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Biodiversity protection and climate change adaptation: two sides of the same coin

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As Europe experiences one of the mildest winters on record, both human society and the natural environment have to adapt to the effects of climate change. It is clear that human society would prefer to have no significant (negative) changes and to keep unavoidable changes as small as possible. In the context of biodiversity, adaptation entails allowing nature at all levels – from genes to ecosystems – to use existing natural adaptation mechanisms. Allowing this can, in turn, also reduce the impacts on human society.

Species' response to climate change

The most obvious responses to climate change can be observed in alterations to species distributions and the timing of biological events such as migration. However, less obvious and more subtle changes are happening all around us.

Ecosystems are composed of large numbers of species with complex mutual relationships. Some of the species are quite tolerant to changes in conditions, others are more sensitive. As a result of climate change, species may fall outside of their tolerance range, and thus disappear. If we are indifferent to these changes, we will end up with highly simplified and homogenous ecosystems. "Weedy" species will dominate our world and we will lose what is different, specific and therefore characteristic for each particular territory – our nature will lose its identity. This will of course affect the quality and quantity of the goods and services delivered by our ecosystems, although at present it is not possible to quantify the extent of these impacts.

It is important to keep in mind, that it is not only species that are relevant in adaptation to climate change. There is a direct link to many other issues such as, for example, soil erosion and degradation, loss of carbon captured in ecosystems, changes in natural pools of other nutrients, water retention capacity and related water regime, quality of water and the severity of weather events.

The accumulated additional stress will have a profound effect upon our natural ecosystems and what our world will look like. Where possible, we need to promote rather than undermine the natural

resilience of the ecosystems upon which we depend, in order to protect our natural capital and ensure the continued flow of ecosystem goods and services. We need to allow natural adaptation mechanisms to remain flexible, to keep our environment in balance, and at the same time contribute significantly to mitigating effects of climate change on human societies.

Space for people and nature

The principal requirement for ensuring the continued flow of ecosystem services is to safeguard the natural and semi natural ecosystems, which are primarily responsible for delivering these services. In other words, we need space for people on the planet, but at the same time we need space for nature. Space for nature could be found at different scales, and we should employ all of them. We should protect the remaining fragments of natural or semi-natural ecosystems in order to create refuges for species and we need to protect larger areas to allow room for natural or semi-natural processes.

In the EU we have developed a system of protected areas termed Natura 2000. Natura 2000 has to take into account that much of our existing habitats and landscapes have been shaped by human use and often depend on continued human use to sustain their biodiversity. Human exploitation of natural areas may thus be carried out in a way, which does not damage, or even enhances, the characteristics of a site or its biodiversity. However, some human activities are harmful to biodiversity. We should strive to minimise the negative impacts, especially in those cases where the carrying capacity of ecosystems is reached.

Due to the differing requirements of species and their role in maintaining the ability of ecosystems to function and be resilient to future change; the individual areas in our natural infrastructure should cover at least the minimum area for those species to survive and/or to uphold a given habitat. If the size is smaller than the critical minimum, the ecosystem will degrade and/or protected or endangered species will disappear. The Natura 2000 network encompasses both large

and small areas that play an equally important role in maintaining a broad variability of species and genomes, which in the long term will allow for the development of a wider range of adaptation options.

The path of evolution

The characteristics of species are the result of interactions between their genes and the environment. Thus changing environmental conditions drive evolutionary processes. Across the whole range of a species, different populations will show adaptations to local conditions. Some species can become particularly well adapted to a specific set of conditions, whereas others are able to thrive in a wide range of conditions. What we receive as ecosystem services in any particular area is the result of evolutionary processes and the local adaptations of these specialist and generalist species. Our approach to land use has acted to homogenise the landscape, thus reducing the variation open to species. We are witnessing a mass decline of species as a result, especially amongst those specialised to particular conditions. Climate change is likely to impose a major additional impact on evolutionary processes over the next century. Of particular concern is how this impact interacts with the fragmentation of habitats and homogenisation of landscapes. If we only allow evolution to work in fragmented, narrowly defined areas this is likely to result in ever more homogenised and simplified ecosystems, which may still deliver ecosystem services, but of limited variety and quality.

Facing the challenge

We are not powerless in the face of climate change and its effect on ecosystems. We can work with natural processes in order to conserve resilience. When species have the opportunity to migrate, they may move along climatic gradients and find the area best fitting their needs. Displaced species fulfilling a certain function in a particular locality may be replaced by ecologically equivalent species, which may immigrate from elsewhere. For both of these processes, we need to ensure connectivity of elements of the natural infrastructure – creating a really interconnected network instead of a patchwork of rather isolated parts. This means we need to address biodiversity issues at the broader landscape and seascape levels. We need to tackle the issues of fragmentation and artificial barriers by creating biological corridors, temporal refuges, or by using the countryside in a way that will allow the species to pass through. Only by putting elements of space and connectivity together, will we increase the resilience of natural ecosystems leading to a natural mitigation of climate change effects on human society. Resilient natural ecosystems are human societies' best defence against the negative impacts of climate change.

Clearly, climate change will not only have negative impacts on ecosystems; some may expand and even increase their biodiversity as the species composition changes. But when we view the European landscape as a whole and look at the relative changes that are taking place, we can see that the maintenance of biodiversity requires sufficient space, connectivity and variation. I believe that the answer to our future challenges lies in better land-use planning and decision-making and that the full implementation of the Action Plan, published in May 2006 as part of the European Commission Communication on Biodiversity, along with achieving our immediate target of halting the loss of biodiversity in the EU by 2010, can contribute significantly to solving some of the problems caused by climate change.

