



Deforestation

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Editorial

Tropical forests: Managing a resource with global and local value

Deforestation is not new: 2000 years ago most of Europe was covered by forests. Today, forests cover less than half of the continent. While forest area is increasing in many temperate regions, the rate of deforestation is alarmingly high in the tropics, where forests are disappearing faster than anywhere else in the world.

Forests are a valuable asset: not only do they provide renewable resources such as timber, food and medicines, but they also play a key role in the fight against global warming and biodiversity loss. This thematic issue reports on recent advances in our understanding of the impacts of deforestation and forest degradation, and explores ways to mitigate these damaging effects. The issue highlights the need for new policy and management tools, bringing together practitioners interested in climate protection, biodiversity conservation, and rural livelihoods to protect forests.

The impact of tropical deforestation on the climate will be felt the world over: two articles in this issue address the impact of deforestation on climate change (see 'Deforestation must stop to curb CO₂ emissions' and 'Deforestation's double-blow: carbon emissions and biodiversity loss'). The changing climate will also affect forests, and measures are needed now to facilitate adaptation (see 'Will tropical forests survive a changing climate?').

Forests are home to a rich array of wildlife, and deforestation and forest degradation can lead to destruction of valuable habitat: recommendations for sustainable logging which takes account of biodiversity concerns are reported in 'Managing logging for biodiversity'.

Involving local communities in managing forests is explored in 'Improving livelihoods for poorer forest dwellers in Nepal', while Payment for Environmental Services (PES) schemes are addressed in 'Are payment for environmental services schemes effective?'.

Many of the issues covered by these articles are controversial. For example, some governments do not accept that conversion of natural forests to tree crop plantations is 'deforestation'. Whatever the label, more information, analysis, and debate on this topic will surely lead to increased understanding of current challenges and future ways forward for sustainable forest management.

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Contents

Page

Deforestation must stop to curb CO₂ emissions

A new report calls for a halt to paper and palm-oil driven deforestation in Indonesia.

2

Deforestation's double blow: carbon emissions and biodiversity loss

Researchers in China have calculated the amount of carbon emissions resulting from deforestation and suggested recovery methods.

3

Will tropical forests survive a changing climate?

How can forests be adapted to survive rising temperatures? A new study investigates.

4

Managing logging for biodiversity

Forest managers are given advice on how to safeguard biodiversity in a recent report.

5

Improving livelihoods for poorer forest dwellers in Nepal

Community forestry schemes can benefit local people, but special steps need to be taken to ensure they are effective.

6

Are payment for environmental services schemes effective?

Recent research suggests that the cost of effective PES schemes could be higher than current logging fees.

7

Related articles

A selection of articles from The Science for Environment Policy News Alert.

8



Deforestation must stop to curb CO₂ emissions

Clearing tropical forests and peat swamps has a significant environmental impact, in particular on climate change. Around 20 per cent of the world's CO₂ emissions are caused by deforestation, Sumatra in Indonesia is one region that serves as an example of how forest clearance can contribute to carbon dioxide emissions and loss of biodiversity.

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“Global consumption of pulp and paper and palm oil is the underlying cause behind Riau’s deforestation.”

Indonesia is one of the world’s largest carbon emitters. Between 1990 and 2007, the estimated total emissions from the Indonesian province of Riau were 3.66 Gt of CO₂, including emissions from deforestation, forest degradation and decomposition and peat burning. Carbon sequestered by the acacia and palm oil plantations that replaced much of the forest was estimated to be 0.24 Gt CO₂. The average annual CO₂ emissions from deforestation in Riau Province between 1990 and 2007 was equivalent to 79 per cent of Indonesia’s total annual emissions from the energy sector in 2004.

In Riau Province in Sumatra, 4.2 million hectares (around two thirds) of tropical forests and peat swamp have been cleared in the last 25 years. Riau’s deforestation is driven by large pulp and paper companies, as well as a number of palm oil companies. The harvested wood from the forests is used in pulp mills. Around a quarter of the forest has been replaced with industrial pulpwood plantations, with about a third of the cleared land now used for industrial oil palm plantations. The remainder has been left as wasteland or is now covered by various smaller scale land uses.

Riau’s biodiversity rich non-peatland forest, home to the endangered Sumatran elephant, has almost all been cleared with the exception of small blocks of protected forests. The industry has now turned to clear natural forests on Riau’s vast peat lands that are estimated to hold Southeast Asia’s largest store of carbon and contain key habitats for the critically endangered Sumatran tiger. Sumatra is the only place on Earth where elephants, tigers, orangutans and rhinoceroses co-exist, but in Riau, Sumatran elephants and tigers are disappearing faster than their forests and may become locally extinct in a few years’ time if deforestation continues.

The report calls on both the Indonesian government and industry to create incentives to prevent all further deforestation and forest degradation on peat lands, using mechanisms to encourage commercialization of environmental services, such as avoiding deforestation, water and soil protection and biodiversity conservation. The report also suggests that all remaining unprotected peatland forest and other forests with high conservation values should be declared as nationally controlled protected areas and that new pulpwood or oil palm plantations only be established on existing wasteland on non peat soil.

Global consumption of pulp and paper and palm oil is the underlying cause behind Riau’s deforestation, the report concludes. Market forces may help prevent further forest destruction through carbon trading schemes that would benefit the local economy and outweigh incentives for further industrial development of the land.

Source: Uryu, Y., Mott, C., Foead, N., *et al.* (2008). Deforestation, Forest Degradation, Biodiversity Loss and CO₂ Emissions in Riau, Sumatra, Indonesia. WWF Technical Report, Jakarta, Indonesia. Report available to download from: http://assets.panda.org/downloads/riau_co2_report__wwf_id_27feb08_en_lr_.pdf.



Deforestation's double blow: carbon emissions and biodiversity loss

Deforestation increases CO₂ emissions, as forests are subjected to 'slash and burn' clearing to make way for agricultural land. In China, for example, vast areas of rainforest are being cleared to make way for rubber plantations. Using satellite images, researchers have assessed that destruction of natural forest between 1976 and 2003 caused a loss of 80 Teragrams (Tg)¹ of carbon.

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"Additional carbon sequestration could be achieved by promoting agroforestry practices as an alternative to slash and burn farming."

China is currently the world leader in afforestation, but these efforts hide pockets of significant deforestation and replacement of natural forest with plantations. This land-use change is also destroying natural habitats, with important consequences for forest biodiversity. The Xishuangbanna forest, for example, is home to the highest level of biodiversity in China. However, by 1976 this forest area had already shrunk by 70 per cent. Deforestation, to make way for rubber plantations, is leading to increased carbon emissions, as carbon stored as plant biomass is released back into the environment as CO₂. Loss of habitats and species is a further consequence in this region.

Researchers have coupled satellite imagery with 'on the ground' forest data, and estimated that the current rate of deforestation in the Xishuangbanna area is 1.12 per cent annually. The increasing demand for rubber and a series of national Chinese policies are driving deforestation in this region. If deforestation continues at the current rate for the next 20 years, the total forest cover in the region will decrease to 24 per cent, with an annual loss of 0.2 Tg of stored carbon per year.

The researchers proposed a forest recovery scenario to prevent continued loss of carbon stocks from this region, while continuing to allow rubber plantations to expand. For example, only establishing rubber plantations in areas of shifting cultivation (a form of agriculture in which the cultivated area is changed regularly, allowing soil properties to recover) below 1500m would reduce the impact of new rubber plantations on carbon stocks. Stored carbon could also be increased by converting grasslands and shrublands back into forest areas. Such young aged stands would contribute to carbon sequestration for the next 40-80 years. Additional carbon sequestration could be achieved by promoting agroforestry practices as an alternative to slash and burn farming. This might include establishing tea plantations in the understory beneath rubber plantations, which would also reduce soil erosion. These practices could also promote habitat development to encourage biodiversity. The researchers also suggest that, in the future, quantification of biomass change could be improved by performing an increased number of long-term surveys, over larger forest areas.

¹ 1 teragram = 1012 gram

Source: Li, H., Ma, Y., Aide, T.M. and Liu, W. (2008). Past, present and future land-use in Xishuangbanna, China and the implications for carbon dynamics. *Forest Ecology and Management*. 255: 16-24.



Will tropical forests survive a changing climate?

Most people are familiar with tree-planting as a way to offset carbon emissions. However, while the focus has been on reforestation and preventing deforestation, there has been little emphasis on how the world's tropical forests, managed for production purposes, will actually be able to adapt to the changing climate. According to a new study, there is an urgent need to put measures in place to ensure that the world's tropical forests will survive.

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“Temperatures and rainfall are predicted to become unstable, and an increase in the intensity of extreme weather events in such tropical areas threatens forests’ survival.”

Tropical forests are not just carbon sinks nor large carbon storehouses; they also make a major contribution to many national and rural economies. Temperatures and rainfall are predicted to become unstable, and an increase in the intensity of extreme weather events in such tropical areas threatens forests’ survival.

The speed and human-driven nature of change might be beyond forests’ natural capacity to adapt. However, since many countries perceive more immediate threats to their forests, such as those from pasture expansion and illegal logging, the threat posed by climate change has been overlooked. A team of researchers has now outlined measures that could help tropical forests to maintain their capacity to deliver goods and services under a changing climate and, in turn, the livelihoods of those who depend upon them.

According to the study, practical guidance and funding to implement the necessary measures are needed now. Some of these measures could be easily incorporated into current forestry management. For example, when selection pressure is strongest (e.g. at the seedling stage) the number of juvenile timber trees could be increased. This could be achieved relatively simply through site preparation to establish seedlings (for example controlled burning in Central American closed cone pine forests), thinning to promote crown development (possibly as part of controlled logging) and eventual fruiting of seed trees and harmonising the timing of tree harvesting to follow seed dispersal.

Efforts could also be made to increase the diversity of planted tree species, in order to establish species that will survive the changing environment. Translocation of tree seedlings and seeds and the maintenance of tree corridors would also allow greater natural seed dispersal, and enable natural, evolutionary adaptation to varying climatic conditions.

However, natural selection may need help in some cases. Enrichment planting of species at risk already takes place in the Brazilian rainforest, where it is mandatory to plant mahogany seedlings. It will become necessary to expand this to other threatened species as climate pressure increases. The choice of species that are planted should also come under regular review. This is particularly important for smallholders, who may be dependent on one species in a single plantation, and will need to be supported.

Practical guidelines need to be devised to indicate which forest management strategies can increase forests’ capacity to adapt in order to ensure long-term management objectives.

Source: Guariguata, M. R. , Cornelius, J.P. Locatelli, B. *et al.* (2008). Mitigation needs adaptation: Tropical forestry and climate change. *Mitigation and Adaptation Strategies for Global Change*. DOI: 10.1007/s11027-007-9141-2.

¹ Additional information: The TroFCCA project is exploring strategies to improve the ability of tropical forests to adapt to climate change. This project is funded by the European Union. For further information see: http://www.cifor.cgiar.org/trofcca/_ref/home/index.htm



Managing logging for biodiversity

Forest management should safeguard biodiversity as well as focusing on harvesting timber, a new report from South East Asia argues. Despite many initiatives such as codes of practice, criteria and indicators and certification schemes, guidelines and standards remain vague and lack quantitative targets. A new report makes detailed recommendations to help forest managers using mechanised logging to take account of biodiversity conservation.

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“As well as being a key area for plant and animal conservation, South East Asia also has strong demand for its timber, with a considerable proportion making its way to the EU.”

Illegal logging, poor management and deforestation continue to cause severe environmental damage, including biodiversity losses and climate change. This affects the livelihoods of local communities who depend on forests. Legitimate operators who are trying to manage forests sustainably find it hard to compete with illegally produced timber. However, where forest governance is strengthened, policies to conserve and sustainably manage forests and reduce deforestation become much more effective¹.

Reduced impact logging (RIL) aims to achieve environmentally sound timber harvesting, and has gained broad acceptance in the tropics. However, RIL guidelines are mainly focused on sustainable timber production and a few environmental aspects such as soil and water, with less concern on plants and wildlife.

A new report links recommended actions to the different phases of the forestry cycle: planning, infrastructure, logging, post-logging and monitoring biodiversity. The report also covers issues related to hunting, fire, invasive species, domestic animals, traffic and logging and conservation for local people. The report states that illegal logging, poor management and habitat destruction continue to be a cause for concern in the region, despite logging bans in a number of countries. However, some countries have made progress and in the past 20 years there has been a marked increase in the number of instruments and tools designed to enable, lead to and achieve sustainable forest management.

South East Asia's tropical rainforests contain high levels of biodiversity and fulfill important local and global ecological functions. As well as being a key area for plant and animal conservation, South East Asia also has strong demand for its timber, with a considerable proportion making its way to the EU.

The report's 104 detailed recommendations are based on the assumption that quite small adjustments to day-to-day forestry activities will substantially benefit wildlife in production forests. To ensure that forest biodiversity is managed according to ecological principles, the primary goals are:

1. To maintain large, well-connected forest landscapes (including unlogged areas) containing a range of local forest types, and to maintain the key landscape elements and wildlife resources.
2. To identify the major threats to forest wildlife and take steps to address them.

Source: Gustafsson, L., Nasi, R., Dennis, R. *et al.* (2007). Logging for the ark: Improving the conservation value of production forests in South East Asia. Center for International Forestry Research (CIFOR) Report, available to download from: <http://www.cifor.cgiar.org/Publications/Detail.htm?pid=2301>.

¹ EU site on Forest Law Enforcement, Governance and Trade (FLEGT): <http://ec.europa.eu/environment/forests/flegt.htm>



Improving livelihoods for poorer forest dwellers in Nepal

Community forestry in Nepal claims to be a successful model of participatory, community-based forest management, and there is considerable evidence that it is improving forest protection and regeneration. However, community forestry makes only a limited contribution to improving rural livelihoods. New research suggests that social factors may be limiting the access of poorer households to forestry products.

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“Conditions of inequality, reinforced by current community forestry policy and practice, severely challenge the development potential of community-controlled natural resources.”

Forests provide direct benefits to local people including food, fuel, timber, fodder, construction materials, medicinal plants, bedding for animals and leaves for composting. Indirect benefits include ecological services such as watershed protection, erosion control, soil fertility and windbreaks for farmland. Community forests in Nepal are areas of nationally owned forest handed over to user groups for community-based protection and use. Through community forestry the government in Nepal gives user groups rights of access, use, exclusion, and management but retains ownership of the land so that community forest lands cannot be sold or transferred. When the community forestry scheme began in 1988 it had the aim of meeting basic subsistence needs while protecting forestland. However, these two aims can be contradictory and government forest officials may view the benefits to livelihood as secondary.

New research uses data on seven hill districts in Nepal to explore the reasons why community forestry has made only a limited contribution to improving livelihoods of the poorest members of the community. The study found that two-thirds of user groups had low participation from women, low income or caste groups and that wealthier and higher caste households were more likely to be represented on executive committees. Executive committees may restrict use of forest products for the first five years after setting up a community forest, which has the most impact on groups who cannot afford alternative sources of fuel or food. This is despite the fact that many forests have sufficient resources to meet poorer groups' subsistence needs. Most user groups also miss opportunities to exploit non-timber resources such as herbs, cloth-grade fibres and resin that could generate income for community development.

Huge wealth disparities between community forest member households, limited access to vital forest products and significant power disparities within a community, may be behind the failure to improve the livelihoods of the poorest community members. The research also found a lack of technical knowledge among forestry officials which has led to a large backlog of forest inventories nationally. Furthermore, current policy dictates that inventories can only be carried out by government foresters. The author writes that loosening that restriction, or allowing non-government forest technicians to conduct inventories, would help resolve the backlog considerably.

Conditions of inequality, reinforced by current community forestry policy and practice, severely challenge the development potential of community-controlled natural resources. Bilateral aid organisations may be reinforcing local power disparities and one remedy would be to encourage more inclusive local decision making, for example by requiring user groups to consist of elected representatives from all sectors of society.

Source: Thoms, C. (2008). Community control of resources and the challenge of improving local livelihoods: A critical examination of community forestry in Nepal. *Geoforum*. 39(3): 1452-1465.



Are payment for environmental services schemes effective?

Designing an effective payment for environmental services (PES) scheme is a complex task, requiring an understanding of the interactions between communities and logging companies. Recent research suggests that the cost of effective PES schemes could be higher than current logging fees and that PES schemes should be targeted at particular communities to maximise environmental benefits.

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“Although communities offered the lowest payments from logging deals might seem logical targets for PES schemes, the research found that these communities tend to be communities that are unable to enforce property rights.”

The rapid expansion of commercial logging in Indonesia under ex-President Suharto resulted in the decline in Indonesia's forest cover of 40 per cent between 1950 and 2000. Around 2 million hectares are lost each year, with lowland forests predicted to vanish from Sumatra and Kalimantan by 2010 if current trends continue. Biodiversity, habitats and carbon sinks are being lost and the environment damaged for forest-dependent communities.

Logging deals offer a range of fees per cubic metre of timber from 0.28 to 11.80 US Dollars, with an average of 3.60 US Dollars. Although communities offered the lowest payments from logging deals might seem logical targets for PES schemes, the research found that these communities tend to be communities that are unable to enforce property rights. Such communities may be unable to enforce a PES agreement and prevent logging activities from taking place anyway.

PES schemes also influence the value that a community places on the standing forest. By providing a potentially lucrative alternative income source, PES strengthens the community's bargaining position vis-à-vis the logging company. If these considerations are not taken into account, introduction of a PES scheme might simply allow the community to negotiate more lucrative logging contracts, rather than encouraging conservation. The research also found that some communities will preserve the forest in the absence of a PES scheme. The researchers recommend that PES schemes be targeted at communities that would not otherwise conserve the forest, to maximise environmental gains.

This new model could assist in PES design in similar cases where local people depend on natural resources for their livelihood and can make decisions on resource use, but have weak property rights and external commercial forces are present.

In a separate analysis¹, researchers compared the design, costs and environmental effectiveness of a range of PES schemes from 12 countries. PES was defined as a voluntary transaction where a well-defined environmental service, such as watershed protection or carbon sequestration, was purchased. Clear differences were found between PES programmes funded by the users of the service provided, such as water supply customers, and government-financed schemes. User-financed programmes were likely to be more efficient – better targeted, tailored to local conditions and needs and monitored to ensure conditions were met. They also had fewer additional objectives, such as poverty reduction. However, in some situations, government-financed PES programmes are the only feasible approach, for example for carbon sequestration.

Source: Engel, S. and Palmer, C. (2008). Payments for environmental services as an alternative to logging under weak property rights: The case of Indonesia. *Ecological Economics*. 65(4): 799-809.

¹ Additional information from: Wunder, S., Engel, S., Pagiola, S. (2008). Taking Stock: A comparative analysis of payments for environmental services programmes in developed and developing countries. *Ecological Economics*. 65(4): 834-852.



A selection of articles on Forests from the *Science for Environment Policy* News Alert

Extreme weather affects forest communities for decades (10/4/08)

Rare and extreme weather events have a major long-term effect on forestry-reliant communities in Northern Europe, according to recent research. Although more general climate change scenarios have been widely discussed, government planning for the socio-economic impact of major storms accompanying climate change can limit the long-term effects on communities.

Managed forests and renewable wood reduce greenhouse gases (3/4/08)

Forests, and the wood-products they produce, can absorb or produce highly variable amounts of CO₂, depending on how they are managed. New research provides guidelines for harvesting forests, while limiting greenhouse gas emissions. Wood is a renewable resource and the greatest environmental benefits from using wood occur when it is used first in the construction industry, and then recycled, if practical, or used to generate energy.

Forests benefit biodiversity in adjacent grasslands (7/2/08)

Commercial forestry, often slated as monoculture, may have an important role to play in maintaining biodiversity. This beneficial effect occurs in nearby fields grazed by livestock, rather than the forest itself. This finding could be important for the conservation of grassland species, which have declined dramatically over the past 100 years as agriculture has intensified in Europe.

Building an effective carbon credits market to reduce deforestation (24/1/08)

Deforestation in tropical countries is often driven by the economic reality that forests are worth more dead than alive. But a new study conducted by the World Agroforestry Centre (ICRAF) and its partners in three major tropical forest regions has found that the emerging market for carbon credits could radically alter that equation. In most areas studied, the various ventures that prompted deforestation, such as clearance for agricultural purposes, rarely generated more than 5 US dollars for every ton of carbon dioxide equivalent they released and frequently returned far less than 1 US dollar. Meanwhile, European buyers are currently paying 23 Euros - about 35 US dollars - for an offset tied to a one-ton reduction in carbon dioxide emissions.

Integrating Forests in the Context of National Accounting (08/11/07)

Currently, different frameworks exist for forest accounting at national level within the European Union. In this context, an Austrian researcher has recently discussed their main characteristics and underlined their differences based on Austrian experiences. He suggests developing unambiguous protocols for dealing with the industry-specific challenges of national accounting as well as harmonising the different accounting schemes with other forest-related statistics.

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