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**JOINT NATURE CONSERVATION COMMITTEE**

**ADAPTING TO CLIMATE CHANGE: OPPORTUNITIES AND PRIORITIES FOR BIODIVERSITY CONSERVATION**

**Paper by the Inter-Agency Climate Change Forum**

**1. The need for climate change adaptation**

1.1 Climate science indicates that even if all anthropogenic greenhouse gas emissions ceased immediately, we would still experience substantial climate change. In any case, it is now clear that many actions to reduce greenhouse gas emissions are likely to be delayed due to technological, economic, political and cultural inertia and limitations. As a result, while in 2008 there is a requirement to adapt to unavoidable warming of 1.1°C (0.6°C observed to date, combined with 0.5°C to which we are committed), by 2020 it is likely to have increased to 1.5°C (0.8°C observed, combined with 0.7°C committed). Hence, climate change adaptation is essential now, and it is almost inevitable that there will be a greater need for adaptation by 2020.

**2. Developing the research agenda**

2.1 Adaptation to a changing climate is a relatively new field of study, with a burgeoning amount of comment, guidance, suggested practical tools and ideas for cross-sector integration, but with relatively little underpinning research. As the nature conservation sector moves from a focus on impacts evaluation towards adaptation, there is a need for more applied research to enhance our understanding of what constitutes appropriate adaptation and to fill the knowledge gaps exposed as we seek to deliver adaptation on the ground.

2.2 There are three broad sets of questions to be addressed through research if we are to adequately understand and manage the risks and vulnerability of the natural environment to climate change. These are:

- i. How do we recognise and measure resilience and resistance in ecosystems? How much resilience may occur inherently (i.e. autonomous adaptation)? How might this be enhanced through our intervention (i.e. directed adaptation)? What kind of data and analysis do we need to assess resilience?
- ii. How do we translate such knowledge of resilience and resistance into a set of practical tools and policy messages to ensure that future actions take this issue fully into account, especially in relation to landscape/seascape connectivity and permeability?

- iii. How do we know if species and habitats are adapting autonomously to climate change? How can we measure the success or otherwise of our directed adaptation measures?
- 2.3 Reviews of the research needs for climate change adaptation have been undertaken by the European Platform for Biodiversity Research Strategy (Annex 1, reference 1) and the UK Biodiversity Research Advisory Group (BRAG) (Annex 1, reference 2). The key research priorities identified by BRAG are summarised in Annex 2.
- 2.4 Annex 2 illustrates our limited knowledge base for adaptation, especially for marine and freshwater ecosystems. In particular, there is a need to understand to what extent adaptation principles, such as enhancing connectivity and heterogeneity, are applicable to freshwaters and the marine environment.
- 2.5 Other key areas of research that are not identified in the BRAG report but which could help inform future adaptation action include environmental cost analysis of projected climate change (and coupled socio-economic) scenarios, and improved understanding of the spread of non-native species, the risks that they pose, and appropriate actions.

### **3. Implementation of adaptation measures**

- 3.1 There has been a considerable amount of discussion, which is still ongoing, around the theory behind climate change adaptation in the UK. The real challenge, however, is putting into practice the developing theories and concepts, and then building on the lessons learned from such action. The UK Biodiversity Partnership principles (Annex 1, reference 3) set out a common agenda of objectives for adaptation for all the country agencies and those involved in implementing the UK Biodiversity Action Plan. The England Biodiversity Partnership (Annex 1, reference 6) has developed this into a wider set of principles. There is a need to further refine a vision of what adaptation should look like and to understand and monitor implemented adaptations.
- 3.2 There is an inherent natural capacity within habitats to adapt to change and therefore any adaptation measures that are implemented should seek to work with these forces.
- 3.3 It has to be recognised that there will often be a price to pay for adaptation and it is unlikely that there will always be a 'win-win' option. However, it is increasingly clear that action is needed and that it requires a positive approach with a tacit 'no regrets, no recriminations' policy.
- 3.4 In order to inspire and inform widespread application and implementation of adaptation measures, it is important to have a set of practical examples that can be promoted as case studies, and which are applicable to a wide range of habitats (and species). Such case studies must be supported by clear guidance

for land managers and information about the most appropriate tools for them to apply. There is a pressing need for an initial network of demonstration sites that embrace the principles set out in the UK Biodiversity Action Plan (and the national biodiversity/environment strategies in England, Northern Ireland, Scotland and Wales).

- 3.5 The European dimension to climate change adaptation needs to be considered. Many (and probably all) species that may move to the UK by natural dispersal will come from mainland Europe, and it is important to ensure that there is sufficient adaptive capacity being developed on an international basis.

#### **4. Cross-sectoral issues**

- 4.1 There is a risk that adaptation measures undertaken in support of agriculture, forestry, coastal defence, river flooding and water resource management will lead to changes in land-use or infrastructure that result in large-scale biodiversity loss. A holistic, cross-sectoral approach to climate change adaptation would mitigate these risks. However, this will be difficult to achieve as it will involve bringing together different sectors to consider and take account of the impacts on each other in an integrated manner. It also raises the question as to who will bear the costs of any compromises reached. The proposed cross-Government Adaptation Policy Framework should address these issues.
- 4.2 It is important to determine what risks and opportunities there are for biodiversity conservation from adaptation to climate change over the next 50 years or so. This will require a balanced consideration of social, economic and environmental issues. There are certain to be difficult conflicts and choices, which will vary from site to site. We need to determine what trade-offs we are prepared to accept for biodiversity if adaptation for different sectors is managed in an integrated way. For example, adaptation in land use policy is likely to have a significant affect on biodiversity, but the nature of the potential changes is unclear. It would be valuable to have more evidence of the benefits that adaptation for biodiversity can deliver for other sectors, e.g. agriculture, forestry and fisheries. There is certainly a need for evidence linking biodiversity impacts with economic and social impacts to strengthen the case for adaptation measures.
- 4.3 The development of greater connectivity for wildlife across landscapes and an increased area of semi-natural habitat has been identified as a goal for nature conservation in the UK. Further assessment of how this can be achieved is being undertaken in England, Wales and Scotland. If landscape-scale adaptation for biodiversity is to be achieved there is a need for dialogue with other sectors, in particular planning, agriculture and forestry.

#### **5. Monitoring**

- 5.1 Climate change poses serious threats to biodiversity and significant challenges to its conservation and sustainable use. The development of response strategies requires an understanding of the nature, extent and severity of these threats.

Monitoring programmes can provide the necessary scientific evidence to detect and quantify impacts and to inform the implementation of adaptive management schemes.

- 5.2 In the UK, there is a wide range of surveillance and monitoring programmes covering various aspects of biodiversity. However, recent work commissioned by Defra, CCW and Natural England has identified a need for improved monitoring of climate change impacts on biodiversity and better integration between existing schemes. It recommended that an extension to the UK Environmental Change Network (ECN) would provide a scientifically robust and cost-effective foundation for addressing these needs. The ECN currently monitors climate, air pollution, biodiversity and biogeochemistry at 12 terrestrial sites and around 50 freshwater sites. A larger network of less-intensively studied sites is under development to complement these and other initiatives, and provide wider coverage and better replication of habitats.
- 5.3 Monitoring programmes are already helping to identify and quantify the impacts of climate change on biodiversity and to develop policy and response strategies. However, consideration also needs to be given to assessing the effectiveness of adaptation measures, coupled to the development of a suite of climate change adaptation indicators.

## **6. Communication**

- 6.1 Delivering a timely and evidence-based climate change message to all sectors of society is vital. However, there are currently multiple messages relating to climate change coming from many sectors and motivations, the results of which can often sound contradictory, complex and/or uncertain to a lay-person. Often people and organisations struggle to identify actions they can undertake given the enormity of the problem and inherent uncertainties.
- 6.2 The nature conservation sector needs to be clear about the environmental adaptation messages it wishes to promote and the rationale behind such messages. Engagement and dialogue with a wide range of partners is vital in identifying collaborative action to tackle a global problem.
- 6.3 Communicating complex issues of climate change adaptation and biodiversity will be a challenge. We should be cautious in making assumptions about the existing level of knowledge of others and their communication needs. Scientific uncertainties need to be explicitly stated and put in context. Communication should cover the following points:
- i. the many interdependencies and interactions between climate change and biodiversity, both in terms of adaptation and mitigation, e.g. the role of biodiversity in supporting adaptation activities in other sectors;
  - ii. the distinction between mitigation and adaptation;
  - iii. the timescales over which environmental adaptation strategies or measures could operate;

- iv. the relative value of different adaptation activities, identifying ‘no-regrets’ options, and recognising when loss of biodiversity or environmental damage is inevitable;
  - v. the importance of ecological thresholds, which if breached may prevent future climate change adaptation;
  - vi. the risks and uncertainties of inaction
- 6.4 There is an ever-increasing resource base of research and policy-related outputs. A central database that is kept up-to-date would be helpful in providing referenced evidence for communicating climate change adaptation messages.

## **7. Integrating adaptation at multiple scales**

- 7.1 Achieving effective adaptation to climate change will require co-ordinated action at various geographical scales:
- i. at the *global* scale, multilateral environmental agreements, such as the UN Framework Convention on Climate Change and the Convention on Biological Diversity, have developed guidance relating to climate change adaptation that the UK can both contribute to, and utilise;
  - ii. within *Europe*, the forthcoming EU White Paper on adaptation to climate change should drive the integration of adaptation into all EU policies and legislation, such as the Common Agricultural and Fisheries Policies, and Natura 2000. There are also some relevant initiatives that extend beyond the EU, e.g. under the Bern Convention;
  - iii. at the *UK* level, the UK Biodiversity Action Plan has noted the need for guidance on adaptation, and the Climate Change Bill has addressed the need for an action plan, and for the evaluation and review of adaptation measures;
  - iv. climate change adaptation is primarily a devolved responsibility, and key action will take place at a *country* level, e.g. country biodiversity or environment strategies, rural development programmes and spatial plans all need to incorporate adaptation measures;
  - v. there are numerous *local* strategies and plans that should incorporate adaptation measures, including Local Development Plans, spatial strategies and Local Biodiversity Action Plans. The UK Climate Impacts Programme has recognised the key role that local authorities have to play in achieving adaptation.

## **8. The role of the Inter-Agency Climate Change Forum**

- 8.1 The Inter-Agency Climate Change Forum (IACCF) exists to support the UK nature conservation agencies in developing a strategic and coherent perspective on climate change issues across the UK and internationally. The forum is made up of officials and Council/Board members from the statutory UK nature conservation bodies. It is chaired by Professor Michael Usher, an independent member of the Joint Committee.
- 8.2 There are several actions relating to climate change adaptation that could be undertaken by the IACCF. These include:
- i. developing high-level positions, shared by all members of the IACCF, that can be used to influence global, European and UK processes (while being aware that shared UK positions must allow sufficient flexibility for the UK nature conservation bodies to work effectively with their devolved administrations to develop approaches that are tailored to their respective countries);
  - ii. encouraging, facilitating and undertaking research to underpin adaptation actions;
  - iii. helping to identify and promote a network of sites demonstrating good practice adaptation measures;
  - iv. building partnerships with other organisations to improve collaboration across sectors on climate change adaptation;
  - v. developing communication products that will aid practitioners, policy-makers and researchers in the UK nature conservation bodies and other organisations.

## **9. Conclusions**

- 9.1 Adaptation to climate change is essential now, and is likely to become more crucial in the future. Sections 2-7 of this paper set out some of the issues relevant across the UK. However, if adaptation for biodiversity is to be successful, implementation will have to be at a more local level. Questions will arise as to how individual species or habitat action plans might need to be modified, about how the management of individual protected areas might need to change, or about planning in wider areas of the land, freshwater and sea.
- 9.2 Perhaps one of the larger issues relates to perception. Nature conservationists, in trying to manage biodiversity and halt its loss, have always been attempting to reverse past declines. Criteria for conservation priority are often based on the scale of decline of species populations or habitat area. Conservationists are used to reacting when monitoring has demonstrated such problems. Adaptation to climate change is different. The effects are all too often perceived to be in the future. In the face of the urgency to do something about the present

declines, the potential future problems may appear as if they can be left until the future. However, action to halt the loss of biodiversity needs not only to take into consideration past losses and present conditions, but also the future effects of a changing climate.

- 9.3 In climate change, there is a major potential threat to our biodiversity. Some species and habitats will almost certainly be ‘winners’, being capable of increasing their population sizes and/or ranges. Other species and habitats will be ‘losers’, with dwindling populations or with declining ranges. The changes can be tracked via monitoring, and it is important that this is done. However, by careful planning it might be possible to assist at least some of the potential ‘losers’ so that populations do not decline to such an extent, or that ranges are not so drastically diminished. But this needs to be planned now rather than waiting for the changes to happen and then asking what can be done about it. In other words, the mindset of conservation managers needs to change from one of being reactive to one of being proactive to the likely future changes.

## Annex 1. Key background documents

1. European Platform for Biodiversity Research Strategy (2005). Climate change and biodiversity conservation: knowledge needed to support development of integrated adaptation strategies.  
[www.jncc.gov.uk/pdf/BRAG\\_CC\\_%20ClimateChangeAdaptationResearchStrategyFINAL.pdf](http://www.jncc.gov.uk/pdf/BRAG_CC_%20ClimateChangeAdaptationResearchStrategyFINAL.pdf)
2. Ferris. R. (ed) (2006). *Research priorities : climate change and adaptation*. UK Biodiversity Research Advisory Group.  
[www.epbrs.org/PDF/EPBRS-UK-2005-ClimateChange-final.pdf](http://www.epbrs.org/PDF/EPBRS-UK-2005-ClimateChange-final.pdf)
3. Hopkins, J.J., Allison, H.M, Walmsley, C.A., Gaywood, M. & Thurgate, G. (2007). *Conserving biodiversity in a changing climate: guidance on building capacity to adapt*. UK Biodiversity Partnership.  
[www.ukbap.org.uk/Library/BRIG/CBCCGuidance.pdf](http://www.ukbap.org.uk/Library/BRIG/CBCCGuidance.pdf)
4. Huntley, B. (2006). *Climate change and the conservation of European biodiversity: towards the development of adaptation strategies*. Discussion paper for Bern Convention Standing Committee.  
[www.coe.int/t/e/cultural\\_co-operation/environment/nature\\_and\\_biological\\_diversity/Nature\\_protection/ClimateChange\\_2007\\_en.asp](http://www.coe.int/t/e/cultural_co-operation/environment/nature_and_biological_diversity/Nature_protection/ClimateChange_2007_en.asp)
5. Mitchell, R.J., Morecroft, M.D., Acreman, M., Crick, H.Q.P., Frost, M., Harley, M., Maclean, I.M.D., Mountford, O., Piper, J., Pontier, H., Rehfisch, M.M., Ross, L.C., Smithers, R.J., Stott, A., Walmsley, C.A., Watts, O. & Wilson E. (2007). *England biodiversity strategy – towards adaptation to climate change*.  
[www.defra.gov.uk/wildlife-countryside/resprog/findings/ebs-climate-change.pdf](http://www.defra.gov.uk/wildlife-countryside/resprog/findings/ebs-climate-change.pdf)
6. Smithers, R., Cowan, C., Harley, M., Hopkins, J.J., Pontier, H. & Watts, O. (in prep.). *England Biodiversity Strategy: climate change adaptation principles*.

## **Annex 2. Research priorities related to climate change adaptation identified by the UK Biodiversity Research Advisory Group (BRAG)**

Further details are provided in the 2006 BRAG report *Research priorities: climate change and adaptation* (Annex 1, reference 2).

1. Assessing the effectiveness of landscape-scale initiatives for adaptation to climate change
  - Review the effectiveness of implementation of landscape-scale adaptation initiatives
2. Wetland, coastal zone and marine adaptation to climate change
  - Identify constraints and opportunities and provide recommendations for optimisation of adaptation in coastal zones
  - Identify options for managing the marine environment in response to climate change
  - Investigate the implications of climate change in wetlands
  - Improve understanding of the biodiversity impacts of managed retreat practices
3. Review of conservation targets
  - Review the suitability of conservation targets in Special Areas of Conservation, Special Protection Areas, Habitat Action Plans and Species Action Plans in light of climate change
4. Planning and implementation of adaptation strategies
  - Establish approaches to site/habitat management which allow adaptation to climate change
  - Improve planning for urban biodiversity under climate change
  - Improve the evidence base for understanding climate change impacts on permeability and connectivity
  - Evaluate which approaches to adaptation work for biodiversity
5. Genetic conservation
  - Undertake research on whether local genetic adaptation within species limits adaptation to climate change
6. Atmospheric chemistry and pollution
  - Improve understanding of carbon feedbacks in natural and anthropogenic systems, and implications for adaptation and mitigation strategies