Climate change: adapt and survive

The widespread flooding that hit the UK in 2013 and 2014 highlighted the vulnerability of biodiversity to meteorological extremes. Future climate change could stress ecosystems further – especially if attempts are made to constrain natural processes.

Between 2012 and 2014, many parts of the United Kingdom faced unprecedented hydrological extremes. Drought was followed by inland flooding and major tidal surges. Many different habitats and species were affected, particularly along the coast. The full impact of these events in terms of biodiversity is not yet known.

Climate change is exacerbating weather extremes. Recent tidal surges would have been significantly more severe if the mean sea level had been 50cm higher – the approximate rise under a conservative projection to the end of the century. This excludes changes in the character of the tidal surges themselves and factors such as increased storminess. Inland, wetter winters with heavier downpours will lead to more flooding similar to that seen in the Somerset Levels and elsewhere in the UK over the past two winters.

“Now is the time to reconsider our strategy for responding to climate impacts,” says Dr Geoff Darch, principal consultant, Climate Futures & Environmental Change, Atkins. “Our instinct is to restore conditions – putting things back the way they were before – as quickly as possible. But unless the events are extremes that are expected to decline in future, doing this will increase the ‘adaptation deficit’ – a measure of how well adapted something is to the prevailing climate.”

Preventing nature from taking its course could be storing up
problems for the future. In the clamour for restoration, there is the risk that opportunities could be missed. Using natural habitats more creatively – for example, by using them to reduce flood risk – could help to manage climate impacts on society.

This will mean facing some difficult decisions, particularly where uncertainties are high. However, through the use of robust decision-making techniques, combined with stakeholder collaboration at local, regional and national scales, there is an opportunity to achieve sustainable adaptation that will benefit both people and the biodiversity on which everyone depends.

**HEADING NORTH**

Action is already underway to understand potential impacts. For example, Natural England – the body that advises the government on the natural environment – runs a research programme on climate change that has identified impacts in a number of diverse geographical areas across England and which has started to identify adaptation measures. The UK Terrestrial Biodiversity Climate Change Impacts Report Card, published last year, demonstrates how climate change is already affecting habitats and species.

There are winners and losers. The UK already has a preponderance of species with northern range margins – plants and animals adapted to the relatively warmer conditions in the south. Species with southern range margins (those which are best adapted to the cooler northern climate) are fewer in number. The report card highlights the way that climate change could further shift the goal posts in favour of southern species, pushing their range ever further north at the expense of cold-area species.

Species whose range is likely to expand under this scenario include the stone curlew and the Adonis blue butterfly. Some species have already started to move north. One of these – the long-winged conehead cricket – has spread from England’s south coast to the midlands in little more than 20 years. By contrast, creatures at home in colder regions – such as the common scoter and black grouse – will find their habitats shrinking as the temperature rises.

These long-term population shifts are distinct from the short-lived, localised changes in species distribution triggered by high-impact events such as flooding. Again, there are winners and losers. As last winter’s floodwaters subsided, the moist ground left behind may have proved beneficial to wading birds. But it also meant fish populations were left stranded in some places.

**LIVING WITH CHANGE**

Principles for environmental adaptation have already been developed. Natural England and the Royal Society for the Protection of Birds (RSPB) recently published an Adaptation Manual which includes a reiteration of principles for sustainable adaptation, underlining the idea that adaptation should increase resilience and that approaches should be flexible.

The National Adaptation Plan, published last year, includes focal themes for the natural environment on building resilience to climate change impacts, and preparing for and accommodating change. The Manual recognises the need for planning both site and landscape-scale adaptation, including site objective setting and improvements to connectivity.


However, the sustainability reductions initiative relating to both directives, which aims to reduce abstractions of water from the environment where they are considered to be damaging protected habitats or preventing the achievement of ‘good’ status, does not appear to take climate change into account. In contrast, water companies have a legal obligation to include the impact of climate change in their Water Resource Management Plans.
In the past, changing the designations of conservation zones has been a reactive process. For example, the re-designation of the SSSI (Site of Special Scientific Interest) at Porlock in west Somerset was undertaken after a coastal gravel barrier was breached in a storm in 1996, demonstrating a failure mode where a natural system cannot adjust freely, in this case to a rise in sea level.

In 2008, Natural England published a SSSI notification strategy, stating that a feature of the SSSI series should be an ability to respond dynamically and to be resilient to the predicted effects of climate change. Natural England is developing its approach to changes to conservation objectives, interest features and site boundaries; it is likely to be increasingly required in future.

“In some cases habitats are unlikely to be naturally resilient. Repeated floods and or droughts, or a very severe event as at Porlock, will fundamentally and permanently alter the ecology,” says Dr Darch.

“Allowing or actively transforming a habitat is a complex and often controversial issue, especially at the landscape scale. Understandably, there are strong economic interests twinned with deep rooted cultural values which imbue a sense of place. But if we do not anticipate and actively manage for the future, then one of two situations will arise: either the natural environment will adapt itself, or we will be forced to spend increasing resources trying to maintain the status quo.”

**FACING THE FUTURE**

Uncertainty is often cited as a reason for inaction or delay. It is clearly not possible to know how the future will turn out: there are uncertainties in the impacts on, and responses of, individual species, habitats and – crucially – the interactions between different species. For example, researchers are already aware of stresses imposed by a loss of synchronicity. Some populations of the pied flycatcher Ficedula hypoleuca in continental Europe, for example, are declining because they now breed after the time of peak caterpillar abundance, which has become earlier.

Nonetheless, uncertainty and complexity are not unique to ecology and techniques that are explicitly focused on decision making under uncertainty are now being used in other areas of adaptation planning. In water resources planning, which is subject to large uncertainties over climate change as well as population and demand, adaptation pathways have been constructed to help frame the decision space on major adaptations. This type of analysis can be extended to incorporate costs using “real options” techniques.

“Robust decision-making methods might be suitable for evaluating adaptation associated with certain habitats that are highly vulnerable,” says Dr Darch. “These include sites that are highly exposed to climate hazards, sensitive to change and with low natural adaptive capacity. Among these are wetlands, coastal habitats and places where there are significant uncertainties – for example, in the size and timing of impacts or the nature of the adaptation measures.”

Adaptation can only be informed by technical exercises such as impact assessments and robust decision-making methods. The questions about adaptation raised in the Natural England/RSPB Adaptation Manual illustrate that it has to be a collaborative process at local, regional and national scales and involving, among others, local residents, landowners, local authorities, NGOs, environmental agencies, tourism bodies and business.

“This makes adaptation difficult, but it is time for society to face the future positively,” says Dr Darch. “If we do not, we are actually deciding to make life harder for future generations. Nature will ultimately adapt itself, but it is just that we may not like the consequences.”

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