theme** (sum of challenges) is being addressed

c) The extent to which new investments are on track

2. Outputs: Evaluate the extent to which the outputs of the above investments have contributed to the theme objective

a) Progress made with each theme challenge

b) Progress made with the whole theme (sum of challenges)

c) The extent to which larger investments have been effective in delivering outcomes

LIST OF ACRONYMS

BBSRC	Biotechnology and Biological Sciences Research Council
BESS	Biodiversity and Ecosystem Service Sustainability – Research Programme
CEH	Centre for Ecology and Hydrology – NERC Centre
CPB	Centre for Population Biology – Time-limited Centre
Defra	Department for Environment, Food and Rural Affairs
DSD	NERC Director of Science Delivery
ESPA	Ecosystems Services for Poverty Alleviation – Research Programme
ESRC	Economic and Social Research Council
IPI	Insect Pollinator Initiative – Research Programme
LWEC	Living with Environmental Change partnership
PG&P	Post-Genomics and Proteomics – Research Programme
RELU	Rural Economy and Land Use – Research Programme
SISB	NERC Science and Innovation Strategy Board
TAP	NERC Theme Action Plan
UKPopNet	UK Population Biology Network – Research Programme

For further information on the Research Programmes listed above, see www.nerc.ac.uk/research/programmes