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Adaptations of Forests to Climate Change: A Multidisciplinary Review

By Chris Eastaugh,
B Eng. (hons), Grad Cert Nat Res St.
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Photo by Alexander Buck,Hustai National Park, Mongolia

Over the past decade several reports have been produced that deal with the possible threats to forest environments in different parts of the world. At the same time, multidisciplinary reviews addressing adaptations of forests to climate change are rare. The present review published as IUFRO Occasional Paper 21 briefly summarizes the pertinent points of existing scientific papers and reports, and provides further details and references more closely aligned with the topic 'Adaptations of Forests to Climate Change'. It also extends prior reviews by combining the physical science review with discussion of economic and social impacts.

Effects of Climate Change

Forests around the world are widely expected to face significant pressures from climate change over the coming century. Although the magnitudes of the projected temperature rises and precipitation changes are still uncertain, modeling based on mean figures shows that ecological, economic and social disruptions are likely. Ecological effects range from phenological changes and extensions of growing seasons to widespread forest structural changes, species migrations and extinctions. Warmer climates are overall expected to have a positive influence on the wood products industries, although some regions are predicted to benefit more than others and some may be disadvantaged. The social effects of climate change are highly uncertain, and projects to strengthen community resilience and reduce vulnerability are recommended. By developing suitable responses to adaptation, harmful effects of climate change on forests and trees can be moderated and beneficial opportunities for people and nature can be exploited.

Interrelations between Forests and Other Sectors

The adaptations of forests to climate change will interact with several other sectors, including agriculture, tourism, legal/regulatory, industry, energy and conservation. This interaction may take three forms; competition for resources, synergies in mitigation/adaptation measures or negative consequences of pro-forest policies. Cases of resource competition, for instance, are competition for land between forestry and agriculture or between forestry and residential use. The increasing areas of biofuel plantations can also be expected to add to resource-use conflicts. Depending on management goals, the increase of forest area may potentially benefit conservation and biodiversity, timber production, recreational opportunities and ecosystem services such as clean water supplies. Yet there are also cases where policies that promote new forests for carbon sequestration, for example, may have negative consequences for biodiversity. Therefore, recognizing the interconnectedness of forests with other sectors can lead to better policy outcomes.

Policy Considerations

Although the global economic consequences for forests from climate change are broadly optimistic, much of this advantage is predicated on a high level of intervention in natural systems, through salvage harvesting, species replacement and plantation establishment. Environmental policies aimed at ensuring maximum biodiversity and the survival of species may also need a high level of management intensity, through changing vegetation structures and communities or altering disturbance regimes.

This multidisciplinary review serves as background document for the **Expert Panel** (http://www.iufro.org/science/science-initiative/adaptation-panel/) on Adaptation of Forests to Climate Change assembled by IUFRO in the framework of the Collaborative Partnership on Forests' **Joint Initiative** (http://www.iufro.org/science/science-initiative/) on Forest Science and Technology. The Expert Panel held its first meeting on 11-12 February 2008 in New York, USA. The full report of the Panel as well as a summary for policy makers will be available in spring 2009.

* The author spent an internship at the IUFRO Secretariat, Vienna, from 8 October to 14 December 2007.