ANNEX 1 – Science & Implementation Plan

ENVIRONMENT AND HUMAN HEALTH
Science and Implementation Plan

Introduction & Background

Natural environments provide numerous challenges to human health and well-being, and many of these challenges are continuing to grow and develop, both in ways that we can reasonably forecast and ways that we cannot. Moreover, social and economic factors mean that different segments of society are affected in differing ways and to varying degrees.

The natural environment contributes significantly to people's health through the quality of air we breathe, the food we eat and the water we drink. On the one hand, it offers health enhancing economic and recreational opportunities, while on the other, it is threatened by activities such as transport, industrial processes, agricultural and waste management practices. Environmental pollutants and potentially pathogenic organisms can harm people's health through a series of complex transport and exposure pathways. These are areas of growing public and government interest and this is reflected in UK and international priorities: for example in the Environment Research Funders' Forum, the EU, the World Health Organisation (*Millennium Ecosystem Assessment*, 2005), and International Year of Planet Earth 2006 (Earth & Health theme).

Prior to SR2004, the members of the Environment Research Funders' Forum (ERFF) identified Environment and Human Health (E&HH) as one of its priority areas for research investment and joint working. In an effort to advance that interest, NERC undertook a number of consultation exercises (e.g. a web consultation; bilateral meetings with stakeholders; and an open, jointly organised, town meeting) to further scope the research needs. A synthesis of these activities can be found in a report on the NERC website. This document highlights the science priorities identified through the consultation activities. The consultation identified four broad areas: *pathogens* and *pollutants* (particles and chemicals), the *pathways* these follow through the environment, and their interactions with *people*.

The Environment and Human Health (E&HH) Programme was formulated as an outcome of these consultations and will address the fundamental question of **'How do we effectively manage the natural environment to improve human health?'** In attempting to solve this problem, a multidisciplinary research approach will be needed in order to address issues such as:

- the effect of global environmental change on vector-borne diseases and parasites;
- the survival and persistence of pathogens;
- the characteristics of particles (including nanomaterials) that impact on human health;
- the toxicity of mixtures of chemicals, particularly at low levels; and
- long-term low level exposure to toxins.

A significant conclusion of the consultation exercises was that, in order to successfully tackle the research priorities identified, we must first facilitate collaborations among scientists that have traditionally not worked closely together. Consequently, the focus of the E&HH Programme, in its first phase, is on **capacity building** (see Annex A): we will be supporting inter-disciplinary activities such as:

- proof of concept studies or exploratory awards;
- workshops/networks;
- working groups;
- "discipline hopping" opportunities to encourage career development for young scientists.

The outcomes of the E&HH Programme will inform development of more effective policy and practice to improve human health and increase scientific knowledge regarding environment and human health issues. It will also create working relationships between academics of different disciplines; these relationships can be built on in the anticipated second phase of the E&HH Programme.

Aims & Objectives

The E&HH Programme aims to develop multidisciplinary and interdisciplinary capacity in order to resolve environmental problems that involve human health issues. The primary objective of the E&HH Programme is to gain a better understanding of how we interact with our natural environment and what the consequences will be for sustainability of environmental goods and human health. This goal requires that we have the necessary multidisciplinary capacity capable of responding in an interdisciplinary way to resolve problems that are intrinsically interfacial in character. By effectively identifying and interconnecting the interdisciplinary elements we will see the emergence of new ways of solving problems in what, at present, are seemingly unrelated areas of environment and human health.

The E&HH Vision

The principal aims of the Environment and Human Health Programme in its first phase are to (i) identify and prioritise the research areas and (ii) encourage, grow, develop and facilitate the research community needed to tackle the "real-world", inter- and multi-disciplinary problems we face, not only in the UK, but globally. The result will be to:

- create a constituency for both inter- and multi-disciplinary work that will underpin our understanding of the links between the environment and human health;
- provide us with better knowledge that will improve our ability to identify and predict emerging issues of potential concern; and
- improve the evidence base for risk assessment and regulation of activities needed by government departments and agencies, and other stakeholders;

with the aim of improving the health of people, both in the UK and globally.

In this first phase of the Programme, we are investing predominantly in capacity building activities as described above. Further details on the different types of mechanisms can be found in Annex A.

Science Plan

Rationale

We live in a highly complex world where living systems are strongly interdependent, often in ways which continue to surprise us. Environmental impacts by both natural events and man-made interventions are a fact of life; and developing the capacity to minimise these impacts and their harmful consequences for biological resources, ecosystems and human health is a daunting task for environmental (and other) legislators and regulators.

Complicated issues are involved in evaluating environmental risk, such as the effects of the physico-chemical interactions on the speciation and uptake of pollutant chemicals, inherent inter-individual and inter-species differences in vulnerability to toxicity, the emergent toxicity of complex chemical mixtures, and knowledge of reservoirs of microbial pathogens as well as factors governing infectious viability. Effectively linking the impact of environmental change, through the various hierarchical levels of biological and social organisation in order to understand the interactions between natural and social systems, requires a pragmatic integrated approach. Initially, this can be based on existing information that can be used to test for causal linkages, starting with driving forces (economic sectors, human activities) through pressures (emissions, waste) to states (physical, chemical and biological) and impacts on ecosystems and human health. This would eventually lead to recommendations for political responses (prioritisation, target setting, indicators).

While the health of the UK, and other parts of the world, has improved considerably over the last three decades, there remains considerable social and spatial difference in ill health distribution. Causal factors have been identified that explain much of this difference for certain diseases (e.g. high cholesterol and insufficient exercise for coronary heart disease). A significant proportion, however, of this difference in health burden remains unexplained; environmental factors are likely to be significant. For example, we are only beginning to appreciate the possible impact of changes in the climate and global environment on ecosystems and health.

Relevant exposure results from pathways through air, soil, and water and from chemical and microbiological residues in food. How exposed populations respond to these stressors in both the short and long term will depend on both the degree of exposure and on individual factors such as socio-economic and nutritional status, age, genes, gender and behavioural aspects that influence avoidance or risk-accepting attitudes. Attempts at mitigating these adverse impacts on human health are often undertaken through risk-based regulation. However, the many levels of uncertainty associated with risk-based regulation contribute to public concern about how policy is both formulated and implemented.

Many human pathogens have reservoirs in the environment or are transmitted between humans by animal vectors or through animal intermediate hosts. Better control of human pathogens requires an understanding of their ecology in the environment. It is also important to try to anticipate new emerging diseases, a problem that is likely to become acute with climate and global change, and increasing globalisation with its concomitant rapid transfer of people and products throughout the world.

Humans have altered and will continue to alter their environment, while remaining dependant upon ecosystems as resources of food, water and materials (e.g., timber, biofuels etc.). Such alterations are a result of combinations of physical, biological and socio-economic factors. However, evaluation and management of the resultant impacts on ecosystems and human health has generally been undertaken as largely separate activities, under the auspices of different disciplines with no obvious interaction. Hence, many of our perceptions of the relationships between the natural environment and human health are very limited, and still relatively unexplored. Consequently, these limitations have resulted in a knowledge-gap for those seeking to develop effective policies for sustainable use of resources and environmental and human health protection.

In attempting to fill these knowledge-gaps our understanding of the functioning of the biosphere and our connections with it must be adequate in order to inform policy and decision-making processes. Unravelling the complex network of interactions is a prerequisite if we are to develop a practical predictive capability to forecast how environmental change impacts on linkages between natural systems, social systems and human health. While such predictive capability must remain a major longer-term scientific goal, the scope of the first phase of the E&HH Programme will be, of necessity, more pragmatic and focus on capacity-building and exploratory research.

Undoubtedly, new developments and improvements in our scientific understanding of how environmental change impacts on the linkages between ecological integrity, environmental goods and human health will aid us as we seek to develop an acceptable standard of living for many more people. This will in turn help us to ensure that the ecological pillars, which support our society and industries, are protected and remain sustainable. We must also aim to successfully integrate social and natural systems on a local scale, while understanding the larger scale ramifications and consequences of decisions on a local, national and trans-national scale.

Themes & Approaches

In formulating the Environment and Human Health Programme, the E&HH Science Advisory Committee has identified a number of potential areas of interest, and these are summarised below. Priority will be given to novel, multi- and/or inter- disciplinary approaches that build relevant capacity in one or more of the following areas.

Transport and dynamics of micro-organisms of human health importance in the natural environment

- response of microbial transfers to environmental change
- science based issues of scaling up from the local site to the catchment or appropriate policy level
- gene flow (e.g. involving antibiotic resistance) through the microbial horizontal gene pool
- harnessing a systems biology approach to help understand complex processes in the soil microbial environment where indirect impacts on human health may result in terms of surface water quality or bathing water quality
- interactions of micro-organisms and pollutants
- integration and quantification of risks to humans through both environmental and other pathways

- the risks of organic agriculture (including trans-national transport of pathogens) through different approaches to crop and animal production

Emerging infectious diseases

- risk assessment, the use of indicators, and anticipatory modelling of novel pathogen dynamics
- influence of global and local environmental change (e.g. climate change, nitrogen deposition, deforestation; as well as land use change, for example CAP reform and the EU Water Framework Directive)
- ecology of wildlife reservoirs and vectors in emergent diseases
- role of farm workers in disease transmission

Transport and dynamics of both chemicals and particles of different sizes and compositions in the natural environment that are of human health importance

- assessment of exposure and bioavailability from various physical (soil, water, air, food) and behavioural pathways through different routes (e.g. developing and using effective biomarkers) to better inform toxicology, epidemiology and human risk assessment
- active features of particles that cause problems, e.g. surface properties, size and composition
- interactive effects of mixtures of chemicals in the environment and the impact on human health, exploiting sensitive analytical and molecular techniques
- chronic low level exposures to toxins, leading to human health effects including trans-generational toxicity (genetic and epigenetic) and other long term outcomes
- inter-individual susceptibility to environmental factors and interactions (e.g. toxicity), including genetic make up, particularly with respect to susceptible groups such as foetus, children, elderly, and those with ill health or receiving medication; including the extent to which these differences may be socially structured
- effect of changes in the environment (e.g. climate change, land use change) on human health; regulatory changes leading to land use change and impacts of changes on the pollution profile and nutrient depletion
- soil degradation and trace metal deficiencies affecting human health

Technologies providing new capabilities for establishing and predicting the impact of the environment on human health

- application of new techniques including computational, physical, engineering, analytical chemistry/biochemistry methods, i.e. application of massively parallel screening approaches possibly using new lab-on-a-chip methods for understanding the interplay of pathogens/toxic agents with other environmental agents on human health
- novel techniques for studying pathogenic microbes or pollutants (chemicals or particles) in the environment where a potential link to human health may be important
- approaches to enable an understanding of the impact of nanotechnology and nanoparticles on human health
- data analysis/modelling tools, including approaches such as machine learning or other intelligent agents, possibly providing predictive capability from large data sets gathered from social, environmental or medical studies. It is anticipated that these tools could provide predictive models of relevance to human health, or alternatively provide models for fate and transport

Social, economic and behavioural factors in the genesis and health impact of environmental hazards

- what are the macro-social factors and processes (e.g. business organisation, trade, urbanisation and population change) influencing the exposure of people to environmental risks and hazards (pathogens and pollutants)?
- what is the role of factors such as socio-economic status, age, gender, and culture in shaping behaviours relevant to environmental health risks?
- how does a stressful social or physical environment impact on biological processes linking the environment and disease?
- what is the importance of age, culture, social position, disability, and illness for resilience and adaptive capacity in the face of environmental health hazards?
- what is the impact of differing perceptions of risk and attitudes in enhancing public engagement and dialogue about environment and health issues?

- how are political, economic, cultural and social forces shaping the emergence of new environmental health risks and benefits and how may these be managed?
- can we quantify the benefits to human health of changes in the environment such as the spatial distribution of and access to green space?
- what are the economic and social costs (or benefits) of environmental impacts on health?

The Bigger Picture

It is also considered crucial that the E&HH Programme addresses broader socio-economic issues involving people orientated environmental health-related problems. Unfortunately, there is still a relative dearth of substantial epidemiological data that would permit a comprehensive understanding of possible causal links between human and ecosystem health (see - World Health Organization - *Millennium Ecosystem Assessment*, 2005). In order to address these issues the E&HH Programme will examine a selection of representative problems. The primary objective of the E&HH Programme is to gain a better understanding of how we interact with our environment and what the consequences will be for sustainability of environmental goods and human health. This goal requires that we have the necessary multidisciplinary capacity capable of responding in an interdisciplinary mode to resolve problems that are intrinsically interfacial in character. By effectively identifying and interconnecting the interdisciplinary elements we will see the emergence of new ways of solving problems in what, at present, are seemingly unrelated areas of environment and human health.

Programme Partners

£4.4m of core funding for the E&HH Programme is being provided by the Natural Environment Research Council, DEFRA, the Environment Agency and the Ministry of Defence. Additional funding of up to £1million is expected from the Wellcome Trust, the Economic and Social Research Council, the Medical Research Council, the Biotechnology and Biological Sciences Research Council and the Engineering and Physical Sciences Research Council, each of whom have agreed to consider co-funding projects with substantial science components within their science remits.

The Health Protection Agency has offered in-kind support, such as laboratory access for training and research projects, to the Programme as part of applications.

All Programme partners will be part of a Programme Management Group.

Scottish Executive, SEERAD, SNIFFER and SEPA are also pursuing an environment and human health initiative. The E&HH Programme will maintain close links with the Scottish (and other) initiatives, to ensure collaboration and avoid the risk of duplication of work.

Implementation Plan

Programme Management

The E&HH Programme has been established with a Programme Management Group (PMG) and a Science Advisory Committee (SAC). The PMG is responsible for final funding decisions and the overall strategy of the Programme, the SAC is responsible for defining the scientific scope of the Programme, drafting the Announcement of Opportunity (AO), assessing applications and advising the PMG on how to engage with their communities (See Annex B for PMG and SAC Terms of Reference and membership lists). The first AO reflected the vision and priorities referred to above, applying the various funding mechanisms described in Annex A. There has been only one major funding round, with a closing date in August 2006. A second, more targeted funding round may also be desirable if strategically significant science gaps emerge following the first funding round.

Science Implementation & Management

The E&HH Programme was launched in May 2006 with a one day "warm-up" meeting to bring together scientists from a variety of backgrounds in order to facilitate the formation of potential consortia that would submit proposals. This followed shortly after the first Announcement of Opportunity for funding. Although not all partners are contributing to a central fund, the AO was a joint Announcement from all Programme partners.

In order to maximise capacity building, we decided to fund several different types of activities (see Annex A); these were:

- proof of concept studies or exploratory awards,
- workshops/networks,
- working groups, and
- "discipline hopping" opportunities to encourage career development for young scientists.

This first phase of the Joint E&HH Programme is primarily a capacity building exercise and we particularly encouraged submission of proposals involving the development of multi- or inter-disciplinary teams comprising researchers and practitioners from several of the following sciences:

- Environmental Sciences
- Medical, Biological and/or Veterinary Sciences
- Social Sciences
- Engineering and Physical Sciences

Component projects were required to combine environmental science with medical, biomedical or public health research; and the inclusion of social, mathematical, biological, physical or engineering sciences was strongly encouraged.

All proposals received were assessed to several criteria, as it was very important that the assessment mechanism ensured we fund multi-disciplinary work. These included science excellence, multi-/inter-disciplinarity, originality, impact, fit to Programme, capacity building, risk reward and cost-effectiveness (see Annex C for definitions). All proposals had to score highly on both Science Excellence and Multi-Disciplinarity to be considered for funding.

Due to the small size of the workshops/networks, working groups and discipline hopping applications these were sent directly to an assessment panel (November 2006). The Exploratory Awards were sent to external peer review and then considered at a moderating panel (February/March 2007). Every effort was made to ensure that exploratory award applications were sent to reviewers from both environmental and medical/public health communities as well as any others appropriate to ensure multi-disciplinary review.

Both the assessment and moderating panels were based on the Science Advisory Committee, with extra panel members recruited to cover particular areas of expertise (selected based on the applications received). The panels used the criteria listed above, and a range of opinions was ensured on each application to deliver multi-disciplinary assessment and consideration of all applications.

The PMG approved the funding recommendations of the assessment and moderating panels.

The proposals selected for the first round of the E&HH Programme fulfil many of the thematic criteria outlined above (see Science Plan), and will provide the consortium-building capacity that will be required for a larger-scale research-driven phase.

The projects chosen for the E&HH Programme will tackle the complicated mix of environmental, social and economic factors that influence health, particularly focusing on naturally occurring toxins, man-made pollutants, nanoparticles and pathogens to ascertain:

- how they spread within the environment,
- how their properties change as they interact with other substances or organisms,
- how humans become exposed to them, and
- impact on human health.

Perturbation of environmental interactions as a consequence of global climate change is an important sub-theme running through many of the E&HH supported projects on pollutants, particles and pathogens.

Multi-disciplinary and Inter-disciplinary Projects - Supported projects include Workshops/Networks (8), Working Groups (5), Discipline Hopping & Career Development (2) and Proof of Concept & Exploratory Studies (22). Through these projects the E&HH Programme will endeavour to initiate the process of mining and integration of large bodies of diverse data in order to provide frameworks for novel interpretation of highly complex issues which will ultimately facilitate the formulation of government policy.

Supporting Activities

Focused Strategic Activities - Annual Science Meetings will be convened for the E&HH Programme participants and members of the PMG and SAC in order to facilitate the integration and capacity building process. These will include one day for focused workshops on themes such as systems level science, and integration of natural and social systems.

Programme Co-ordination

Co-ordination of the Programme will encompass not only the monitoring of progress of funded projects and reporting on Programme activities, but more importantly the raising of the profile of Environment and Human Health in a political context in order to galvanise large-scale support for a second phase of the Programme. There is concern from potential co-funders that, unless a concerted effort is made to secure more substantial (cross-council / multi-agency) funding for the future, the capacity building phase will be a wasted effort.

The Annual Science Meetings (2008 & 2009) will serve to bring together all of the award holders and members of the PMG and SAC. Other specialists and representatives of end-user communities will also be invited to these meetings. Furthermore, the Programme Science Co-ordinator will be meeting with all lead Principal Investigators during the course of their projects in order to discuss and review progress as well as to recommend additional interactions with members of related projects within the E&HH Programme. This will serve to further the capacity-building process and the attainment of a suitable critical mass of potential interdisciplinary consortia to bid for support in the second phase.

The SAC will be required to comment on the progress of the Programme at the end of each Annual Science Meeting and their advice will be considered by the PMG at subsequent meetings.

The Programme Science Co-ordinator will be tasked with raising the profile of the E&HH Programme in the UK through delivery of presentations at Scientific Conferences and other appropriate forums, as well as preparation of short articles for publication in the popular scientific literature and media. Ongoing dialogue with the existing stakeholders and potential new stakeholders will also be conducted by the Programme Science Co-ordinator. The Programme Science Co-ordinator will also explore international links if appropriate.

Knowledge Transfer (KT)

There is strong involvement of stakeholders (i.e. DEFRA, EA, DH, HPA), and many of the activities we anticipate supporting through E&HH are by their very nature Knowledge Transfer (e.g. networks, workshops). KT is a key component of this Programme and all awards are made on the basis that they include end-users. Many of the stakeholders are also end-users, and are represented on the PMG and SAC.

Considerable effort is also being expended by the Programme management team to engage other relevant groups in the activities of the Programme. Examples include the nanotoxicology/nanotechnology and climate change communities as well as systems biologists and social scientists.

Data Management

Since round 1 is essentially a capacity-building phase of the E&HH Programme there will be no significant generation of new large data sets. Rather the projects will be largely reliant on existing information and supportive data mining.

All larger research projects supported by the Programme awards include a data management plan, particularly where "proof of concept" data will be generated.

Further information

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Glossary

EA	Environment Agency
DEFRA	Department of Environment, Food and Rural Affairs
SE	Scottish Executive
SEERAD	Scottish Executive Environment and Rural Affairs Department
EPSRC	Engineering and Physical Sciences Research Council
ESRC	Economic and Social Research Council
MOD	Ministry of Defence
MRC	Medical Research Council
HPA	Heath Protection Agency
DH	Department of Health
SEPA	Scottish Environment Protection Agency
SNIFFER	Scotland and Northern Ireland Forum For Environmental Research

Annex A

Types of Capacity Building Activities Envisaged

The types of activities that will be funded through the Environment and Human Health Programme are as follows:

Workshops and Networks
These are small awards to enable contacts and communities to be built.

Working Groups
This scheme is intended to support groups of up to 20 scientists to work at a designated institution for a few days to a few weeks (generally smaller groups and longer stays are most effective), concentrating on specific issues that require in depth analysis of data and synthesis of ideas.

'Discipline-hopping', Consortia Building and Career Development Awards
This scheme provides short term support, in the form of salary replacement and ancillary costs, for researchers spending periods of between 3 and 12 months in close collaboration with an active research group in an adjunct discipline (e.g. a medical researcher working with a group engaged in environmental research or vice versa); these could be international placements.

Proof of Concept Studies and Exploratory Awards
These are small, targeted awards to fund the early stages of multi-disciplinary research projects into Environment and Human Health. Such awards (6 to 18 months in duration) would be expected to lead to larger, more mature studies.

Details of funding for these capacity building activities are shown in Table 1.

Activity category	**Maximum duration**	**Maximum value (total FEC of the project (100%) - of which we will fund 80%)**
Workshops, networks	Up to 12 months	£50K
Working groups	Up to 18 months	£75K
Discipline Hopping	3 - 12 months	n/a
Proof of Concept Studies and Exploratory Awards	18 months	£150K

Table 1

Further details can be found here.

Annex B

Programme Management Group Terms of Reference

The Programme Management Group (PMG) is chaired by NERC. The group is made up of a representative from each funding organisation and has overall responsibility for the strategy of the Programme. The role of this group is to:

- have overall responsibility for the Programme, including final decisions on allocation of funding
- appoint the Science Advisory Committee (SAC) and Programme Science Co-ordinator, who will report to the PMG, advising on the Announcements of Opportunity, scientific remit of the Programme, and future direction of the Programme; the PMG will ensure that the SAC has the correct balance of representation to cover all the disciplines involved in the Environment and Human Health Programme;
- agree the strategic aims of the Programme and the types of activity that will be supported, e.g. capacity building (although science priorities will be identified by the SAC);
- agree the detailed methods of implementation of the Programme, including arrangements for making awards through the partner Councils and finding an agreed way for all funders to work together;
- finalise the membership of panel(s) for the assessment of proposals;
- prepare options for consideration by the SAC, relevant to the SAC terms of reference; and
- manage the Programme budget in an appropriate manner.

The Management Group will report formally at least once a year, through the Chair, to the Chief Executives (or nominated person) of all the funding organisations involved. The Chief Executive of the NERC, as lead Council, will be responsible for reporting to RCUK.

Programme Management Group - Members

Chair: Pamela Kempton, Natural Environment Research Council
Sophia Abbasi, Biotechnology and Biological Sciences Research Council
Hannah Corney, Natural Environment Research Council
Catherine Davies, The Wellcome Trust
Gary Grubb, Economic and Social Research Council
Richard Owen, Environment Agency
David Russell, Health Protection Agency
Gavin Salisbury, Engineering and Physical Sciences Research Council
Jim Squire, Ministry of Defence
Jane Stratford, DEFRA
Heike Weber, Medical Research Council
Martin Williams, DEFRA

***Ex Officio* Members**
John Stephenson, Department of Health

Science Advisory Committee - Terms of Reference

The Science Advisory Committee is responsible for directing and integrating the Programme science and related activities, assessment and recommending the award of research funds, future vision and direction of the Programme and ensuring the delivery of Programme objectives. The SAC reports to the Programme Management Group (PMG) and will be supported by a Programme Science Co-ordinator.

In particular, the Science Advisory Committee is required to carry out the following tasks:

- provide overall guidance and direction on the Programme and advise on the general approach;
- help define the objectives, based on the draft Science and Implementation Plan, that will guide the scientific development and management of the Programme and against which it can be subsequently evaluated;
- ensure these objectives are set out in a revised Science and Implementation Plan;
- guide the progress of activities supported within the Programme, providing advice to investigators and encouraging collaborations where appropriate;
- advise on the future vision and direction of the Programme;
- participate in the assessment of applications in response to Announcements of Opportunity as members of Assessment and Moderating Panels;
- provide views on the reported monitoring of progress and evaluation of the results of individual projects and of the Programme as a whole, taking account of Output Performance Measures (OPMs);
- advise on the development and implementation of a Communication Strategy, to promote the Programme's various activities and outcomes to a wide audience;
- advise on and help foster the development of international collaborative activities;
- advise on and foster the development of user engagement;
- report to the PMG as required, including ensuring provision of Annual Programme Reports and a Final Programme Report;
- advise on the development of an Evaluation Plan and assist the PMG with any evaluation of the Programme.

Science Advisory Committee - Members

Chair: Prof Anthony Seaton
Prof Jon Ayres, Aberdeen
Prof Mel Bartley, UCL
Prof Kevin Chipman, Birmingham
Prof Sarah Curtis, Queen Marys London
Prof Charles Godfray, Imperial (Silwood Park)
Prof Roy Harrison, Birmingham
Prof Louise Heathwaite, Lancaster
Prof Paul Hunter, UEA
Prof David Kay, Aberystwyth
Dr Eric Lebret, National Institute for Public Health and Environment (RIVM) Netherlands
Dr Tracey Melvin, Southampton
Prof George Morris, Scottish Executive
Dr Paul Nathanial, Nottingham
Dr Mark Nieuenhuijsen, Imperial
Prof Vala Ragnarsdőttir, Bristol
Prof Marian Scott, Glasgow
Dave Stone, English Nature
Prof Liz Wellingon, Warwick
Prof Chris Wild, Leeds
Prof Faith Williams, Newcastle

Annex C

Assessment criteria for proposals submitted to the Environment and Human Health Programme

The Environment and Human Health Programme aims to build capacity for joint research between environmental science and public health/medical research communities.

The intention of the Programme is to fund applications containing excellent science but also that are building multi-disciplinary teams. **Therefore all applications need to involve both environmental scientists and medical/health researchers working on joint research projects.** We also strongly encourage the involvement of relevant social, biological, mathematical, physical and engineering sciences in proposals. The assessment process will consider how effectively the proposed work achieves this aim of building capacity across disciplines.

Environmental Science in the context of this Announcement of Opportunity (AO) means fields of research traditionally associated with Natural Environment Research Council (NERC). This includes abiotic and biotic processes occurring on the land and in the sea, in freshwater, in the soil and in the atmosphere. We exclude processes that do not occur in the "natural environment" of NERC's remit: for example restricted to the inside of buildings or the surface of human skin.

Proposals will be assessed against the following criteria:

Multidisciplinarity	Annex 1
Originality	Annex 2
Impact	Annex 3
Capacity Building	Annex 4
Overall Science Quality	Annex 5
Risk-Reward	Annex 6
Fit to Programme Priorities	Annex 7
Cost effectiveness	Annex 8

Annex 1. Approach to Multi-disciplinarity and Quality of Integration
All projects **must** combine environmental science with medical, biomedical or public health research.
Grade the proposal on the following scale using the descriptions to guide your grading:

1. Research is not multi-disciplinary and does not involve both environmental and health/medical research
2. Weak connection between environmental and medical/health research, e.g. research in one area dominates proposal and other research area is a minor add on, or weak integration between 2 distinct research topics
3. Good joint research between environmental and medical/health researchers. Applicants are from both areas and are engaging in joint research
4. Excellent joint research between environmental and medical/health researchers. Research is truly integrated and will benefit both fields of research
5. Excellent joint research between environmental and medical/health researchers. Research is truly integrated and will benefit both fields of research and, in addition, includes other disciplines e.g. social, physical sciences, etc.

Annex 2. Originality
How original is the proposal? Please consider if the combination of disciplines creates originality. Originality is graded on the following scale:

A. Not original, duplicates existing work
B. Some elements of originality but not others
C. Highly original, all elements of the proposed work new and original, or standard elements are combined in an original way

Annex 3. Impact

Although the applications are for exploratory research or proof of concept studies, the potential impact of any follow-on work will be considered and graded on the following scale:

A. No Impact
B. Some impact
C. High Impact

Annex 4. Capacity Building

The aim of the Programme is to build capacity for multi-disciplinary research on Environment and Human Health issues. With limited funds we want to make sure we are building capacity in areas where there is a real need for a multidisciplinary approach and where this isn't already well established. Capacity building will be graded on the following scale:

A. Multidisciplinary working is already well established in this area or not needed
B. Some multidisciplinary work established, but there is a need for additional capacity and topic would benefit from joint research
C. Very little joint research occurring - there is a great need for multi-disciplinary research to effectively research the topic

Annex 5. Overall Science Quality

This criterion is used to judge the scientific excellence of the proposal. The scientific importance of the proposed work, and the strengths and weaknesses of the proposed science/methods will be considered.

Proposals will be graded on a five point scale using the following descriptions to guide the grading:

1. Little or no advance in the field
2. Good: quality science, but not leading edge
3. Very good: generally competitive science; top 50%
4. Excellent: at the forefront of field; will significantly advance understanding; top 25%
5. Outstanding: exceptional scientific merit and originality; expected to have major scientific impact; top 5%

Annex 6. Risk Reward

Risk-reward will be graded on a matrix as follows:

		Reward		
		Low	**Medium**	**High**
Risk	**Low**	**1**	**2**	**5**
	Medium	**1**	**2**	**4**
	High	**1**	**1**	**3**

The criteria for Reward are as follows:

Grade	**Definition**
Low	Little probable contribution to programme objectives regarding impact on knowledge, competitiveness, public services, policy, or quality of life
Medium	Probable contribution to programme objectives regarding impact on knowledge, competitiveness, public services and policy, or quality of life
High	Certain contribution to programme objectives regarding impact on knowledge, UK economic competitiveness, effectiveness of public services and policy, or quality of life

The criteria for Risk are as follows:

Grade	**Definition**
Low	No discernible operational risk. Certain that the proponents can carry out the research and contribute to the programme objectives
Medium	Some discernible operational risk. Certain that the proponents can carry out the research and contribute to the programme objectives
High	Likely operational risk. Risk that proponents cannot carry out the research and contribute to the programme objectives

Annex 7: Fit to Programme Priorities

Grade	Definition
1	Not aligned with the Programme's objectives
2	Limited alignment with the Programme's objectives
3	Aligned with the Programme's objectives
4	Well aligned with the Programme's objectives
5	Completely aligned with the Programme's objectives, as expressed in the specific announcement of opportunity.

Annex 8: Cost Effectiveness Criteria

Grade	Definition
1	Poor value for money. Possibly little cost of the research borne elsewhere. No external financial, or in-kind input
2	Satisfactory value for money. Possibly limited cost of the research borne elsewhere. Little external financial, or in-kind input
3	Good value for money. Possibly with some of the full cost of the research borne elsewhere through external finances, or in-kind input
4	Very good value for money. Possibly some of the full cost of the research borne elsewhere through external finances, or in-kind input
5	Excellent value for money. Possibly some of the full cost of the research borne elsewhere in external finances, or in-kind input