The Natural England Partnership

THE STERN REVIEW ON THE ECONOMICS OF CLIMATE CHANGE

COMMENTS ON THE DISCUSSION PAPER: WHAT IS THE ECONOMICS OF CLIMATE CHANGE?

1 INTRODUCTION

1.1 A new organisation – *Natural England* – is being created with responsibility to conserve and enhance the value and beauty of England's natural environment and promote access, recreation and public well-being for the benefit of today's and future generations.

1.2 The creation of the new organisation, *Natural England*, has already begun, with English Nature (EN), the Landscape, Access and Recreation division of the Countryside Agency (LAR), and the Rural Development Service (RDS) working together as partners. From April 2006, this natural partnership will work together to deliver joint outcomes and pave the way for *Natural England* whilst continuing to deliver their separate and respective statutory duties:

1.3 **English Nature** is the independent Government agency that champions the conservation of wildlife and geology throughout England. **The Rural Development Service** is the largest deliverer of the England Rural Development Programme and a range of advisory and regulatory rural services. The aim of the Countryside Agency's **Landscape, Access and Recreation** division is to help everyone respect, protect and enjoy the countryside.

1.4 This submission has been produced by English Nature on behalf of the Natural England Partnership.

2 KEY POINTS

- We broadly support the economic framework presented but, crucially from our point of view, it fails to capture the potentially significant welfare changes that will result from climate change induced impacts on our natural environment. We would urge the Stern Review Team to broaden the analysis to include these issues to the greatest extent possible.
- We welcome the headline message that 'climate change is a serious and urgent threat' and believe that this message needs to come through strongly.
- The prospect of irreversible changes in our natural environment (both locally and globally) warrants more effective use of the precautionary principle.
- The leadership role of (the UK) government will be critical in helping to achieve the necessary behavioural changes both in terms of mitigation and adaptation at a national and international level.
- The role of education and persuasion is likely to be significant in changing people's preferences in addition to more conventional regulatory measures. Insights from the 'behavioural economics' literature could usefully be applied in a policy context.
- Going forwards, Natural England will be able to contribute to future policy discussions through its sound scientific research base and operational guidance on

adaptation strategies, for example, we are leading on the INTERREG project which seeks to build climate change adaptation into spatial planning in the South East.

3 COMMENTS ON THE DISCUSSION PAPER

Broadening the scope of analysis

3.1 The Natural England Partnership welcomes this opportunity to input into the Stern Review on Climate Change and comment on the discussion paper: 'What is the Economics of Climate Change'. Our key point of feedback is that, whilst we support the economic analytical framework presented in the paper, we believe that, for completeness, it could usefully be broadened to include an assessment of the likely impacts of climate change on our natural environment and the associated welfare impacts that will result from this. At present, there is a tendency to focus quite narrowly in terms of (macro-economic) impacts on growth, productivity and competitiveness (particularly where mitigation options are discussed). We would urge the Stern Review to broaden the scope of economic analysis to include these additional welfare changes and, where possible, to approach this from a 'well-being' point of view (for example, the UK Sustainable Development Framework) rather than focusing only narrowly on GDP measures.

3.2 To elaborate, the paper notes a number of likely impacts resulting from climate change such as sea level rise, increased flooding, sea acidification (as a result of increased concentrations of GHGs in the atmosphere rather than climate change *per se*), more extreme weather patterns, and so on. These changes and events will have direct impacts on people's lives. In addition, they are likely to have significant impacts on the global natural environment and global wildlife, both directly and indirectly through people's response strategies. These changes to our natural environment will impact on people's welfare and we would argue that such costs (and possibly benefits in some cases) need to be included in an comprehensive economic analysis of climate change and feature prominently in the development of adaptation strategies.

3.3 Society values attributes of the natural environment in many different ways. In many developing countries, the direct (and indirect) use-values of biodiversity are perhaps the most significant since the natural environment forms an important part of peoples livelihoods and incomes and provides a vital 'safety net' in times of catastrophic events (or when other livelihood strategies fail). In more developed countries, direct-use values remain important (e.g. for recreation and amenity purposes) but other components of 'value' such as *option* and *non-use values* are significant factors affecting the quality of people's lives. There is a large and growing body of literature which illustrates the significant values that people place on wildlife in a UK and global context[1].

General comments

3.4 We welcome the headline message of the paper that 'climate change is a serious and urgent threat' and believe that there is significant evidence to support this conclusion (as referenced in the discussion paper itself and the accompanying technical annex). In

[1] See Christie *et al* (2004) Developing measures for valuing changes in biodiversity, Defra.

formulating an effective policy response at all levels of society, both in terms of mitigation and adaptation, this message needs to come through strongly.

3.5 We also welcome the message that 'uncertainty does not warrant inaction' and that the 'significant possibility of severe adverse consequences of climate change may justify ***more*** extensive action now on prudential grounds'. Some short-term actions may be 'regret free' such as efforts to increase resource (in particular energy) productivity (i.e. there is likely to be some scope for win-win outcomes). For others, better use of the precautionary principle seems appropriate.

3.6 Prudential action is also appropriate when faced with the prospect of irreversibility. In the context of ecosystem services and our natural environment, the potential for climate change to result in irreversible changes, for example species loss, is a very real threat that can only be prevented through effective action in the short-term (see Annex A accompanying this paper for more details).

3.7 We support the paper's conclusion that the role of government (in terms of mitigation and adaptation) is absolutely critical. Clear, long-term objectives are needed so that society can operate with some degree of certainty about the direction of future policy (particularly in the case of mitigation). In short, the government's policy on climate change has to be credible, both in a national and international context, and this in turn will facilitate business led innovation and appropriate financing in response.

3.8 We welcome the message that an effective response to climate change will require action at a global level and that this should be based on shared understanding of the implications for different countries of the consequences of different actions. Also, we welcome the proposed leadership role of the UK and EU and would urge a 'leading by example' approach to mitigation. In terms of adaptation, full UK and EU engagement in an international context (referring here to issues raised on page 29 of the paper) is critical if we are to continue to effectively promote international development and poverty eradication that is 'climate proof'. Given the strong linkages between the environment and poverty reduction, the reference to 'investment in infrastructure such as flood defences' could usefully be expanded to include investment in environmental infrastructure more broadly.

<u>Changing behaviour and people's preferences:</u>

3.9 The paper makes several references to this issue. Much of the economics literature tends to be quite orthodox in its approach, e.g. getting prices and incentives right through economic instruments and regulation. Whilst such mechanisms should undoubtedly form the backbone of a comprehensive climate change policy, other measures will be needed in addition to effective price signals. As the paper mentions, the role of education will be critical, not only in terms of making people aware of the impacts of climate change and the implications of their individual actions (crucially over the long-term), but also in terms of providing information about the sorts of changes people can make that will enable them to make a difference.

3.10 Leadership and consistency from government will also be important, for example, a number of successful behaviour changing 'campaigns' are worth mentioning: drink driving, seatbelts, speeding and possibly passive smoking are all examples of effective

non-economic approaches. In some cases, economic measures have helped reinforce the message that behavioural change is needed (e.g. fines, taxation and other price incentives).

3.11 These approaches have been captured in a growing body of literature which is generally characterised as 'psychological economics'. The fundamental assertion behind much of this thinking is that people do not always behave 'rationally' as is often assumed in much of the economics literature. The New Economics Foundation[2] (nef) has identified 7 principles (other than the desire to maximise self-interest) that shape people's behaviour. We would encourage greater emphasis on such factors in the government's consideration of climate change policy responses aimed at changing people's behaviour. The main principles are:

- Other people's behaviour matters;
- Habits are important;
- People are motivated to 'do the right thing';
- People's self-expectations influence how they behave;
- People are loss averse;
- People are bad at computation; and
- People need to feel involved and effective to make a change.

Issues relating to the natural environment in a UK context

3.12 Annex A is a technical annex and provides a short overview of some of the evidence supporting climate change, the likely impacts of climate change on biodiversity and the mechanisms through which this is likely to take effect, and the sorts of action needed to protect and enhance our natural environment. We would be happy to provide more information on any or all aspects.

3.13 The key messages from the technical annex are:

1. Notable changes have been observed in the seasonal and reproductive behaviour of species (phenology) and more changes are anticipated. Migration pathways are shifting, and nesting, hatching, budding and flowering times are advancing.
2. The 'climate space' of species (i.e. the optimum space determined by climate that would be occupied by a species if dispersal was possible and if suitable habitat was available) is moving polewards. The composition of habitats is changing as species move in response to climate change. Species are exposed to increased extinction risk where population numbers are low, habitats are restricted or patchy, and climate / geographic ranges are limited.
3. Protected areas are the last remnants of semi-natural habitat and, in most cases, the best places to maintain functioning ecosystems. The focus for conservation management must shift from maintaining the status quo to managing dynamic systems – building resilient ecosystems and robust species' populations which are better able to adapt to climate change.
4. Protected areas will not accommodate all climate change impacts on biodiversity. Many species will attempt to move to new climate space as they track climate change to higher latitudes and altitudes, or more appropriate

[2] Nef (2005) Behavioural economics: seven principles for policy makers, New Economics Foundation.

hydrological conditions. An effective response against irreversible biodiversity losses needs to reinforce the need for landscape-scale connectivity and it will be critical to adopt an integrated approach incorporating protected areas and wider landscapes. Policies such as agri-environment schemes which aim to create the required degree of connectivity will be of critical importance in helping species gradually adapt to climate change. As with the protected area networks, such schemes need to be adequately financed.

5. Assessments of observed and projected impacts of climate change on biodiversity will help adapt targets and identify indicators to shape policies for biodiversity conservation and integration of biodiversity conservation needs into other policies. Policies, plans and actions must be "climate change proofed" in light of observed and projected impacts – both direct and indirect.
6. A significant challenge for biodiversity conservation is to avert risks to biodiversity in key sectors by integrating appropriate adaptation measures into policies for land and water management, for example: spatial planning, agri-environment, flood alleviation, and climate mitigation.

English Nature
29th March 2006

ANNEX A

INDICATIONS AND PROJECTIONS OF CLIMATE CHANGE

The Earth's climate has changed continually since it was formed 4,600 million years ago. Evidence comes from fossils and other signals in rock sequences, ocean and lake sediments, peat deposits and ice cores. These changes have affected the distribution, diversity and abundance of all life forms.

The rate of climate change increased dramatically during 20th Century, with industrial and social development resulted in increasing greenhouse gas emissions. Atmospheric CO2 levels have risen from 280 parts per million volume (ppmv) in pre-industrial times to 380ppmv today. Man-made greenhouse gases have accelerated what was once a wholly natural process.

Global temperatures have increased by 0.6C and European temperatures by almost 1.0C in last 100 years. The 1990s was the warmest decade in the last 1000 years and 2004 the fourth warmest year on record. Ice sheets and glaciers are retreating: Arctic sea ice has reduced by about 40% in recent decades; ice sheets in Antarctica and, to a lesser extent, Greenland, are retreating, as are montane glaciers. Extreme weather events (floods, droughts and storms) are becoming more frequent.

Sea levels are rising, largely due to thermal expansion of sea water, but also ice melt. Sea waters are also becoming more acidic. Oceans are an important carbon store, but absorption of increasing quantities of anthropogenic CO2 from the atmosphere is decreasing pH and increasing acidity.

In 2001, the IPCC produced its most recent set of global climate scenarios. These are based on projected greenhouse gas emissions under a range of socio-economic futures, and complex and highly sophisticated computer simulations of interactions between the oceans, atmosphere, biosphere and cryosphere. The scenarios assume that atmospheric CO2 levels will rise to between 500 and 900ppmv by 2100. Temperatures are projected to increase by 1.5-2.5C by 2050 and up to 5.8C by 2100. Sea levels are projected to rise by 9-88cms by 2100. By way of comparison, temperatures have increased by 5C since the last Ice Age 15,000ya!

In 2002, the UK Climate Impacts Programme produced a set of climate scenarios for the UK. These are based on IPCC's greenhouse gas projections and climate modelling at the Hadley Centre (Met Office). Temperatures are projected to increase by 2-3.5C by 2080. Annual precipitation is likely to decrease by up to 15% and snowfall by 30-90%. In the SE, air temperature is likely to rise by up to 5C, summer sea temperature by 2-4C and sea level by 26-86cms. The projections take account of weakening of the Gulf Stream and reduction in heat transfer of up to 25% by 2100.

IMPACTS OF CLIMATE CHANGE ON BIODIVERSITY

The seasonal and reproductive behaviour of species (phenology) is changing. Migration pathways are shifting, and nesting, hatching, budding and flowering times are advancing. The "climate space" of species, the optimum space determined by climate that would be occupied by a species if dispersal was possible and if suitable habitat was available, is moving polewards. The composition of habitats is changing as species move in response to climate

change (species and ecosystems respond individualistically, with each species responding in a unique way). Species are exposed to increased extinction risk where population numbers are low, habitats are restricted or patchy, and climatic/geographic ranges are limited.

It has been hypothesised that the scientific value of protected areas for biodiversity will diminish in response to climate change. English Nature's thesis is that the converse is likely to be true, although it is recognised that significant conceptual and practical challenges lie ahead.

Protected areas are the last remnants of semi-natural habitat and, in most cases, the best places to maintain functioning ecosystems. The focus for conservation management must shift from maintaining the *status quo* to managing dynamic systems - building resilient ecosystems and robust species' populations which are better able to adapt to climate change. Conservation objectives must reflect ongoing changes in species and habitats; as the impacts of climate change become more severe in years and decades to come, our ability to deliver existing, predominantly static, objectives will be seriously compromised, particularly as the species compositions of habitats will continue to change. In the terrestrial environment, the outputs of the English Nature-led MONARCH project (Modelling Natural Resource Responses to Climate Change) will provide information and projections to inform the review of these objectives and to guide conservation decisions. Climate change, therefore, highlights the need for dynamic conservation designations, subtle re-interpretations of the legislative framework in which designations are set and a fundamental shift in nature conservation values.

Protected areas will not accommodate all climate change impacts on biodiversity. Many species will attempt to move to new climate space as they track climate change to higher latitudes and altitudes, or more appropriate hydrological conditions. Habitat fragmentation restricts movement – in terrestrial, freshwater, coastal and marine environments. Climate change reinforces the need for landscape-scale connectivity/permeability; the effective accommodation of climate change impacts on biodiversity requires an integrated approach, incorporating protected areas and wider landscapes (or indeed seascapes), in which achieving ecological functionality is a key principal. Climate space projections can help in planning habitat mosaics to facilitate species movements; again, the outputs of MONARCH can inform the development of landscape-scale initiatives and help accommodate the potential shifts in species distributions being driven by climate change.

ADAPTATION ACTIONS

Assessments of observed and projected impacts of climate change on biodiversity will help adapt targets and identify indicators to shape policies for biodiversity conservation and integration of biodiversity conservation needs into other policies. English Nature has developed a sound scientific research base, and begun to use its outputs to help underpin policy advice and operational guidance, particularly on the management of ecosystems to optimise resilience and accommodate climate change (resilient ecosystems will buffer perturbations and accommodate and adapt to change). Strong partnerships between governments, their agencies and practitioners, together with better capacities within these organisations, are needed to address climate change and adapt biodiversity conservation to its impacts. Organisations need to be able to anticipate the impacts of climate change and formulate 'regret free' options for adapting land and water management to change.

Policies, plans and actions must be "climate change proofed" in light of observed and projected impacts – both direct and indirect. Opportunities already exist within the

biodiversity policy framework for integrating climate adaptation; climate adaptation should reinforce existing commitments and not necessitate major revisions or adjustments.

Those working on biodiversity conservation and climate change have primarily focussed on assessing the direct impacts of changing climatic conditions on biodiversity and on the adaptation of conservation policy and practice to accommodate likely responses. However, climate change will have implications for all sectors, and those which interface with biodiversity conservation should be of particular concern as the indirect impacts are likely to be complex and uncertain. The intimate relationship between land use and biodiversity will have a major influence on conservation in a changing climate:

- land use patterns and crop types in agriculture and forestry will change as temperatures and carbon dioxide levels rise, as growing seasons lengthen, and as water availability becomes more variable;
- lowland farming will be increasingly affected by riverine and coastal flooding due to storm events and sea level rise, and extreme droughts will become more frequent in many areas;
- additionally, incentive schemes for food and non-food crops, livestock, environmental management and renewable energy projects will impact on land use.

A significant challenge for biodiversity conservation is to avert risks to biodiversity in key sectors by integrating appropriate adaptation measures into policies for land and water management, for example:

- spatial planning – to promote ecological networks to counter fragmentation (EU, national and regional levels);
- agri-environment – to improve cohesion in fragmented landscapes (creating corridors and habitat patches to facilitate species movements and functioning ecosystems in the farmed landscape);
- flood alleviation – to ensure schemes sustain and enhance biodiversity (avoiding hard engineered solutions and favouring options which incorporate dynamic natural systems);
- climate mitigation – to ensure activities complement biodiversity conservation (avoiding environmental conflicts such as energy crop monocultures and unsustainable locations for wind farms).