



**JNCC ROLE AND PRIORITIES IN THE IDENTIFICATION OF FUTURE  
CHALLENGES FOR UK AND GLOBAL BIODIVERSITY**

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## **JOINT NATURE CONSERVATION COMMITTEE**

### **JNCC ROLE AND PRIORITIES IN THE IDENTIFICATION OF FUTURE CHALLENGES FOR UK AND GLOBAL BIODIVERSITY**

**Paper by Helen Baker, Mark Tasker, Elizabeth Moore**

#### **1. Introduction**

- 1.1 This paper responds to the JNCC Vision and Strategy Statement which states that JNCC 'will contribute to the development of the UK, EU and global evidence base and identify future challenges to UK biodiversity and geodiversity by gathering intelligence and assessing risk and opportunity'.
- 1.2 In March 2009, the Joint Committee discussed a forward programme of committee business, to reflect the Vision and Strategy Statement, in which discussion of emerging scientific issues and the implications for nature conservation (including research priorities) was proposed (JNCC 09 P03). Committee welcomed the opportunity to horizon scan and discuss emerging issues on an annual basis. This paper proposes how JNCC could add value to existing activities to capture emerging challenges for UK and global biodiversity.
- 1.3 JNCC Support Co. has very limited staff resource committed to horizon scanning and foresight work; equivalent to less than 1 FTE across the whole organisation. Therefore the most appropriate role for JNCC staff is collation of results from work done elsewhere, especially in the country agencies, and analysis and presentation of key issues for discussion by Committee; agency experts could be invited to participate in this process.

#### **2. Identifying emerging challenges: horizon scanning and future scenarios**

- 2.1 Horizon scanning focuses on assessment of current knowledge to identify technological and behavioural changes, including policy changes, which might increase pressure on biodiversity. The development of scenarios goes a step further in suggesting ways in which these changes might unfold in the future, including rate, magnitude and scale of change.
- 2.2 Together horizon scanning and scenarios, often termed foresight or futures, are used to identify emerging issues and provide context for prioritising activities, creating a common focus, raising awareness, integrating sectors and generally helping organisations to plan. The methods used include projections of trends,

quantitative modelling, qualitative scenarios and horizon scanning by experts (methods are described in more detail in Appendix 1).

### 3. Existing foresight activities relevant to JNCC

- 3.1 Many organisations invest in foresight activities, including the United Nation bodies (e.g. *Global Environment Outlook*; *Global Biodiversity Outlook*), the Millennium Ecosystem Assessment (MA), the European Environment Agency (e.g. *PRELUDE*), UK government (e.g. *Foresight*), the Natural Environment Research Council (NERC), Environment Agency and the country conservation agencies.
- 3.2 Important recent publications include: *Land Use Futures (Foresight 2010)*; *Alternative Future Scenarios for Marine Ecosystems (Defra 2006)*; *The Natural Environment in 2060 (Natural England 2009)*; *PRELUDE - 2050 European Land Use Scenarios (EEA 2007)*; *fourth Global Environment Outlook (GEO-4) (UNEP 2007)*.
- 3.3 Appendix 2 lists a fuller selection of organisations and their foresight activities, including important publications; there is a significant amount of foresight activity being undertaken at all scales, with the potential for considerable overlap.

### 4. Current foresight-relevant JNCC activities

- 4.1 JNCC is already undertaking a number of activities that could provide outcomes of value to ongoing foresight activities. These include:
  - i. the provision of data and trends from the surveillance and monitoring programmes funded or managed by JNCC, including marine programmes;
  - ii. contribution to the development of surveillance and monitoring strategies, including data access, through participation in UK and global initiatives. Examples include the UK Environmental Observation Framework and Global Biodiversity Information Facility;
  - iii. the provision of evidence for use in foresight work. Examples include assessment of the global biodiversity footprint of UK biofuels consumption (2009<sup>1</sup>) and prediction of future distributions of the non-native pathogens causing 'sudden oak death' (*Phytophthora* spp.<sup>2</sup>);
  - iv. gathering intelligence on European policy development;
  - v. facilitation and participation in the horizon scanning activities of various UK and EU research coordination bodies undertaken to

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<sup>1</sup> <http://www.jncc.gov.uk/page-4209>

<sup>2</sup> <http://www.jncc.gov.uk/page-5091>

underpin research needs analysis, including the Biodiversity Research Advisory Group (UK BRAG), the UK Global Biodiversity Sub-Committee (GBSC; see Appendix 3), and the European Platform for Biodiversity Research Strategy (EPBRS);

- vi. representing user needs, including through peer-review, in various global, European and UK scale foresight projects. Examples include participation in the National Ecosystem Assessment, NERC and Defra funded horizon scanning activities undertaken by Prof. Bill Sutherland (see Appendix 3), and advice to Defra on scenarios work in the 3<sup>rd</sup> Global Biodiversity Outlook and the Millennium Ecosystem Assessment follow-up process;
- vii. supporting foresight activities in the Overseas Territories, for example facilitating evidence sharing, and horizon scanning to underpin research priorities analysis.

## **5. Conclusions and recommendations**

- 5.1 There are a large number of foresight activities underway that can fulfil UK and country requirements for assessing emerging issues and adapting sustainable management approaches and policies. JNCC is already contributing to some of these initiatives and, whilst some of these contributions could be improved, there is no role for JNCC in initiating its own independent horizon scanning and future scenarios projects.
- 5.2 However, with the many different initiatives ongoing there is both a risk of duplication of effort and a confusing overload of information for users. JNCC could add value to ongoing foresight activities by providing a meta-analysis of key messages on future challenges from their outcomes, especially tailored to facilitate understanding of evidence needs for the UK Overseas Territories and for supporting the development of UK biodiversity and sustainable development policy in Europe and internationally.
- 5.3 There are significant resources and expertise assigned to foresight activity within the country conservation agencies; JNCC should seek to draw on this and to facilitate greater synergies across foresight activities.
- 5.4 Several important assessments, including the UK National Ecosystem Assessment (UK NEA), Global Biodiversity Outlook 3 (GBO3) and The Economics of Ecosystems and Biodiversity (TEEB), will be published in 2010 and it would be timely to complete an analysis of key messages after these events.
- 5.5 *It is therefore recommended that the JNCC Support Company should:*
  - i. identify and analyse emerging challenges for UK biodiversity from outcomes of existing foresight projects and present key messages,

including evidence needs, to the Joint Committee biennially or more frequently if major activities report;

- ii. in meeting recommendation (i), undertake an analysis of emerging challenges following the publication of the UK NEA and present this to the Joint Committee in 2011;
  - iii. in accordance with the JNCC role identified in the UK Overseas Territories Biodiversity Strategy, provide specialist support for identifying and undertaking foresight activities in the UK Overseas Territories when requested to do so and as resources permit;
  - iv. utilise outputs from completed foresight activities and consult with agency specialists in developing evidence and advice on international biodiversity policy, including advice on future requirements for foresight work at global and sub-global scales;
  - v. participate in developing ideas for new foresight activities, including through participation in relevant coordination bodies like UK BRAG, GBSC and EPBRs;
  - vi. in response to clear user needs, continue to provide, or facilitate the production of, evidence on emerging issues when UK scale evidence is identified as necessary (e.g. to support UK or EU research initiatives, to report to EU or global assessments, etc.).
- 5.6 In undertaking all of the above JNCC will liaise with country agency specialists and keep under review the potential benefits to be gained from closer inter-agency cooperation through establishment of a more formalised inter-agency group or network at some future stage.

## APPENDIX 1:

### SUMMARY OF METHODS USED IN HORIZON SCANNING AND FUTURE SCENARIOS

1. **Trend projection** is based on the assumption that the future is a continuation of what has happened in the past. It provides a very simple way of predicting future status and may be useful in the short-term (<10 years) for understanding the continued impact of various pressures, but is of limited value beyond this. There are few examples of this method being used in isolation for environmental change prediction, although they are sometimes used in modelling and for context within qualitative scenarios development (see below).
2. **Modelling** methods use existing trend information and knowledge of how variables influence trends (derived from research results) to predict how they might change in future in response to estimates of change in important variables. There are many examples<sup>3</sup> of modelling being used to predicting future pressures on, and state of, the environment and hence potential impacts on biodiversity, *inter alia*:
  - i. climate models (e.g. Intergovernmental Panel on Climate Change and UK Climate Impacts Programme projections);
  - ii. atmospheric chemistry, including pollutants (e.g. Air Quality Expert Group);
  - iii. ocean chemistry, including acidification (e.g. Intergovernmental Oceanographic Commission);
  - iv. resource exploitation, including fish stocks and sustainable fishing pressure (e.g. International Council for the Exploration of the Sea);
  - v. forestry, agricultural change and biomass production (e.g. Forestry Commission Climate Change Impacts on UK Forests, DG ENV Models for Exploring Future Trends in Biodiversity);
  - vi. changes in species, invasive non-native species and pathogen distribution under climate scenarios; some predictions of future fish stock changes/risks.

The certainty associated with modelled predictions and their temporal relevance depends on the quality of data included, complexity and the likely rate of change of key variables, but they are not suitable for long-term prediction.

3. **Qualitative Scenarios** use expert judgement to assimilate different types of evidence, including trends and models, to develop possible alternative futures based on different assumptions. There are many methods available for qualitative scenario creation, including expertise-based methods (e.g. averaging, Delphi), and virtual simulation (gaming).

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<sup>3</sup> European Environment Agency has published an overview of modelling types and existing European models ([http://www.eea.europa.eu/publications/technical\\_report\\_2008\\_11](http://www.eea.europa.eu/publications/technical_report_2008_11))

## APPENDIX 2:

### A SELECTION OF EXISTING BIODIVERSITY RELEVANT FORESIGHT PROGRAMMES (INCLUDING HORIZON SCANNING)

#### **Foresight** (<http://www.foresight.gov.uk/index.asp>)

Government funded initiative since 1994, with specific thematic panels; energy and natural environment, marine, chemicals. Supported by the *Horizon Scanning Centre*, which develops and undertakes formalised evidence scans. *Foresight* has published scenarios for Flood and Coastal Defence (30 - 100 years), Infectious Diseases (plant, animal and human; 10-25 years), and Land Use Futures (50 years), which include assessments of possible policy responses. In addition, several important scenarios studies of relevance to the environment are due for completion in 2010, including global food and farming, energy, built environment and migration. *Foresight* also provides comprehensive resources on definitions and methods in futures analysis.

#### **Defra Horizon Scanning and Futures Programme** (<http://horizonscanning.defra.gov.uk/>)

Launched in December 2002 and underpinned by five research themes: Environmental Constraints; Coping with Threats; Future Landscapes; Meeting People's Future Needs; Re-Thinking the Food Economy. A Baseline Scan identifying over three hundred emerging trends relevant to the Defra agenda was undertaken in 2003-2005. In 2009, developed nine key trends, in collaboration with other futures research teams across government (e.g. GO-Science) and elsewhere (e.g. Natural England and the Environment Agency). Defra published four marine ecosystem scenarios in 2006 (Alternative Future scenarios for Marine Ecosystems), with a 20-30 year timeframe and in the context of EU and global marine considerations. The Prime Minister's Strategy Unit produced the report '*Net Gains*' with JNCC and EN input in 2004; it predicted the future of the UK fishing industry under current trends and recommended some significant management changes. *HorizonS* is an online resource that provides a regular update on the outputs of horizon scanning by Defra, Natural England and the Environment Agency. It provides a synthesis of important environmental and social trends and analyses of some of the implications of changes for the natural environment and Defra and its network.

#### **The National Ecosystem Assessment** ([UK NEA](#))

The National Ecosystem Assessment (NEA), which will be completed early 2011, will include plausible futures (scenarios) for the UK's ecosystems and the services they provide, and outline policy options to secure continued delivery of the UK's ecosystem services. The development of the scenarios will include an initial SWOT analysis of existing scenarios, from which focal questions will be derived for use in subsequent analysis. An experts' workshop early in February 2010 also produced focal questions for consideration in the analysis. The scenarios will be developed using the morphological method, either at the habitat or ecosystem level.

#### **Royal Society** (<http://royalsociety.org/Content.aspx?id=10777>)

In April 2009, the Royal Society embarked on an 11-month inquiry into the role that science will play in equipping Britain to meet the economic, social and environmental challenges of the next fifty years. *The Fruits of Curiosity: science, innovation and future sources of wealth* will look beyond the current 10-Year Investment Framework to assess the long-term direction of UK research policy and investment.

**Environment Research Funders' Forum Horizon Scanning Group**  
(<http://www.erff.org.uk/about/structure/workinggroups/horizon/index.aspx>)

The group was established to identify the most important dimensions of environmental uncertainty that could impact the UK in the next 20 years. 11 dimensions of uncertainty were identified in 2007: Cities and the environment; Changing behaviours; Changing ecosystems; Consequences of population movement; Costs and benefits of renewable energy; Economic growth within environmental limits; Deploying technology; Food production; Reducing uncertainty around climate change impacts; Sustainability of water supply; Transport and mobility. Natural England led a workshop on *Changing Ecosystems* in April 2009, which will contribute to identification of key research needs.

**Living With Environmental Change** (<http://www.lwec.org.uk/news-archive/2009/8122009-paper-published-horizon-scan-global-conservation-issues-2010>)

Participated in a horizon scanning exercise with international scientists and policy makers and co-authored "*A horizon scan of global conservation issues for 2010*" (Trends in Ecology and Evolution, 1198). The National Ecosystem Assessment is an LWEC initiative (see above).

**Natural England** ([Natural England - The natural environment in 2060](#))

In November 2009, Natural England launched scenarios for England's natural environment in 2060. The aim of the scenarios, four in total, was to provide visions of how society might develop over the next 50 years and identify key issues for the natural environment that might arise in the long-term. The scenarios will be used to inform Natural England strategies, such as their vision for the uplands (due for launch in 2010), and are intended to influence research within the Living With Environmental Change programme. The method used to generate these scenarios was an expertise-based approach. The underpinning analysis of information provides a very useful inventory and review of scenarios work since 1996, including selected EU and international initiatives. NE has a dedicated Strategy and Environmental Futures Team (SEFT), which is charged with continually scanning the horizon for potential threats and opportunities facing the natural environment. It has developed a range of tools and techniques including future proofing, identifying a set of key strategic challenges, horizon scanning and scenarios, to assist in strategic planning. A regular briefing, *Strategic Challenges*, brings together the outputs of the most significant pieces of strategy and futures work in Natural England to ask 'what are the strategic challenges for the natural environment over the next 5-10 years' and 'what could they mean for us.'

**Scottish Natural Heritage**

SNH launched a horizon scanning system in 2008, which produces biannual briefings identifying key issues, their importance to SNH and proposed actions. The organisation, working with the Scottish Environment Protection Agency, the Scottish Futures Group – an informal networking arrangement so that those working in this area (primarily in the public sector) can share their experiences of horizon scanning and futures analysis.

**Environment Agency** (<http://www.environment-agency.gov.uk/research/policy/40177.aspx>)

The Environment Agency forecasting work includes environmental forecasts, statistics and forecasting models and technology and environmental foresight. See also Defra.

**European Environment Agency** (<http://www.eea.europa.eu/themes/scenarios>)

The EEA assesses long-term prospects for Europe's environment and the consequences of key-policy choices using various methodological approaches. The aims are to add value to current policy discussions, by consistently producing information with a broader and longer-term perspective, and to help organise the European environmental information systems to encompass information on future trends. The EEA also contributes knowledge and expertise to scenario-based assessments at pan-European and global levels. EEA maintains an Environmental Scenarios Information Portal, which includes inventories of forward-looking studies at national, EU and global levels. PRELUDE (PRospective Environmental analysis of Land Use Development in Europe) is an EEA project and explores what European landscapes may look like 30 years from now and beyond; five different 2050 land use scenarios were published in 2007, based on combined forecasting and semi-quantitative simulation methods.

**European Commission**

There are a number of projects and cooperation activities, funded mainly through the Framework Programmes: many undertaking horizon scanning and developing future scenarios in various sectors. DG Research and DG Environment have been involved in various projects; a recent example is the IEEP, Alterra, Ecologic, PBL and UNEP-WCMC (2009) *Scenarios and models for exploring future trends of biodiversity and ecosystem services changes* (Final report to the European Commission, DG Environment). The Joint Research Centre European Foresight programme - FORERA (<http://forera.jrc.ec.europa.eu/>) – is a European Research Area for Science and Technology Foresight. The European foresight team provides forward looking intelligence to support decision making and enhancing the use of foresight as an instrument for policy making in Europe. Current and recent projects include: Facing the future – time for the EU to meet global challenges; Future orientated technology analyses international conferences; FOR-LEARN tools for foresight analysis; Foresight in future member states and candidate countries.

**DIVERSITAS** (<http://www.diversitas-international.org/>)

The core programme bioDISCOVERY includes understanding and predicting the impacts of the drivers of biodiversity change; the programme is currently involved in several major global foresight initiatives.

**Convention on Biological Diversity** (<http://www.cbd.int/>)

The CBD Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) is remitted with the identification of new and emerging issues relating to the conservation and sustainable use of biodiversity, which is done in the lead up to each CoP via consultation. See also appendix 3.

**Organisation for Economic Cooperation and Development** ([Organisation for Economic Co-operation and Development](#))

The OECD International Futures Programme provides the Organisation with an early warning of emerging issues, pinpoints major developments, and analyses key long-term concerns to help governments map strategy. The Programme uses a variety of tools including multiyear projects, high-level conferences, expert workshops, and consultations; a futures-oriented online information system, and a network of contacts from government, industry, academia and civil society. Recent studies include agriculture and health biotechnology futures (2015), international migration (2030), the bioeconomy (2030), and family structures.

### **United Nations**

The Millennium Ecosystem Assessment (MA) Scenarios, published in 2005, and the United Nations Environment Programme 4th global assessment scenarios in 2007 (GEO-4) are perhaps the most relevant global foresight resources. The MA presents four global scenarios exploring plausible future changes in drivers, ecosystems, ecosystem services, and human well-being to 2050, with selected results up to 2100 (<http://www.millenniumassessment.org/en/index.aspx>). The MA scenarios method combines qualitative storyline development and quantitative modelling. GEO-4 includes scenarios for 2050 developed via drivers-pressures-state-impacts-response (DPSIR) forecasting method, underpinned by modelling drivers and change over the previous 20 years.

### APPENDIX 3:

#### EMERGING CHALLENGES FOR UK AND GLOBAL NATURE CONSERVATION IDENTIFIED FOR CONSIDERATION BY COP 10 OF THE CONVENTION ON BIOLOGICAL DIVERSITY

The Convention on Biological Diversity (CBD) defines a new and emerging issue as one where there is new evidence of unexpected and significant impacts on biodiversity<sup>4</sup>.

One of the functions of the CBD Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) is the identification of new and emerging issues relating to the conservation and sustainable use of biodiversity. During 2009, SBSTTA collated information on over 20 issues identified through open consultation; it will consider these at its May 2010 meeting and decide on recommendations to CoP 10 (October 2010). SBSTTA has chosen to focus its recommendations on future actions, within existing work streams, on the following issues (paper UNEP/CBD/SBSTTA/14/18):

- **Ocean acidification;**
- **Arctic biodiversity;**
- **Ground-level ozone;**
- **Ocean noise** (in relation to marine protected areas).

Three submissions from the UK are reflected in the above list:

- The Global Biodiversity Sub-Committee (GBSC<sup>5</sup>) submitted evidence relating to ocean acidification, Arctic biodiversity and the impact of ground-level ozone on biological diversity.
- The Royal Society made a submission based on its 2008 review of ground-level ozone.
- Professor William Sutherland, Cambridge University, submitted a briefing identifying the following as emerging issues: microplastic pollution; nanosilver in waste water; synthetic meat; artificial life; stratospheric aerosols; promotion of biochar; mobile-sensing technology; deoxygenation of the oceans; changes in denitrifying bacteria; high-latitude volcanism; invasive Indo-Pacific lionfish; trans-Arctic dispersal and colonization; assisted colonization; possible impact of REDD on non-forested ecosystems; large-scale international land acquisitions. This submission was based partly on NERC-funded horizon scans<sup>6</sup>.

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<sup>4</sup> Decision IX/29 of the Conference of Parties to CBD

<sup>5</sup> GBSC is a sub-committee of the UK Global Environmental Change Committee established by Defra in 2004; JNCC is a member of GBSC and provides the secretariat (<http://www.jncc.gov.uk/page-4962>).

<sup>6</sup> For example, Sutherland *et al.* 2008. Future novel threats and opportunities facing UK biodiversity identified by horizon scanning. *Journal of Applied Ecology* 45: 821–833.