

# Managing Protected Areas under Climate Change—Diverse Management for Biodiversity

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The loss of species and habitats is one of the major threats for biodiversity. Current drivers are anthropogenic factors such as the intensification of agriculture, urbanization, and infrastructure development. However, climate change adds to the mix and reinforces the negative effects on biodiversity. It alters abiotic habitat conditions, such as water balance, shifts phenology and the distribution of species, affects habitat structures and changes ecosystem functions and services (Bellard et al. 2012). To address these changes, we need improved institutional cooperation, expanded spatial and temporal observation, better models to project the effect of climate change scenarios, and greater effort to address multiple threats and global change drivers simultaneously within conservation management on different planning scales (Heller and Zavaleta 2009).

Climate-adapted conservation requires continuous adaptation to changing climate and its ecological consequences. Inter- and transdisciplinary research on cross-cutting themes is necessary to provide mutual learning among all actors and the development of effective strategies (Raymond et al. 2013). From 24 to 26 September 2012, the International Conference on Managing Protected Areas under Climate

Change (IMPACT) was held in Dresden (Germany) to meet the growing need for good-practice examples of climate-adapted conservation management. More than 120 experts in the field of nature conservation from over 30 countries joined the conference. Participants represented research institutions, national ministries and conservation agencies, NGOs, and managers from protected areas like Nature Parks, Biosphere Reserves, and National Parks. The event provided a platform for dialog between scientists and conservation managers to develop a better understanding of the complex impacts of climate change on biodiversity at the local level and the means to adapt management in protected areas accordingly.

This Special Feature covers selected contributions from the conference and tries to wrap up the main results from the management perspective. The need for further research and open questions is also highlighted. The topics covered in this Special Feature are focused on current as well as future management practices, legal aspects, policy recommendations, and supporting adaptation to climate change.

Three contributions address current and future management practices:

- Ivajnsic and Kaligaric (2014) evaluate three potential adaptation measures to protect coastal wetlands from sea level rise. They use a habitat transition model to compare the effect of buffer zones, the construction of artificial islets, and permanent, artificial sea-barriers on the preservation of two low-lying wetlands at the Adriatic coast.
- Ausden (2013) gives a very practical example of climate change adaptation by evaluating the management plans of the nature reserves of the Royal Society for the Protection of Birds in the UK. In this article, the main types of measures which are expected to facilitate

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adaptation of wildlife management to climate change are identified.

- Macgregor and van Dijk (2014) investigate how adaptation to climate change in protected areas has been implemented in south-east England. They used written questionnaires and semi-structured interviews to collect information from managers of a range of different conservation areas. The authors identified a set of major themes, among them a growing awareness of the need to take a strategic and large-scale approach to climate adaptation.

Two papers are related to legal and policy recommendations to support adaptation to climate change:

- Cliquet (2014) searches international and European regulations on protected areas and climate change for evidence about whether the legal framework is capable of dealing with the required changes of a climate-adapted management. In order to adapt the legal regulations to increasing dynamics in climatic conditions, more flexibility in their use and interpretation is recommended. However, this flexibility must not be understood as ‘legal’ flexibility, in the sense of weakening nature conservation provisions.
- Rannow et al. (2014) present an overview on challenges and priorities for the adaptation of conservation management as discussed at the IMPACT 2012. The paper summarizes the main issues for implementing adaptation that emerged from the conference. This includes a series of conclusions and recommendations on monitoring, assessment of species and habitat sensitivity to climatic changes, current and future management practices, as well as legal and policy aspects.

These contributions in this Special Feature illustrate how climate adaptation can be integrated in conservation management to help conservation managers today make decisions about climate impacts of the future.

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