

## **Royal Society of Chemistry response to the NERC strategy**

### **1. Context, direction and goals**

#### SPECIFIC COMMENTS:

1.3 – A pedantic point, but quoting the Stern report without the appropriate standard deviation gives a very unscientific impression.

1.3 – Agree that natural science is critical in delivering local predications for climate change and that this is perhaps the most complicated challenge.

1.5 – Agree that NERC should be partnering others.

1.7 – Is there a clear direction for the Environment Research Funders' Forum.

1.9 – Should reducing health costs be included? This fits with the Environment, Pollution and Health theme in section 7.

1.16/1.17 – The RSC applauds the need for new, specific programmes. Will there be joint research programmes with EPSRC, BBSRC, etc on technology issues – for example sensor technologies?

1.18 – The RSC reinforces the need for responsive mode funding. It would be useful for NERC to indicate the degree of funding for responsive mode and the balance between responsive and directed programmes.

1.19 – There is a need for more detail on how integrated research communities will be formed.

1.20 – In what will the way in which research is funded, delivered and evaluated change fundamentally? How will NERC ensure that interdisciplinary proposals are not lost in a gap between funding councils?

1.21 –The concept of Nationally Capability needs to be spelt out in much greater detail. The concept seems sound and there is definitely a need to maintain and improve our National Capability. Note – how does this match with the closure of parts of the Centre for Ecology and Hydrology facilities and will this pattern be repeated elsewhere? This is discussed in potential further closures (see 12.12).

1.25 – There needs to be clarity about how the business opportunities will be exploited – will this be a requirement in grant applications (ditto 1.36)? The EPSRC is currently consulting on how best to maximise the economic return from research funding – is NERC also going down this route? Is there a danger that work aimed at understanding fundamentals may be ruled out because it has no discernable business opportunities?

1.29 – It is strange that critical issues such as carbon capture and storage and nuclear waste do not feature heavily in the strategy beyond this statement. They should.

1.31 – The RSC believes that water should be a key priority in its own right. There are numerous aspects of water policy that require research support – particularly in relation to the UK implementation of the Water Framework Directive. This argument could equally be applied to air quality.

## **2. Climate system**

### GENERAL COMMENTS:

In the 4th Assessment report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) it was remarked that the understanding of chemistry in the climate predictions models is still at a relatively basic level. Improving the understanding of the role of the chemical sciences in the models should be a priority for NERC.

It was also noted in AR4 that prediction of regional and local effects of climate change in terms of both geography and timescale is hugely complicated and requires significant effort.

Finally, in AR4 it was noted that the role of aerosols in atmospheric science is not yet fully understood – this should be a priority for NERC.

Will NERC funding focus on climate impacts in the UK?

### SPECIFIC COMMENTS:

2.2 – Local and regional scale predictions are very important as is timeframe – this is also the most complicated part. How does NERC envisage that the research from the UK is best focussed?

2.3 – There is a need for chemistry to be included in the models, AR4 was the first report that included a significant chemistry contribution. There is also a question on how future emissions are predicted and whether the scenarios can be improved?

2.12 – Should there be an encouragement/programme to enable collaboration with chemists?

2.15 –What are the implications of improved observations – does this relate to investment into technology and facilities?

### **3. Biodiversity**

#### GENERAL COMMENTS:

There is still a lack of understanding pertaining to mixtures of chemicals in the environment. This is also true for the effect of chemicals in the environment in low concentrations.

There is a need to ensure that the tests to examine the effect of chemicals on biodiversity do not lead to disproportionate loss of biodiversity (for example only; consider the consequences of killing 80,000 animals to prove that the level of chemicals in them wasn't harmful in the first place).

The RSC believes that NERC should take into the account of related European projects and international projects that are relevant to biodiversity. One example is the European Environment and health strategy (SCALE) that examines the effect of environmental pollutants on vulnerable groups, and in particular children.

#### SPECIFIC COMMENTS:

3.13 – This needs to specify which long-term data sets will be supported and how they will be reviewed.

#### **4. Sustainable use of natural resources**

##### GENERAL COMMENTS:

It is assumed that natural resources are inexhaustible. If human activity harnesses wind, tidal and geothermal energy sources on a massive scale will this ever have an impact in the total energy of the system? There is also a need to understand the local effects (for example, on eco-systems) of renewable technologies.

Nuclear waste and carbon capture and storage appear out of the blue – these critical areas need to be carefully introduced.

##### SPECIFIC COMMENTS:

4.2 – By the time this is published the DTI should have published the 2007 Energy White Paper – the NERC strategy should take into account the implications of this paper in the final draft.

4.4 – Effective use of non-renewable resources should be connected to EPSRC green chemistry funding initiatives. NERC should encourage the most efficient use of resources throughout their lifecycle (e.g. growing, harvesting, manufacture, use and ultimate disposal).

4.5 – Insert word “best” after society (to read ... *how society can best exploit renewable...*) – you can exploit renewable resources in many ways but it isn't necessarily the best.

4.6 – It is predicted that water will be as, if not more important, than the current energy priority. This should be reflected in the NERC strategy.

4.10 – What is the solar marine resource?

4.11 – The RSC is surprised that the EU Water Framework Directive is not mentioned here.

4.14 – What are low exposure nuclear sources (radon) and why do these appear out the blue – it needs to be introduced. Does this include nuclear waste?

4.16 – Again this needs introducing it is a hugely important topic.

## **5. *Earth system science***

### GENERAL COMMENTS:

What is the definition of abrupt change – this term does not appear to be defined.

This priority area has significant overlap with that of climate system (section 2) – is there a danger of duplication of effort and funding?

However, the RSC recognises that there is a danger that other important issues could be ignored unless directly related to climate change, so to have a science theme dealing with global issues, but without climate in the title allows these problems to be explored.

## **6. Forecasting and mitigation of natural hazards**

### GENERAL COMMENTS:

Hydrogeological events lead to potential mobilisation of chemicals in the environment through different mechanisms. For example increased river flow can mobilise species trapped in sediment. Equally, drought conditions lead to increased concentrations of chemicals in the environment? These factors need to be studied in the context of precipitation changes through climate change.

### SPECIFIC COMMENTS:

6.8 and 6.9 – The RSC agrees that these are important.

## **7. Environment, pollution and human health**

### GENERAL COMMENTS:

Analytical techniques are allowing us to detect minute quantities of materials in the environment. How are/how should chemicals of concern be prioritised – it is impossible to address every chemical in the environment?

There is concern over the effect of mixtures of chemicals in the environment; it is particularly difficult to predict these effects.

Both these will rely on and perhaps assist in improving QSAR methods.

The Royal Society is conducting a study into predicting future ground-level ozone. This study is hampered by the lack of prediction of local and global emissions in the period 2030 – 2100. This is an area that NERC could fund research into.

### SPECIFIC COMMENTS:

7.1 – Typo – cost up to [range] – should read cost up to £21.4 billion pa<sup>-1</sup>. Or it should read “cost is estimated to be in the range”.

7.4 – The RSC agrees that the development of sensor technology is critical. It is important that the sensors developed should measure the appropriate species at a level that is applicable now and in the future. The RSC is currently running a project on this and would be happy to discuss this further.

7.5 – What is meant by waste management systems?

7.10 – See general comments. This entry should specifically mention air, soil and water.

7.11 – Agree with the need for monitoring techniques for atmospheric pollutants. There is also a need for predictions to assess future emissions that will enable models to examine future scenarios.

7.12 – Should more correctly read “Determine the behaviour and impact of newly (recently) developed/man-made nano-particles in the environment with reference to the very heavy global load of existing nano-particles”.

7.13 – Agree - complicated system – much interesting work has been carried out already as part of the WFD (and previous directives – local and EU).

7.14 – Agree – although this may also need to look to the future in terms of how previous sites have become contaminated and therefore lessons that can be

learned in order to avoid a repeated situation.

## **8. Technologies**

### GENERAL COMMENTS:

Agree that there is a need for technologies. Should NERC be prescriptive about which areas in particular should sensor technology be developed for. The RSC is currently engaged in a project that is examining sensors for the atmosphere and in 2008 will widen this project to examine sensors in the natural environment.

### SPECIFIC COMMENTS:

8.9 – Whilst the RSC strongly agrees that there should be an appropriate base of skilled people – this statement seems out of place in the technology section and should perhaps be an overriding aim of NERC.

8.10 – Management of data is absolutely critical. NERC should be applauded that they have developed a data repository for key information. This should be maintained in a state for the foreseeable future. This should also be readily accessible to UK researchers.

## **9. Responsive funding**

### GENERAL COMMENTS:

NERC should continue to fund responsive mode research. As indicated this should be flexible to allow relevant projects of any size. *A healthy investment* (9.2) is not a quantifiable term; it would be of more interest to know that NERC is committed to a particular level of funding.

### SPECIFIC COMMENTS:

9.4 – Suggest that the word “perfect” is removed from sentence “NERCs responsive schemes provide a perfect platform to...”. The RSC suggests that there is a need to further improve the scientific community’s confidence in the assessment of multidisciplinary proposals.

9.5 - There is a need for more detail on ‘recognising and promoting the outcomes and potential benefits of responsive funding’. There is a danger that if there is too much emphasis on immediate economic benefits, then fundamental work could be neglected. Good science has got to still be the primary driver although the science cannot be presented without the appropriate context.

## **10. Knowledge**

### SPECIFIC COMMENTS:

10.2 – 10.4 – Why can these three factors not be included in the overall NERC aim.

10.6 – How will this knowledge transfer work in practice.

10.7 – Agree – how will this engagement be encouraged – will it form part of the grant application – how will it be measured?

10.8 – How will the data sets be managed correctly – what is the failsafe?

10.9 – Will exploitation be included in the research proposal?

10.6 and 10.9 – These could result in major issues for research taking place in areas where there is no immediate economic benefit.

10.11 – 10.16 - Seem to be rather vague.

## **11. People**

### GENERAL COMMENTS:

NERC science can be very equipment intensive whether in the laboratory or in the field. A career structure that allows NERC centres and universities to support, retain and develop people at a level below full academic would be helpful, although this is a complicated issue and would require collaboration with the universities.

The action points seem rather vague in this section.

### SPECIFIC COMMENTS:

11.4 – Will career opportunities be included in grants for students etc?

11.5 – How will NERC attract people into the science?

11.6 – How will the gaps be assessed?

11.9 – Where will the evidence be coming from?

11.10 – There needs to be clarity here whether this refers to internal NERC employment or whether it applies more widely to anyone funded by NERC.

11.11 – Enthusing young people is fine, but it also important to demonstrate the career path. Now that students are paying fees they are savvier to wise career moves.

## **12. Science infrastructure**

### **SPECIFIC COMMENTS:**

12.5 – If measurements are to be collected over very long-term – will NERC support be in relation to this? What happens if the changing science priorities mean that long-term measurements are no longer viable because of short-term funding needs? This needs to specify which long term data sets will be supported and how they will be reviewed.

12.12 – Agree – you can't do everything. How is this reconciled with long-term support for measurements? How does closing facilities relate to the support of a National Capability?

### **13. Delivery**

SPECIFIC COMMENTS:

13.4 – How is the National Capability defined?