



# MACIS



[www.macis-project.net](http://www.macis-project.net)

## Minimisation of and Adaptation to Climate change: Impacts on biodiversity -

Newsletter  
July 2008

### **Adaptation and mitigation measures and their impacts on biodiversity**

Lead consortium member: University of Oxford

Author: Pam Berry

A number of MACIS deliverables have been submitted to the European Commission and one of these is a review of possible climate change adaptation and mitigation measures and their potential effect on future biodiversity. The report covers a variety of sectors (agriculture, forestry, energy, built environment, river and coastal flood management, health, tourism and leisure; and conservation). For each of these sectors, the review considers what measures are being, or have been proposed either

- to reduce the effects of climate change by restricting further emissions of carbon dioxide to the atmosphere
- to sequester carbon entering or already in the atmosphere or
- to facilitate adaptation to changes in climate which are already taking place

The review collates, summarizes and analyses information from a very wide database of research findings (in the case of the agriculture sector alone, over 300 studies and papers were reviewed). For each sector the review sets out to identify what conflicts exist between mitigation and adaptation measures and the protection of biodiversity (species and habitats) and in so doing aims to identify any examples of “maladaptation”, i.e. where biodiversity would be negatively affected by the measure. Similarly, cases of synergy between any of the policies and measures reviewed are identified, so that “win-win-win” actions, which not only reduce emissions and atmospheric carbon as well as enhancing adaptation but also benefit biodiversity, could be highlighted.

As an example of findings for a single sector, the concluding section of the report’s chapter on the built environment (contributed by Oxford Brookes University) is reproduced below.

### **Built environment: Conflicts and synergies in mitigation and adaptation to climate change, as they affect biodiversity**

#### *Conflicts*

Adaptation to climate change in the built environment sector (urban areas, built infrastructure and construction) may induce conflicts between mitigation and adaptation objectives. Some adaptive measures will be taken by individuals as a result of behavioural changes. These might include: greater use of air conditioning, the sealing of open areas, or the removal of mature trees near houses which are seen as a storm risk. All these will probably have negative impacts for biodiversity and so are examples of “maladaptation”. More frequent watering of greenspace and gardens, helping to support “managed” biodiversity in dry conditions may be considered maladaptive as it may increase energy use and actually reduce water available for biodiversity elsewhere. Some mitigation and adaptation measures entail potentially adverse impacts, e.g. disturbance or fragmentation of habitats associated with changes in transport networks and travel behaviour. The design of new or regenerated urban areas cannot be resolved without reference to specific cases and requires further research: should this be relatively dense – reducing transport emissions but also reducing available green space – or relatively scattered, and therefore cooler but inevitably encroaching upon additional rural land?

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#### **Impressum**

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### *Synergies*

Some policies and measures may act positively in synergy for biodiversity, where interactions between measures provide suitable spaces with appropriate linkages and networks (provided with sufficient water resources) which can be successfully occupied by wildlife. Such measures also possibly lead to further benefits for people in the functioning of urban areas.

At the level of individual buildings, adaptation measures with benefits for biodiversity include green roofs and tree planting for shade. Adaptation measures and policies at a wider scale may offer benefits, particularly those associated with water infiltration and retention, with the protection of any semi-natural areas, or associated with an increase in green and blue infrastructure. These also offer opportunities for more sustainable recreation, e.g. walking and cycling.

### *Win-win*

This literature review has indicated options for climate change mitigation where there are opportunities for adaptation to be taken into account at the development design or regeneration stage for the built environment. In these cases the value of the measures for biodiversity is often indirect, i.e. acting to reduce pressures which increase emissions and climate change. In addition to emissions reduction, some of the measures discussed also offer direct benefits for biodiversity – e.g. green roofs and some forms of biomass production, reduction in disturbance or of heat levels in the urban heat island; similarly, developing habitats in association with walking and cycle-paths could also have direct benefits for biodiversity.

There are many adaptation measures available which can ease human adaptation to climate change and at the same time either directly or indirectly improve conditions for biodiversity in urban areas, offering potential for more resilient habitat. These measures include sustainable drainage systems and new flood retention capacity, additional erosion-proof habitats and flood provision, as well as green spaces, trees planted for shade, water bodies for cooling.

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## **Policy analysis for biodiversity under climate change**

Lead consortium member: Oxford Brookes University

Author: Jake Piper and Elizabeth Wilson

### **Comparing EU and national strategies**

EU and Member States' national policies on climate change and biodiversity have been reviewed and analysed by the Oxford Brookes University MACIS team. This section summarizes sections of their report.

Policy development across the EU is uneven, but it seems that nations are learning from each other and collaborating on research and policy development. Also, strategic adaptation plans from three countries (Finland, Spain and France) were analysed in more detail to see in what ways they might be upgraded. This is a rather new field of policy: awareness of impacts of climate change upon natural ecosystems is growing, as is awareness of the value and importance of protecting biodiversity as a route to moderating climate change.

Some countries are further advanced in this than others and late starters may be expected to make rapid progress given the material and models of approach now available as well as increasing research work across the EU - this provides opportunities for awareness raising, evaluation of approaches, etc. Cooperative transboundary activities on biodiversity conservation also provide a platform for sharing practice and for learning.

### **Policy integration**

Interactions between biodiversity and many other policy fields - perhaps especially agriculture, built environment and transport - are very complex, as are the interactions between the respective policy

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communities. Biodiversity and natural ecosystems provide services for other sectors (services such as pollination, flood mitigation and maintaining water quality) - this is acknowledged and the consequences of losing biodiversity are beginning to be recognised. Nevertheless, few of the major policy areas make significant reference to climate change and less attention is given to biodiversity.

The review has shown the complexity of interactions between sectors, operating at and across multiple scales. It is important not just that there is policy integration of climate change adaptation with other sectors (as proposed in the EU Green Paper), but that the adaptation and mitigation actions of each are also consistent. This is important for the achievement of the EU's biodiversity policies under conditions of climate change. There is therefore a clear need for measures at institutional (policy), operational (plan) and technical (implementation) scales to ensure consistency and avoid conflicts.

### **Measures for biodiversity protection by sectors**

Measures that could be taken by six major sectors (Agriculture, Built Environment, Centralized energy generation, Industry, Tourism and informal recreation, and Transport) were outlined. They offer ways to protect biodiversity and strengthen the resilience of four types of natural systems: ecosystems and biodiversity; water, rivers and wetlands; coastal areas; and soils.

Policies and measures which can help include full impact assessment procedures, principles such as “no net loss” or “net gain” in natural resources, the introduction of compensatory measures to counter impacts and restore system quality, and research. A pre-emptive and proactive style of engagement on impacts, acknowledging the value of the natural systems to the sectors, would help to prevent losses and may well cut long-term costs.

### **Assessment frameworks needed**

An assessment framework for policy and plans could help provide policy integration and to “climate proof” policy - i.e. to take into account potential impacts associated with climate change, extreme weather and sea level rise, and where possible to introduce measures which increase resilience to climate change. An SEA-based framework is proposed in order to integrate and harmonize land use and other decisions – risk assessment is also needed. A process and some techniques to assist in this assessment work are put forward to help in exploring and negotiating policy and measures with respect to impact mitigation and climate change adaptation. A systematic and transparent approach is necessary.

Clear strategic planning towards an achievable objective is needed at EU level and within Member States, to include funding, targets, implementation measures and monitoring; allocating responsibilities and setting a schedule for expected progress towards aims. Aims of the work should be to:

- research and address transboundary effects
- integrate biodiversity and climate change concerns across other sectors (e.g. transport, energy)
- promote a sense of urgency identify necessary changes
- seek consensus on a set of essential goals (in line with the strategic aim of the Water Framework Directive, “all water bodies will be restored towards good quality”)
- bring about harmonization of vision and action across the community
- offer incentives via funding, and seek to balance impacts of this new policy on different countries
- maintain a strong and continuing commitment to the NATURA 2000 network – but seeking to extend the network with additional areas

**The MACIS homepage [www.macis-project.net](http://www.macis-project.net) also lists all institutions, and all partners in the project.**

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## New publications

### Climate change can disrupt trophic interactions

**Schweiger, O., Settele, J., Kudrna, O., Klotz, S., Kühn, I.** (2008, in press): Climate change can cause spatial mismatch of trophically interacting species. – Ecology.

Recent climate change has already affected the spatial distributions of many species but future changes are likely to have even more severe impacts. In this context, climate change may have unexpected consequences when the distribution of one species is influenced by the distribution of another species. When we analysed the impact of three future climate change scenarios (medium, intermediate, maximum) on the distribution of the monophagous butterfly *Boloria titania*, which is restricted by both climate and the distribution of its larval host plant *Polygonum bistorta*, we observed an increasing mismatch of both potential future ranges. While the butterfly may expand considerably its future range (by 124-258%) increasing restrictions by its host plant will lead to a severe loss of its current range (52-75%). These findings strongly suggest that climate change has the potential to disrupt trophic interactions because co-occurring species do not necessarily react in a similar manner to global change.



The Titania Fritillary may expand considerable its future ranges – but its host plant will not  
(Photo: Walter Schön)

Oliver Schweiger, Helmholtz-Centre of Environmental Research

**James S. Paterson, Miguel B. Araújo, Pam M. Berry, Jake M. Piper, Mark. D. A. Rounsevell** (2008, in press): Mitigation, adaptation and the threat to biodiversity. - Conservation Biology

Two responses to the observed and projected impacts of climate change are mitigation and adaptation, as mentioned earlier in this newsletter. Both are necessary to reduce adverse impacts, but mitigation and adaptation activities in other sectors can interact synergistically or antagonistically with biodiversity and its conservation. This paper, is reviewing two case studies from the energy sector and identifying how a failure to recognize the impacts of such mitigation schemes on biodiversity could threaten human welfare.

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