

**Contribution to the Synthesis publication under the Nairobi work programme by the
International Union of Forest Research Organizations (IUFRO)**

ADAPTATION OF FORESTS AND PEOPLE TO CLIMATE CHANGE

Edited by Alexander Buck¹

The world's forests and climate are closely interlinked. Despite the growing interest globally in the relation between forests and climate change, there has been a lack of accessible, high quality information on the ability of forests to adapt to climate change. As part of its action pledge for the Nairobi work programme, the International Union of Forest Research Organizations (IUFRO) coordinated the first global assessment of the scientific knowledge regarding the current and projected future impacts of climate change on forests and people along with options for adaptation. The assessment identifies 'sustainable forest management' as an effective practice for reducing the vulnerability of forests and people to climate change. The report also concludes that the adaptive capacities of many forests will be exceeded in the course of this century unless greenhouse gas emissions are reduced substantially.

Why adaptation is needed

The world's forests and climate are closely interlinked. Forests contribute to global and local climate regulation and play a major role in the global carbon cycle. Forest biomass and soils are estimated to contain about 1,640 Pg of carbon which is about half of the total carbon stored in land ecosystems. At the same time, about 20% of the total carbon emissions come from forest cover loss and forest degradation. Therefore, the fate of forest ecosystems is of decisive relevance also for the future fate of the climate system.

Forests, and the goods and service they provide, are also essential for human well-being globally and locally. It is estimated that 1.6 billion people rely on forests for their livelihoods. Over two billion people, a third of the world's population, use biomass fuels, mainly firewood, to cook and heat their homes, and billions rely on traditional medicines harvested from forests.

Climate change is projected to have significant impacts on forests and will affect their ability to provide essential ecosystem services. Together with existing socio-economic processes, such human population growth, changes in the extent of croplands and pasturelands, and industrial pollution, the climate change impacts on forests will have far-reaching social and economic consequences.

A global assessment to inform decision making on forest adaptation

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Policy makers have repeatedly stated a need for more complete scientific information on the ecological, social and economic impacts of climate change on forests and people to support management and policy decisions².

Responding to this need, IUFRO initiated the first global scientific assessment with a specific focus on climate change impacts on forests and people. The assessment was carried out by a panel of leading scientists from all regions of the world in the frame of the Global Forest Expert Panels (Box 1). Membership in this Expert Panel on Adaptation of Forests to Climate Change also included several members of the Intergovernmental Panel on Climate Change (IPCC).

[begin of Box 1]

Box: Global Forest Expert Panels initiative

The "Global Forest Expert Panels" initiative of the Collaborative Partnership on Forests was launched in April 2007 to provide objective and independent scientific assessments of key issues in order to support more informed decision-making at the global level. The initiative is led and coordinated by IUFRO. The assessments are carried out by thematic Global Forest Expert Panels uniting leading scientists from around the world. The Collaborative Partnership on Forests (CPF) is a voluntary arrangement among 14 international organizations and secretariats with substantial programmes on forests.

[end of Box 1]

The Expert Panel presented its comprehensive report titled "Adaptation of Forests and People to Climate Change – A Global Assessment" in April 2009³. Based on the main findings of the assessment, a policy brief titled "Making Forests Fit for Climate Change - A global view of climate-change impacts on forests and people and options for adaptation" was prepared especially for policy and decision makers. The assessment received significant media coverage around the world.

Main results of the assessment and on-the-ground impacts

The assessment provides clear evidence that climate change over the past half-century has already affected many aspects of forest ecosystems, including tree growth and dieback, the distributions of indigenous species, the proliferation of invasive species, seasonal patterns in ecosystem processes, and the population dynamics of forest species; in some cases it has been implicated in species extinctions.

² Reference can be made, for example, to the Bali Action Plan and the Decision 1/CP.13, the ECOSOC Resolution 2006/49 agreed by the United Nations Forum on Forests, and the Decision IX/16 of the Convention on Biological Diversity.

³ Recommended catalogue entry: Risto Seppälä, Alexander Buck and Pia Katila. (eds.). 2009. Adaptation of Forests and People to Climate Change. A Global Assessment Report. IUFRO World Series Volume 22. Helsinki. 224 p.

[begin of Picture 1]

Picture: Yukon

Caption: Dead white spruce (*Picea glaucens*), Kluane, Yukon Territory, Canada. A series of warmer-than-average winters have allowed populations of the spruce beetle (*Dendroctonus rufipennis*) to develop, resulting in the mortality of almost 400,000 hectares of this boreal forest.

Photo credit: John Innes

[end of Picture 1]

The assessment also shows that climate change will have even increasing effects on forests and people in the future. Under all scenarios studied in the assessment and in all major forest types - boreal, temperate, sub-tropical and tropical forests – climate change is expected to affect the distribution of forest types and tree species. These impacts of climate change on forest goods and services will have far-reaching social and economic consequences.

The expected increases in extreme weather events such as heat stress, drought and flooding and the increased risk of fire and pest and disease outbreaks will cause additional stress in regions with large forest-dependent populations. The forest-dependent poor, who often depend directly on forests for their livelihoods and for meeting domestic energy, food and health needs, will be most vulnerable to such stresses. Non-wood forest products often provide a safety net for rural and urban communities during food shortages. Crop failures could increase under climate change, increasing the safety-net role of forests and placing greater pressure on them especially during extreme weather events. The increasing difficulty that people will have in meeting their basic needs for food, clean water and other necessities will lead to deepening poverty, deteriorating public health and increased social conflict (as, for example, people seek to migrate to more hospitable areas or to already-overcrowded urban centres).

[begin of Box 2]

Box: Coastal mangroves

Coastal mangrove forests are a widely utilized resource, providing nurseries for important fish species, for example, and helping to protect coastal areas from floods and coastal storm surges. Although such ecosystem services are highly valued, the area of mangrove forests declined significantly in the last half-century.

Under all scenarios of climate change, coastal storms are projected to increase in most regions. As erosion rates and the frequency or intensity of storms increase in the tropics, the coastal protection function of mangroves will become increasingly critical. Mangrove forests, however, are themselves vulnerable to climate change, their persistence depending on accretion rates relative to sea level. While mangroves appear to have adapted to sea level rises that have already occurred, it will be harder for them to do so as the sea level rises more rapidly and as conversion pressures increase.

[end of Box 2]

Yet, also some positive impacts of climate change on forests are expected. In certain areas, climate change could lead to substantial gains in the supply of timber. The combination of warming temperatures and the fertilizing effect of increased carbon in the atmosphere could fuel a northward expansion of the boreal forests running across the earth's northern latitudes.

Forests at risk of becoming net sources of carbon instead of net sinks

Forests currently sequester slightly more than a quarter of total anthropogenic emissions, an important ecosystem service in the context of climate change. Several models project, however, that the current carbon-regulating services of forests could be lost entirely under a global warming of 2.5°C or more relative to pre-industrial levels, when all land ecosystems would begin to turn into net sources of carbon. Such carbon emissions would add significantly to those from fossil fuels and deforestation and forest degradation, exacerbating climate change. Adaptation alone, therefore, will be insufficient to preserve the ecosystem services currently provided by forests and to lessen the risks of significant biodiversity losses. In addition to adaptation, mitigation that effectively curbs climate change is necessary, notably through a large reduction in fossil-fuel emissions and a cessation of deforestation.

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“We normally think of forests as putting the brakes on global warming, but in fact over the next few decades, damage induced by climate change could cause forests to release huge quantities of carbon and create a situation in which they do more to accelerate warming than to slow it down.”
Risto Seppälä, Chair, Expert Panel on Adaptation of Forests to Climate Change

[end of quote]

Emerging good practices – the role of sustainable forest management

The vulnerability of forest ecosystems can be reduced by reducing their exposure to climate change (e.g. through hazard preparation and early-warning systems, controlled burning, and other measures to reduce forest fuel loads), decreasing their sensitivity to climate change (e.g. by planting hardier species and increasing reservoir storage capacity to help avoid water stress in drought conditions), and maintaining or increasing resilience (e.g. by applying reduced impact logging, or by thinning overstocked stands).

Such measures can be implemented as part of sustainable forest management, which is a system of forest practices that aims to ensure that the goods and services derived from forests meet present-day needs while at the same time securing their continued availability and contribution to long-term development. To date, however, limited progress has been made in adopting sustainable forest management, particularly in developing countries. This is likely to limit the ability to adapt to climate change; there is an urgent need, therefore, to increase capacity for sustainable forest management.

Focus on Africa

The global assessment also revealed the limitations in our knowledge about forests and climate change. Given the diversity of forests, more precise regional and local climate-change projections are required. More research is especially needed on the forest-related social and economic impacts of climate change. The IPCC expects warming to be greater in Africa than the global average, with warming greatest in the drier, sub-tropical regions. Since Africa is also home to large forest-dependent populations, also the social impacts of climate change are likely to be particularly severe.

Based on the global assessment, IUFRO therefore initiated the preparation of a policy brief on 'Making African Forests Fit for Climate Change' as part of its action pledge. This regional policy brief aims to complement and further refine results of global assessment in collaboration with key knowledge holders in the region. Interim results will be presented at the Climate Change Conference in Copenhagen. The final policy brief will be available in spring 2010.

About IUFRO and the CPF

The International Union of Forest Research Organizations (IUFRO) is the only world-wide organization devoted to forest research and related sciences. Its members are research institutions, universities, and individual scientists as well as decision-making authorities and other stakeholders with a focus on forests and trees.

For further information, please visit: www.iufro.org.

The Collaborative Partnership on Forests (CPF) is a voluntary arrangement among 14 international organizations and secretariats with substantial programmes on forests. Its mission is to promote the management, conservation and sustainable development of all types of forest and strengthen long-term political commitment to this end.

For further information, please visit: <http://www.fao.org/forestry/cpf/en/>.

Acknowledgements

We gratefully acknowledge the generous financial support provided by the Ministry for Foreign Affairs of Finland, the Swedish International Development Cooperation Agency, the United Kingdom's Department for International Development, the German Federal Ministry for Economic Cooperation and Development, the Swiss Agency for Development and Cooperation, and the United States Forest Service.