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FORESTS, PEOPLE AND WILDLIFE

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Cover:
From Henri Rousseau, *The dream* (1910)

Contents

Forests, people and wildlife

Unasylva celebrates 2010, the International Year of Biodiversity, by examining strategies for the successful cohabitation of forests, people and wildlife. This issue addresses the challenges of balancing conservation and use of plant and animal biodiversity in forest settings, particularly where people's livelihoods or species survival are at stake.

The first article, by E. Kaeslin and D. Williamson, summarizes some of the main issues and challenges to be considered in managing forests and wildlife so that both they and people benefit. Topics considered include threats to forests and forest wildlife from overuse and uncontrolled trade; human-wildlife conflict; the potential and risks of ecotourism; and the challenges of integrating conservation and development.

Especially in Africa, the increasing proximity of people and wildlife has multiplied the losses of life and property due to human-wildlife conflict. A short contribution introduces a toolkit developed by FAO and partners in southern Africa to assist villagers in selecting appropriate solutions according to the case.

S. Nguiffo and M. Talla analyse the ineffectiveness of wildlife law in Cameroon, attributing the frequent violations to the law's failure to recognize adequately the contribution of local customs to sustainable wildlife resource management. The article emphasizes the contradictions in a law that encourages wildlife safaris and sport hunting as a source of revenue for the State, but prohibits traditional hunting practices that are fundamental to local livelihoods and culture.

The next articles explore aspects of community involvement in biodiversity conservation. E.K. Alieu, drawing mostly on examples from Sierra Leone, underlines the value of incorporating traditional knowledge and practice in conservation strategies. He emphasizes that involving communities in conservation is the best way to obtain their support for it.

Rawee Thaworn, L. Kelley and Y. Yasmi present an example from Thailand where the creation of a national park prevented local communities from carrying out their livelihood activities. In this case exclusion – the more traditional paradigm for protecting biodiversity – resulted in serious conflict between villagers and park authorities. The authors describe the negotiation process that eventually succeeded in defusing the situation and restoring some of the villagers' rights to use the resources. This not only fostered the villagers' survival, but also encouraged them to become active promoters of protection measures.

Nepal has extensive experience in community conservation approaches. T.B. Khatri presents one of the solutions adopted to balance conservation and people's livelihoods in Nepal's protected areas: buffer zones where sustainable use of natural resources is permitted and a portion of revenue from protected area management (particularly tourism) is reinvested in local development.

In South Africa, the end of apartheid created a particular situation for devolving forest management, with previously appropriated land now being returned to its rightful owners. M.A.I. de Koning describes a model developed to negotiate co-management agreements for land restitution in protected areas. The viability of co-management is first evaluated based on the area's biodiversity and tourism value.

Ecotourism is a relatively new concept for bringing together forests, people and wildlife in beneficial ways. It can raise people's awareness of conservation needs and offer sustainable livelihood opportunities in rural areas. A. Bien explains its growth and particular success in Costa Rica, also noting the risks to be considered in developing policy to promote ecotourism. Next, a short piece describes a novel form of ecotourism: canopy walks, which although originally developed for research, now make it possible for all kinds of people, in all regions, to explore the forests from high above the ground.

Finally, L. Miles and B. Dickson examine the outlook for biodiversity conservation in the context of the global climate change negotiations. They outline how REDD-plus – actions on reducing emissions from deforestation and forest degradation, including conservation and enhancement of forest carbon stocks and sustainable management of forest – can be planned in such a way as to promote biodiversity benefits while combating climate change.

Additional shorter pieces highlight FAO's "One health" approach to animal health, which considers the connectivity among ecosystems, wildlife, livestock and people in addressing emerging disease threats; the merits of edible insects; building local capacity to implement the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) for timber species; and a project in Switzerland that provides opportunities for volunteers – including corporate employees – to do hands-on forest maintenance work, with benefits for both the forests and the volunteers.

Until recent decades, the main strategy for conserving forest biodiversity was to keep people out of the forest. There will always be cases where strict protection is necessary, but as the articles in this issue demonstrate, allowing local people, and sometimes tourists, to use and appreciate the resources may be a better way to ensure their conservation. Only those solutions that carefully balance varied interests, and that integrate (rather than separate) resource use and conservation, will be sustainable.

Forests, people and wildlife: challenges for a common future

E. Kaeslin and D. Williamson

An overview of conservation issues affecting the successful coexistence of forests, people and wildlife.

Edgar Kaeslin is Wildlife Officer in the Forest Assessment, Management and Conservation Division, FAO Forestry Department, Rome. **Douglas Williamson** is a consultant based in Cambridge, United Kingdom; he was Wildlife Officer in the FAO Forestry Department until his retirement in 2006.

In addition to providing people with wood and other plant products for food, construction and income, and ecosystem services such as freshwater, soil protection and climate regulation, forests are also major habitats for wildlife. Forest wildlife likewise provides both products (e.g. honey, wild meat, even edible insects [see article by Vantomme in this issue]) and ecosystem services (e.g. pollination, seed dispersal). Forests and wildlife together provide a basis for commercial and/or recreational activities such as hunting, photography, hiking and birdwatching. On a global scale, the goods and services provided by forests and forest wildlife are worth many billions of dollars. Added to this is their cultural and spiritual value which cannot easily be expressed in monetary terms.

This article summarizes some of the main issues and challenges to be considered in managing forests, people and wildlife so that all three benefit.

THREATS TO FORESTS AND FOREST WILDLIFE

Despite their value, or often because of it, even protected forests and wildlife face a formidable array of threats attributable to people. These include:

- conversion of forest to agriculture;
- overgrazing of woodlands;
- unsustainable harvesting or collection of wood, fuelwood and non-wood forest products;
- excessive hunting;
- illegal wildlife trade;
- encroachment of human settlement;
- tourism and recreational pressure;
- mining and fossil fuel extraction;
- forest fires.

The International Union for the Conservation of Nature (IUCN, 1999) defined three categories of threats to protected areas:

- removal of an individual element of a protected area without alteration

Forests and forest wildlife offer people not only products and ecosystem services but also recreational activities such as nature tourism, photography, hiking and birdwatching

FAO/FO-5874/K. SHONO

FAO/FO-7009/A. PERLIS

FAO/CTU000129

Wildlife harvested for bushmeat includes certain reptiles, including this tropical American edible iguana

of the overall vegetation structure – for example, animal species hunted for the bushmeat trade, high value timber species and commercially important ornamental plants;

- overall impoverishment of the ecology of a protected area by, for example, persistent poaching, unregulated tourism and recreation or encroachment of human settlement;
- major conversion and degradation, for example, by the removal of forest cover, the routing of a major road through the protected area or the undertaking of mining operations.

There are two main drivers behind these threats: the increasing consumption of wealthier populations, which stimulates agricultural and industrial production, resource extraction and tourism; and poverty, which creates needs for land and resources, especially in developing countries.

These drivers are in turn related to factors such as population growth, economic growth, trade and development; legal and governance issues, including corruption; insecure land tenure; lack of scientific and technical capacity; international debt; economic and social inequality, including gender inequality; conflict and war.

These dynamics form the backdrop for any action to address the threats to forests and forest protected areas. The centrality of threats in the thinking of conservationists is reflected in the development of Threat Reduction Assessment (TRA) as a simple and practical method of estimating the success of conservation measures (Salafsky and Margoluis, 1998). In essence, this approach involves identifying the threats to a given conservation area, developing responses to these threats and monitoring the degree to which the responses are successful.

OVERUSE AND TRADE OF WILDLIFE RESOURCES – THE EMPTY FOREST SYNDROME

Of the many threats that forest wildlife faces, none has had a more severe impact than unsustainable, unregulated and often illegal hunting and trapping for commercial trade in wildlife and wildlife products, including the pet trade, across the developing world. Wild forest animals captured and traded as pets include mammals, birds, fish, amphibians, reptiles (e.g. tortoises, lizards) and even spiders (e.g. tarantulas). Wildlife products include bushmeat and high-value commodities such as ivory, rhinoceros horn and tiger bone. Animals harvested for bushmeat include common ungulates, rodents, large birds and reptiles (alligators, crocodiles, snakes) as well as larger threatened species such as chimpanzees, gorillas, bonobos, wild pigs and elephants.

As a result of faunal depletion, the remaining primary tropical and subtropical forests, which still provide good habitat for wild animals, are widely becoming empty of large vertebrates (see also Box on

Ethical considerations in forest and wildlife management and conservation

Jeremy Bentham (1748–1832), an English philosopher, legal and social reformer and early advocate of animal rights, articulated a criterion for identifying individuals whose interests need to be considered: their ability to suffer. Singer (1995) expressed this ethos as follows:

The capacity for suffering and enjoyment is … not only necessary, but also sufficient for us to say that a being has interests, at an absolute minimum, an interest in not suffering. … So the limit of sentience (… the capacity to suffer and/or experience enjoyment) is the only defensible boundary of concern for the interests of others.

Among the animals affected by human activities in terrestrial ecosystems, those that are the most closely related to humans – large-brained, highly sociable species such as bonobos, chimpanzees, gorillas, orang-utans and elephants – suffer in ways that humans can easily imagine. Bonobos and chimpanzees, *nota bene*, share around 98 percent of their DNA with humans.

For the animals that experience it, suffering is not an abstract philosophical issue, but a harsh physical reality. Their interests therefore need to be considered. How this should be done is an important question for forest and wildlife conservationists and managers. In an ethically responsible world an obvious response would be to include ethical implications in the overall planning and management of human activities.

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Crocodiles on sale in a fish market, Brazzaville, the Congo

p. 4). Forests thus deprived show not only shifts in the relative abundance of animal species, but also reduced seed dispersal and altered patterns of tree recruitment (Wright *et al*., 2007) and may thereby be impairing the functioning of the globally important carbon sink provided by tropical forests (Brodie and Gibbs, 2009).

The Convention on Biological Diversity (CBD) Liaison Group on Bushmeat defines bushmeat hunting as the harvesting of wild animals in tropical and subtropical forests for food and non-food purposes, including for medicinal use (CBD, 2009). In Central Africa, an estimated 579 million forest mammals are consumed annually – up to 5 million tonnes of dressed bushmeat (Fa, Peres and Meeuwig, 2002). On Bioko Island, Equatorial Guinea, hunting has reduced primate populations by 90 percent in some areas and caused local extinction in others (Bennett, 2006).

Even in remote and protected areas, such as the Okapi Wildlife Reserve in the Democratic Republic of the Congo, the commercial bushmeat trade in markets hundreds of kilometres away threatens the survival of indigenous populations that depend on sustainable hunting for their subsistence and livelihoods (Pitman, 2010). In Africa the bushmeat trade is often facilitated by logging activities, because logging roads provide easy access to increasingly remote forests and logging trucks are used for transporting bushmeat. Moreover, logging companies often regard bushmeat as a free food supply which relieves them of the responsibility to provide for their labourers (Nasi *et al*., 2008; Poulsen *et al*., 2009).

Unsustainable hunting and trade in wildlife for use as food and in traditional medicine are also serious conservation and development concerns in East and Southeast Asia, where the severity of the problem is related to high human population densities, a long tradition of consuming wildlife products for medicinal use (e.g. tiger bone for arthritis, snake bile as a tonic) and exceedingly rapid economic growth. In Viet Nam, 12 species of large animals have become extinct, or virtually extinct, in the past 50 years, mainly as a result of hunting. Every major protected area in Southeast Asia has lost at least one species of large mammal to hunting, and most have lost many more (World Bank, 2005). Ho Chi Minh City, Viet Nam has an estimated 1 500 restaurants selling wildlife meat; every year 90 000 wild mammals are sold for meat in a single market in North Sulawesi; and 1.5 million live birds are sold annually in the Pramuka market of Jakarta (Bennett, 2006). When populations of a target species in one area decrease, markets seek their supplies from other species such as smaller mammals (e.g. rodents) or from other areas, causing ever-widening circles of loss.

Beyond the tropics, commercial wildlife trade also poses a threat to wildlife populations in Mongolia's temperate steppes and woodlands, as hundreds of thousands of Mongolians have turned to hunting wildlife – particularly for the large Chinese market – as one of the few available income alternatives in the post-Soviet era (World Bank, 2006).

In the Neotropics, the large-scale hunting of forest wildlife is still mostly within the limits of sustainability, mainly because of lower human densities. Species harvesting rates in relation to production have been found to be 30 times less in the Amazon than in the Congo Basin (Fa, Peres and Meeuwig, 2002). But even in this part of the world, the defaunation process is spreading rapidly (Box below).

Private industry, trade in wild meat and changing local subsistence patterns: an example from Ecuador

Between 2005 and 2007, the trade of 11 717 kg of wild meat (mostly pacas, white-lipped peccaries, collared peccaries and woolly monkeys) was recorded in a wholesale wild meat market in Pompeya, near Yasuni National Park in Ecuador. The market was developed near a road built to facilitate oil extraction in the national park, offering an opportunity for local Waorani and Kichwa indigenous people to trade with commercial dealers. Free transport provided by the oil company within the park indirectly facilitated the hunting activities. Prices for wild meat were up to two times higher than those for domestic animal meat. Almost half of the wild meat delivered to the market was bought for resale at restaurants in Tena, a medium-sized town 234 km distant (Suárez *et al*., 2009).

International trade in wildlife

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates international trade in endangered wildlife species and derived products. Yet the illegal wildlife trade thrives nonetheless.

China is the world's largest importer of wildlife products, with continuous demand for turtles, ivory, tigers, pangolins, snakes and many other species used for food or medicines. The world's second largest importer of wildlife products is the United States of America, which since 2000 has imported almost 1.5 billion live animals, mostly from wild populations in Southeast Asia (Rosen and Smith, 2010). Between 1992 and 2002, trade in wildlife and wildlife products in the United States increased by 75 percent, and it shows no sign of abating.

Because of the ineffective enforcement of CITES regulations in many countries, the illegal wildlife trade is fertile ground for organized criminal groups smuggling exotic animals, plants and derivatives in and out of CITES member countries with little risk of prosecution. For example, it has been estimated that around 5 tonnes of bushmeat per week are smuggled in personal luggage through Charles de Gaulle airport (Paris, France), not only for private consumption, but as part of a lucrative business involving high prices and a wide range of species, many of which are CITES listed (Chaber *et al*., 2010). Although the exact dimensions of this type of trade are unknown, it is understood to be among the world's largest illegitimate businesses, after narcotics (Zimmerman, 2003; Rosen and Smith, 2010).

A high proportion of today's illegal trade in wildlife and wildlife products is conducted through the Internet, with thousands of CITES-listed specimens offered for sale online every week (IFAW, 2008). This trade poses a huge challenge for biodiversity conservation, a risk of introducing invasive species (often with disastrous effects) and enormous potential for disease transmission to both humans and animals.

Indeed approximately 60 percent of human pathogens are known to be zoonotic, i.e. transmitted through animals, and since 1980 more than 35 new infectious diseases have emerged in humans, including HIV and Ebola viruses which have both been traced back to human consumption of infected African great apes (Karesh *et al*., 2005; Rosen and Smith, 2010) (see Newman, Slingenbergh and Lubroth, following this article).

What can be done?

Although there is no single solution to the widespread overhunting of forest wildlife, three management components in general are needed to reverse unsustainable use: effective laws and law enforcement (see article by Nguiffo and Talla, this issue), awareness raising/education and the provision of protein or livelihood alternatives (Bushmeat Crisis Task Force, no date; CBD, 2009). In Cameroon, the Wildlife Conservation Society (WCS) and the Last Great Ape Organization (LAGA), a wildlife law enforcement NGO, have successfully worked with the government to reduce the illegal bushmeat trade through education, law enforcement and the development of alternative protein and income sources. Perhaps most effective was the WCS collaboration with Cameroonian railways, which led to regular inspections on trains for illegal animal products. The trade has lessened greatly now that its main mode of transport is under scrutiny.

To control illegal trade in wildlife effectively at the national and international levels (and also illegal trade in plant products – see article by Tong, Schmidt and Johnson), there is a need for decisive support to CITES member countries in their efforts to implement and enforce adequate national legislation to fulfil their CITES commitments. Increased education, networking and capacity building are also needed in most developing countries (Milner-Gulland *et al*., 2003; Rosen and Smith, 2010).

HUMAN-WILDLIFE CONFLICT

Humans and wildlife come into conflict in many different contexts. The problem is most pronounced in areas of high or growing human and/or livestock densities where wildlife still occurs in

To prevent damage by elephants, chilli pepper can be used as an innovative repellent

Climate change – increasing the pressure on forests and forest wildlife

In addition to storing about half the total carbon contained in land ecosystems, forests host the majority of terrestrial biodiversity, mainly in the tropics and subtropics. Even moderate climate change puts some of this biodiversity at considerable risk. The rise in average global temperatures will influence the length and severity of seasons and the frequency and severity of floods and droughts, increasing the prevalence of fire and predisposition to pests and pathogens – with expected impacts on forest habitats and species. About one-quarter of vascular plants and higher animals on the globe are estimated to be at an increasingly high risk of extinction as temperatures rise by 2° to 3°C above pre-industrial levels. It is very likely that even more modest losses in biodiversity would affect ecosystem services (Seppälä, Buck and Katila, 2009).

As global average temperatures continue to rise, it is important to develop strategies to conserve species and habitats that are unable to adapt. Measures to reduce the impacts of other human pressures – which still exceed those of climate change in most cases – are also likely to help reduce the overall vulnerability of forest ecosystems to climate change. More radical measures for adapting forests and wildlife to climate change include modifying or newly creating habitats, translocating whole animal and plant communities and moving boundaries of protected areas.

significant numbers. It is especially pronounced in Africa, where it has serious implications for food security (FAO, 2009). Examples include elephants raiding crops, lions killing livestock, baboons stealing food, birds damaging crops, hippopotamuses threatening fisherfolk or crocodiles attacking villagers when they collect water from a river.

Efforts to manage the problem have evoked considerable ingenuity, such as the use of cloths, projectiles or bricks impregnated with chilli pepper to serve as a repellent to crop-raiding elephants. Because of continuing human population growth, economic growth and expansion of human settlement, and a likely amplification of competition for natural habitats and resources as a result of climate change (see Box above), the incidence of human-wildlife conflict will probably increase in the foreseeable future, requiring ever more attention.

FAO, in collaboration with the International Cooperation Centre of Agricultural Research for Development (CIRAD), the World Wide Fund for Nature (WWF), the Zimbabwean Parks and Wildlife Management Authority and other organizations working in southern Africa, has developed a practical toolkit to assist rural communities in choosing the best possible options to prevent or mitigate human-wildlife conflicts (see Le Bel, Mapuvire and Czudek, this issue).

ECOTOURISM – OPPORTUNITIES AND COSTS

Ecotourism has the potential to make a substantial positive contribution to the management and conservation of forests and forest wildlife (Williamson, 2006). Ecotourism destinations are generally in rural areas, which tend to be poorer than urban areas and to offer fewer employment opportunities. In such areas, ecotourism offers potential to provide income and employment for local people (Box below).

The International Ecotourism Society (www.ecotourism.org) defines ecotourism as "responsible travel to natural areas that conserves the environment and improves the well-being of local people". It can be distinguished from general nature tourism by its emphasis on conservation, education, traveller responsibility and active community participation. Contemporary ecotourism encompasses a diversity of experiences ranging from luxury safaris for wealthy nature lovers, with plush accomodation

Ecotourism contributes to gorilla conservation and livelihood generation in Uganda

In Uganda, where approximately 60 percent of the estimated 720 remaining mountain gorillas live, the annual income from gorilla viewing treks increased from US$113 million to $400 million from 2000 to 2007, an increase of 36 percent per year (Rukundo, 2009). Uganda receives about 20 000 visitors per year to view the apes. In 2007, visitor permits brought in US$4.7 million; hotels and services created 70 000 jobs; and revenue sharing funded 181 community projects – for clinics, schools, community centres, bridges, roads, maize mills and water access. Tourism now tops Uganda's foreign exchange earnings (Redmond, Mapesa, and Rwetsiba, 2008).

FAO/FO-6921/J. BALL

A gorilla family – male, female and two young – in Bwindi-Impenetrable forest, Uganda

and motorized game viewing, to wilderness treks in which the participants travel by foot on rugged trails and sleep on the ground in small tents.

Eagles, McCool and Haynes (2002) identified three clusters of potential benefits from ecotourism:

- ***enhancing economic opportunity***, for example, through increased employment, increased income, commercial opportunities for local suppliers, local manufacture of goods, new markets and foreign exchange, improved living standards, tax revenues, new skills and funding for protected areas and communities;
- ***protecting the natural and cultural heritage***, which conserves biodiversity at the level of genes, species and ecosystems, brings out the value of biodiversity, propagates conservation values and contributes to protected area financing;
- ***enhancing the quality of life*** by promoting aesthetic, ethical and spiritual values, providing environmental education, improving intercultural understanding, stimulating the development of arts and crafts and raising the educational level of local people, thus helping them to value their own culture and environment.

Ecotourism unequivocally generates benefits for a range of stakeholders, for example national and international ecotourism businesses, operators of hotels and eating places, local food producers, local artisans and producers of curios for tourists, local tourist guides, and people and companies working in transport (from national and international airlines to local drivers) – not to forget the national and international tourists who benefit from the intrinsic value of the forest experience.

Ecotourism, however, also entails costs – economic, social and environmental.

Economic costs are generated by increased demand for expanded public services, such as road, health and security infrastructure, which results from the presence of large numbers of visitors. The cost of protected area management may also increase by the need to service, manage and monitor tourism, but this in general can be compensated through levying park fees and additional income opportunities.

Social costs arise, for example, from excessive numbers of visitors who interfere with local activities; insufficient attention to the needs and required involvement of local people by governments that prioritize short-term economic gain from tourists; denial of access to resources in protected areas that have traditionally been important to local people; and large gaps in wealth between tourists and local people, which can result in exploitation of local people and indifference to their needs and concerns.

Tourism can result in many different forms of damage to the environment, plants and animals alike, such as disruption of ecosystems by infrastructure development, soil erosion, habitat degradation, water pollution, disturbance, injury and contagion with potentially harmful pathogens/diseases.

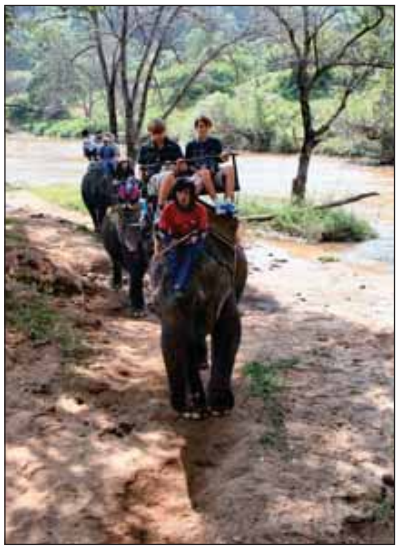
It is indeed at the centre of the concept of ecotourism that such detrimental impacts are avoided. If nature tourism activities are not based on the following principles, they do not qualify as ecotourism:

- conscientious, low-impact visitor behaviour;
- sensitivity towards, and appreciation of, local cultures and biodiversity;
- support for local conservation efforts;
- sustainable benefits to local communities;
- local participation in decision-making;
- educational components for both travellers and local communities.

None of the above-mentioned problems are insuperable, and if ecotourism is well planned and managed it can often make a substantial contribution to the sustainable financing of a protected area and provide multiple socio-economic and ecological benefits. The prerequisites include solid marketing strategies to create access to sufficient numbers of clients in an increasingly competitive market. Making good use of tourist revenues by reinvesting them into improved management actions can contribute markedly to

Contemporary ecotourism encompasses a diversity of experiences ranging from luxury safaris to rugged wilderness treks; shown, horseback safari in Botswana

K. MCLEOD



M. WILKIE

Ecotourism generates economic benefits for local guides and tour operators, and cultural and spiritual benefits for the national and international tourists who enjoy the experience (Thailand)

the long-term integrity of a protected area (see article by Bien in this issue). Particular efforts need to be made to ensure that economic benefits of tourism reach the poor (UNWTO and SNV, 2010).

Not all rural areas, however, are suitable for ecotourism activities. Planners should evaluate carefully whether ecotourism is an option in a given location and what kind is most promising by considering special features, existing infrastructure and past experiences. Heavy dependence on tourism revenues can also be risky because of fluctuations in visitor numbers as a result of economic and political change, social unrest or environmental disasters. Diversification of economic activities, for example by promoting non-wood forest products, is therefore advisable to avoid overdependence on tourism.

INTEGRATED CONSERVATION AND DEVELOPMENT – DOES IT ADDRESS THE PROBLEMS?

One approach for responding to the threats faced by forests and associated wildlife involves integrating the management of natural resources with economic development to improve the quality of life of rural people. Such integrated conservation and development projects (ICDPs) have been given a variety of designations, for example, "people-centred conservation and development", "eco-development", "grassroots conservation" and "community-based natural resource management".

Community-based conservation can be a significant complement to conventional government-led protected area management and enforcement activities, especially in developing countries with limited budgets. When local people are involved in and benefit from the management of natural resources, they are more likely to support conservation efforts.

In adopting an ICDP approach, however, it is important to avoid certain assumptions. It should not be assumed, for example, that local people and their livelihood practices constitute the main threat to the biodiversity resources of a given area, since outside agents, such as commercial bushmeat hunters, may be a bigger threat. New livelihood options may not actually reduce human pressures on biodiversity if they are seen by the community as additional opportunities rather than alternatives to exploiting biodiversity. And the capacity of traditional approaches (e.g. providing jobs and opportunities for local people to produce goods and services for tourists) to generate sustainable benefits for local people should not be overlooked.

Reviewing ICDPs, Schreckenberg, Luttrell and Moss (2006) recognized "the need to address concerns that the benefits from participatory forest management may not be sufficient to cover the costs imposed on poor communities, which raises doubts about the longer term viability of the approach". The costs could include, for example, the disruption or curtailment of established patterns of resource use by local people.

Although the challenges remain high and success depends on the context, the integration of conservation and development is standard practice today. New FAO projects in Central Africa and Mongolia, for example, are being designed with community wildlife management components. Some positive examples are described in other articles in this issue (see Alieu; Khatri; and Rawee Thaworn, Kelley and Yasmi). Increasingly, communities are demanding the rights to manage their natural resources. Some governments are responding by making the necessary policy and legislative changes to help communities receive the benefits from such transfer of responsibility. Such devolution, however, also implies a need to share the costs (see article by de Koning).

CONCLUSIONS

Since time immemorial people have benefited in a diversity of ways from forests and forest wildlife, but in the contemporary world much damage has been done to both forests and wildlife through unsustainable resource use, which is also often illegal. Unless measures are taken to curtail unsustainable and/or illegal resource use, the benefits from forest and wildlife will continue to dwindle, in many cases to the detriment of those who are already poor.

Experience suggests that breaking the supply chain is an effective way of reducing illegal and unsustainable exploitation of forest wildlife, but additional measures urgently need to be applied. These include improved law enforcement capacity, public awareness and education campaigns and generating benefits for local communities through employment and improved economic opportunities, such as in providing goods (e.g. local arts and crafts) and services (e.g. tourist guide services). Full involvement of local people in managing and benefiting from the products and services delivered by forests and wildlife is crucial for the sustainable conservation of these vital resources. ◆

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One health – one destiny: appreciating the connectivity of health among ecosystems, wildlife, livestock and people

S.H. Newman, J. Slingenbergh and J. Lubroth

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FAO's current work in animal health addresses emerging infectious diseases at the animal-human-ecosystem interface.

The concept of addressing the connectivity between animal and human health is not new. In the 1960s, Calvin Schwabe, a veterinary epidemiologist and parasitologist in the United States, coined the expression "One Medicine" calling for a unified approach between veterinary and human medicine to combat zoonotic diseases – those diseases transmitted from animals to humans. Building on this concept, the Wildlife Conservation Society developed the term "One World, One Health™" and established, with the participation of FAO, the Manhattan Principles, which focus on preventing the emergence and re-emergence of diseases in the modern globalized world. The concept has continued to evolve; in 2010 FAO and international partners began to use the term "One Health" to express the linkages between animal and human health and their dependence on ecological or environmental health. It has become clear that the emergence of infectious diseases, while complex in nature, is driven to some extent by ecosystem changes associated with growing global human population, increasing demands for animal protein, unsustainable natural resource consumption, loss of biodiversity and habitat fragmentation, which lead to the loss of ecosystem services. More intensive farming systems are also fertile breeding grounds for pathogens that can infect multiple hosts including livestock, wildlife and people.

Natural systems such as forests, grasslands, wetlands and oceans provide ecological services that all life depends on. Forests, for example, help purify air and water and mitigate greenhouse gas buildup in the atmosphere. Alteration in natural systems – whether in a rural, modified peri-urban or urban setting – results in decreased ecosystem services, leading to disease and increased health risks for all of the species in the ecosystem, including plants, wildlife, livestock and humans. Climate change and loss of ecosystem resilience, furthermore, are paving the road for the emergence of new conservation and health challenges.

Approximately 70 percent of the 1.5 billion poorest people depend on livestock and natural resources. Poor sanitary and biosecurity conditions, in densely populated human-dominated, modified multispecies environments, provide opportunities for pathogens to more easily transit among potential host species. Subsistence bushmeat consumption, wildlife farming and wildlife trade bring people into contact with a great diversity of forest-dwelling birds, mammals and reptiles, exposing people to novel pathogens.

In a globalized world where pathogens can travel the world in a day, emerging diseases, especially those affecting humans, livestock or wildlife, can have large negative socio-economic implications. Impacts can be severe for public health, livelihoods and food security, as well as for international trade and tourism.

Since 2006, FAO has been a key partner in a series of interministerial conferences on animal, avian and pandemic influenza. The 2007 conference (New Delhi, India) addressed the larger issue of emerging infectious diseases at the animal-human-ecosystem interface. The Hanoi Declaration adopted at the 2010 conference reaffirmed that to be capable of addressing high-impact disease threats that arise at this interface (e.g. H5N1 highly pathogenic avian influenza and pandemic [H1N1] influenza), health systems require: international and regional cooperation, national political commitment, intersectoral collaboration, timely and transparent communication and capacity building. As part of the Food Chain Crisis Management Framework, FAO has recently developed a One Health programme to guide the implementation of FAO's work in animal health by drawing on expertise from many disciplines, including forestry, fisheries, natural resources and law.

Approximately 60 percent of emerging infectious diseases of humans are zoonotic. Of these, 70 percent originate from wildlife (often forest dwelling). These pathogens and diseases include HIV/AIDS, Nipah, Hendra and West Nile viruses, as well as ebola, rabies, severe acute respiratory syndrome (SARS) and monkey pox. It is clear that the solution to the challenge of emerging infectious diseases relies on collaboration and integration of multiple disciplines and partners including ministries of forestry and environment, agriculture and health. While more science is necessary to understand the complex relationships among disease emergence, transmission and ecological systems, science alone is not the solution. It is also essential to address the social and cultural dimensions of societies where issues concerning livestock, wildlife, humans and entire ecosystems intersect. Changes in thinking and behaviour must be encouraged, and future decision-making must be cognizant of the repercussions of poor natural resource management and their implications for civilization.

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Human-Wildlife Conflict Toolkit: comprehensive solutions for farmers and communities

S. Le Bel, G. Mapuvire and R. Czudek

A new toolkit suggests strategies and practical tips to make the increasingly tight cohabitation between people and wildlife safer.

Human-wildlife conflict is a growing global problem. It is not restricted to a particular geographical region or climate condition, but is common to all areas where wildlife and human populations coexist and share limited resources (Distefano, 2004). The February 2010 meeting of the Southern African Development Community (SADC) Technical Committee on Wildlife pronounced that wild animals represent the number-one problem for Africa's rural populations in terms of both personal security and economic loss, and the situation is getting worse. The population of the African continent, which has the world's largest reserves of wildlife, is expected to double from 0.8 billion to 1.8 billion people in the next 40 years (ILRI, 2009). Africans will not only be packing more tightly into cities; they and their crops will also be increasingly pressing up against territory populated by wildlife.

Human-wildlife conflict is a problem for farmers, and ultimately it must be tackled by the farmers themselves. However, although numerous research articles, reports, recommendations, guidelines and training manuals have been produced in recent years to address the problem, most have been aimed at technical support agencies, government wildlife departments, and conservation and/or development oriented non-governmental organizations (NGOs). Few tools have been developed for and adopted by rural farmers and communities.

In southern Africa, FAO and Bio-Hub, a consortium of conservation agencies – the International Cooperation Centre of Agricultural Research for Development (CIRAD), the Worldwide Fund for Nature (WWF), the African Wildlife Foundation (AWF) and the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) – have teamed up to assist local populations in dealing with human-wildlife conflict. With FAO support, Bio-Hub held a workshop in December 2008 to brainstorm ways of developing and implementing a community- and farmer-based, practically oriented approach to human-wildlife conflict mitigation. A tangible result has been the Human-Wildlife Conflict Toolkit, released in 2010 and currently being tested in southern and western Africa.

The toolkit is designed for use by extensionists working with local communities. Four four-day "training of trainers" workshops were organized in Zimbabwe between December 2009 and July 2010, involving extensionists, researchers, conservationists, private-sector representatives, workers from government and NGOs, local game scouts, village heads and other traditional leaders. The workshops were publicized through the Community-Based Natural Resource Management Network (www.cbnrm.net). In total, more than 200 toolkit prototypes were distributed during the workshops for preliminary field tests with local communities in Botswana, Gabon, Malawi, Mozambique, South Africa, Zambia and Zimbabwe.

IGF/P. CHARDONNET

Human-wildlife conflict is a growing problem where wildlife and human populations exist at close quarters: an elephant foraging in a garden

CIRAD

The human-wildlife conflict toolkit

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Fencing protects a watering point from Nile crocodile

Villagers scare wild animals with fire

The toolkit produced by Bio-Hub and FAO recognizes some of the challenges and gaps in implementing mitigation measures. It acknowledges that human-wildlife conflict is multifaceted and that some of the mitigation practices advanced to date are ineffective on their own over time. Therefore the toolkit presents tools and practices that can have great success when used in combination. It is designed not only to help protect people, their livestock and their crops from wild animals but, just as important, to safeguard wild animals from people.

The materials help communities identify control options in five colour-coded categories:

- awareness raising (blue);
- access prevention (green);
- translocation (brown);
- driving animals away (yellow);
- as a last resort, lethal control (red).

A booklet entitled "Individual animals and index to the tools" provides descriptions, photos and drawings of the 16 main problem animals, their typical behaviours and their spoor (tracks). Solutions vary according to whether the need is to protect people, villages, livestock, water or crops. The index identifies (by number) solutions in each of the colour categories, in columns according to what it is the user needs to protect. Stencils direct users to the right column of solutions for their needs. Finally, a booklet of tools describes each colour-coded and numbered option in detail, including the technique, its advantages and disadvantages and also its cost effectiveness.

Some examples of solutions that may be effective in certain situations include:

- chasing elephants away from field crops with the trademarked "Mhiripiri Bomber"©, a plastic gun that fires ping-pong balls containing a highly concentrated chilli solution at 50 m range (Le Bel *et al.,* 2010);
- using enclosures to protect fishermen or villagers from Nile crocodile – the animal causing the most human deaths in Zambia and Mozambique – at watering points;
- driving away crop-raiding hippopotamuses by shining a strong light in their eyes;
- investing in a guard dog or donkey to warn of the approach of predators and keep them away.

As a general strategy, the toolkit emphasizes conflict prevention through advance land-use planning, for example ensuring that crops are planted where they are less accessible to problem animals, and providing corridors for wildlife to go to and from water. Awareness raising and training in how people can live safely alongside wild animals also constitute a fundamental set of solutions.

The review and development of the toolkit is ongoing. A template for providing feedback and sharing additional strategies is being distributed through the workshop participants, and the toolkit is designed in such a way that new information can be inserted. Planned activities include the addition of CD-ROMs to the toolkit and the creation of an online version.

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The hope is that in the long run, people and wildlife can live together and walk side by side

Cameroon's wildlife legislation: local custom versus legal conception

S. Nguiffo and M. Talla

To be effective, wildlife law needs to recognize local uses of wildlife; to take into account the contribution of traditional customs and practices to sustainable wildlife resource management; and to harmonize conservation and social goals.

Lions drinking in Cameroon

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Wildlife is important in all the countries of the Congo Basin, although local communities and the State may view it in different ways. At the local level it is used for food and for medicinal and cultural purposes (especially in rituals and as emblems of traditional dignitaries), and it is traded through barter or commerce. The State adopts legislation intended to protect wildlife and makes all decisions related to its management, protection and use. The same legislation, however, excludes communities from wildlife management and this could paradoxically have negative effects for wildlife conservation.

The legal framework for wildlife in the Congo Basin countries had its origin in the colonial era. A decree of 18 November 1947 regulated hunting in the African territories coming under the French Ministry of Overseas Territories. This legislation was inspired by the London Convention (19 May 1900) on the protection of animals in Africa and by the Convention Relative to the Preservation of Fauna and Flora in Their Natural State (8 November 1933), also adopted in London (see FAO, 2006). These documents were intended to ensure recognition of then-new uses of

wildlife (especially scientific, touristic and decorative) that were introduced into the region with colonization, and to reconcile the many uses of wildlife resources.

Since independence, the law of Cameroon has continued along the same lines, resulting in a situation that is sometimes schizophrenic: senior officials accustomed to consuming bushmeat are in the position of passing and supervising the application of laws that are contrary to their culture.

In these circumstances, the system tends to be ineffective. Infringements of wildlife legislation are numerous, both through an increase in the bushmeat trade in large cities and through international trade in live protected species or trophies. Examples include the illegal export of four gorillas to a Malaysian zoo, which were sent back to South Africa and finally returned to Cameroon (IFAW, 2006); the export of 1 200 parrots with false CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) certificates (*Le Jour*, 2010); and the seizure in Hong Kong of 3.9 tonnes of ivory originating in Cameroon (Afrique en ligne, 2010). Moreover, restaurants in Yaoundé and Douala – and indeed Cameroonian restaurants in European cites – are still serving dishes based on bushmeat, which often comes from illegal trade. Global Forest Watch (2000) showed that most infringements of forest law in Cameroon's Eastern Province concerned wildlife, often involving farmers. Such activities persist despite political statements advocating increased severity in dealing with poachers.

This article analyses why the written law is inappropriate for ensuring optimal protection for wildlife in Cameroon. Some of the conclusions may be extrapolated to other countries in the Congo Basin, where authoritarian management of wildlife is the norm (e.g. Mukerjee, 2009).

Effective wildlife management is hampered by a combination of three main factors: the law's failure to recognize adequately the contribution of local customs to sustainable wildlife resource management; the outlawing of many traditional and local practices; and the lack of clarity in the messages conveyed by the law.

RESTRICTED CONTRIBUTION OF LOCAL COMMUNITIES

In Cameroon, wildlife is governed by Law 94-01 of 19 January 1994, which lays down a legal code for forests, wildlife and fisheries. Supplementing this law, Decree 95-466-PM of 20 July 1995 specifies how the code is to be applied.

Traditional methods of wildlife management were based on subsistence aims and cultural values and were not necessarily destructive of wildlife. The current law, however, privileges non-traditional practices: wildlife safaris, scientific research, sport or trophy hunting and wildlife as a source of income for the State. The objective of species conservation is clearly stated, and the law aims to achieve this by limiting, or indeed forbidding, extraction of the most threatened species, banning hunting in certain zones and prohibiting certain hunting methods.

This legislation was formulated without the people's participation and without taking the rights and interests of local communities into sufficient account. The legislation was thus deprived of

Cameroon's wildlife law fails to recognize adequately the contribution of local customs to sustainable wildlife resource management (a Cameroonian villager hangs an antelope)

CIFOR/E. DOUNIAS

traditional knowledge regarding the management of wild animals that could have increased its effectiveness. The new law fails to take advantage of the traditional legal system, including local taboos on certain species and places. In some regions sacred forests and the animal species in which they abound have been better protected than government protected areas (Luketa Shimbi, 2003). Spiritual penalties for a failure to respect rules of protection are often more feared than legal penalties (Panafrican News Agency, 2001).

Forest inhabitants have few rights or responsibilities under the present legislation. The law sees them merely as users of wildlife and allocates them no responsibility in the management of wildlife resources or the areas designated as habitat for these resources – apart from hunting zones under community management, which are very few in the Congo Basin. Traditional hunting is subject to restrictions regarding area (forbidden in protected areas and sports hunting areas), hunting seasons and method. The code prohibits all non-traditional instruments, but provides neither a list of these nor criteria for determining them – a silence that leaves the door open to various interpretations, which can be unfavourable to local communities.

A missed opportunity to involve communities in wildlife management

The wildlife code obliges the government to classify animal species in three classes according to their level of protection, and to update the list every five years. Frequent updating is intended to ensure that conservation efforts and measures reflect the actual wildlife situation. However, the government has never adhered to the revision requirement, doubtless because of the lack of resources, and as a result the appropriate services are unable to compile regular reliable inventories of animal biodiversity. The classification currently in force is based on obsolete scientific data.

By outlawing many traditional hunting practices, the wildlife code has paradoxically encouraged the expansion of illegal activities (an arrested poacher in Southeast Cameroon)

WWF/CARPO/PH. JENGI

However, if local communities were more closely involved in wildlife management, they could help the wildlife service to update its classification by collecting data on the presence of animal species in forests in the immediate vicinity of their villages. Setting up local communities as service providers would make them partners rather than opponents of the government, and would benefit both groups:

- by reducing the wildlife service's operating costs;
- by providing a source of income for local communities based on their traditional knowledge;
- by raising the awareness of communities regarding changes in stocks of game in their areas.

REPRESSION OF LOCAL ACTIVITIES, FOSTERING ILLEGALITY

By outlawing many hunting practices, the wildlife code has paradoxically encouraged the expansion of illegal activities.

The classification of animal species according to their degree of protection, the cornerstone of the system, sometimes blatantly contradicts local customs. For example, hunting elephants is prohibited by law; the species is in class A, enjoying the highest degree of protection. However, killing an elephant is a rite of passage in traditional Baka society, which accords the elephant hunter the maximum respect (see e.g. Abega, 1997), and elephant meat is especially prized in most indigenous forest communities.

Forced to choose between respect for the law and respect for local custom, communities usually choose the latter. If they pursue their hunting activities in violation of the law, they do so not in deliberate defiance of the legislative authority, but in observation of ancestral practices that written legal measures cannot eradicate, particularly if these practices are essential for subsistence.

In addition, the marginalization of local communities and competition from new users of wildlife can lead local hunters to intensify their own extractive activities; assuming, as they are likely to do, that any animals they spare will be killed in any case by sports hunters, they are liable to disregard conservation considerations.

The law would have been more effective, and would have obtained the adherence of local communities, if the legislators had identified local practices that are compatible with the goals of sustainable wildlife management and incorporated them into the written law. Implementation measures would then have involved supervision rather than an unrealistic formal ban.

AMBIGUOUS MESSAGES FROM THE COMMERCIALIZATION OF WILDLIFE

The law lacks clarity in its handling of the commercialization of wildlife. It turns wildlife into a commodity, in particular by taxing all activities associated with it (see Roulet, 2004). This approach creates ambiguity about the principles underlying the law: conservation or revenue? The contradiction is seen in connection with the penalties for infringements of the wildlife code, the sale of hunting rights and the handling of confiscated game.

Transactions: the preferred way of managing infringements of the wildlife code

The transaction mechanism is one of the foundations of the system of control in the wildlife sphere. According to Article 2(17) of the 1995 decree, breakers of the wildlife code have a choice – either to let the legal process follow its course, with all the uncertainties this entails, or to make a settlement payment, for which the amount is set by the government service; in return proceedings are dropped.

Originally established to bypass particularly lengthy legal procedures, the transaction mechanism became the preferred way of managing wildlife-related litigation in the countries of the Congo Basin. This system is often viewed as a source of irregularities and corruption, especially in countries where the process lacks transparency (FAO, 2002; Nguiffo, 2001; Global Witness, 2005). Communities prevented from carrying out their hunting activities may well have difficulty understanding how notorious poachers can escape legal proceedings by making payments to the government.

Taxation of hunting activities

Wildlife has become a source of income for the State, which collects taxes on hunting rights, through issuance of hunting permits, and on the activities of hunting guides, who must be approved by the ministry responsible for wildlife. These taxes are beyond the means of local communities, and their inability to pay excludes them from the legal hunting of large mammals, for example. The issuing of permits for sports hunting has a disastrous effect on the morale of local communities when they are banned from hunting certain species while the government services provide assistance to well-off Western hunters to pursue the same species.

Institutionalization of the auctioning of confiscated game

The commodity approach to wildlife is confirmed by the law's stipulation that animal carcasses confiscated by agents of the wildlife service should be auctioned, with the proceeds going to the public treasury. This provision may seem to legalize the fruits of poaching and to suggest that the government's only argument with local hunting activities is that they do not bring any income to the public coffers. The wrong message is taken, as demonstrated also by reports that government officials serve dishes based on meat from protected animals at their tables. Public destruction of the confiscated carcasses would send a more consistent message.

The commodification of wildlife gives the impression that ultimately the State has no objection *a priori* to the hunting of game, including large mammals, provided that its financial interests are protected. At the same time, the law forbids any commercialization of the fruits of hunting on the part of local inhabitants, insisting that they hunt only for subsistence purposes. It is therefore easy to understand why many communities doubt the real aim of the restrictions on traditional hunting imposed by the State: they may suspect that the sole aim is to eliminate competition in access to the resources, so that the State can reap substantial profits from the sale of rights of use. Evading the law can thus also be a form of political resistance.

CONCLUSION

Like most other countries, Cameroon has declared the concern for guaranteeing the protection of wildlife in its laws and other regulations. However, the effectiveness of this legislation is severely compromised by its failure to take into adequate account the local uses of wildlife and related customs.

It is imperative to rethink the wildlife code within a realistic, consistent body of norms that is appropriate to the social context, relevant at the local level and clear in purpose. Such a new code should be drafted through a process involving communities' representatives, government officials and other relevant actors in wildlife management such as game hunters and conservation project leaders. The terms of reference of the reform should be to find the best solution to take into account the various needs, giving

priority to community uses. In addition, conservation and game hunting activities should be designed so that communities are involved in their implementation, including the control of compliance with the law. A golden rule should be that subsistence should always have priority over game hunting.

The legitimacy of a revised wildlife code and the guarantee of its effectiveness would depend on its ability to harmonize conservation and social goals at the local level and also on the careful choice of the right protection tools and mechanisms so that its aims are clear and not misunderstood.

The current ineffectiveness of the system for protecting animal biodiversity calls for a radical change to a century of wildlife legislation in Cameroon and the other countries of the Congo Basin. The main obstacle will be in adopting an unfamiliar approach that contradicts convictions inherited from colonial days. ◆

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Edible forest insects, an overlooked protein supply

P. Vantomme

Worldwide, over 1 400 insect species are reportedly eaten as human food; most are harvested from natural forests.

Many people, and some forest managers, consider insects mainly as pests. However, insects have many beneficial roles, such as facilitating pollination, seed dispersal, soil texture improvement and litter decomposition. They provide products such as honey, beeswax and dyes. Some insects are also used for medicinal purposes (see Box). Moreover, many insects are important as food – an excellent source of protein, carbohydrates and vitamins – for humans and domestic animals alike. The amino acid composition of most food insects compares favourably with the reference standard recommended by FAO and the World Health Organization (WHO) (Bukkens, 2005).

Insects contribute significantly to people's food security and livelihoods in many developing countries, mainly in Africa and Asia, but they are also eaten in some parts of Latin America and in some developed countries (e.g. Japan). Insects can be a regular, seasonal or occasional part of the diet, not usually because people have no meat to eat, but because they consider insects a delicacy. The most commonly eaten insects are grasshoppers, termite eggs, beetle and honey-bee larvae, silkworms and caterpillars. Other insects used as human foods include scorpions, crickets, locusts, wasps, cicadas, leaf-cutter ants, dragonflies and giant water bugs.

Insects are mainly consumed in tropical countries, where insect species are larger, species diversity is higher and insects are available year round. In cold and temperate regions, insect populations are decimated by the first winter cold – which probably explains why consumption of insects was not generally part of the survival strategies of the early peoples that colonized the cold and temperate regions of Europe, and may explain the usual European cultural aversion to entomophagy (consumption of insects by humans).

Insects in medicine

Insects don't only nourish; they also heal. Ants belonging to the genera *Atta* and *Camponotus* (carpenter ants), for example, were used in ancient times (as reported, for example, in early Hindu writings) to stitch wounds (International Biotherapy Society, 2000), and the practice is still used in traditional healing in sub-Saharan Africa. Individual ants are placed so that their powerful jaws close on the edges of the skin and draw them together. The head is then cut off, and the jaws remain firmly attached until the wound is healed.

A biotherapy adopted today by some practitioners in the United States, Western Europe and the Near East, known by military doctors before the advent of antibiotics, is the use of live maggots – primarily blowflies (family Calliphoridae) – to clean and disinfect heavily infected wounds. The maggots dissolve dead tissue by secreting digestive juices and then ingest the liquefied tissue and bacteria (Handwerk, 2003).

In the Himalayan highlands of Bhutan, Nepal and Tibet, the parasitic fungus *Cordyceps sinensis* grows in caterpillars, consuming and killing its hosts. The mummified caterpillars are collected and used in Tibetan traditional medicine; they are sold in China as a power booster at an average retail price of US$5 000 per kilogram of air-dried insects.

S. PELDON

***These Bhutanese highlanders have collected and are selling caterpillars infected by the fungus* Cordyceps sinensis**

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FAO/24683.0915/G.NAPOLITANO

Dried caterpillars for sale in a Kinshasa market, Democratic Republic of the Congo

Insects consumed by humans are almost always gathered from the wild, often in forests. The collectors (mostly women and children) know how and where to choose insects that feed on non-noxious plants and are untainted by insecticide. Insects are gathered for subsistence, for sale at local markets and sometimes for export.

In Central Africa, a region rich in forests and wildlife, large amounts of insects are consumed, including the caterpillar *Imbrasia* sp., which feeds on the leaves of the sapele tree (*Entandrophragma cylindricum*) (Vantomme, Göhler and N'Deckere-Ziangba, 2004). A study by FAO (2004) revealed that in urban Bangui, Central African Republic, edible insects contributed up to one-third of the protein intake in the rainy season when supplies of bushmeat and fish declined, and that dried *Imbrasia* caterpillars were sold in Bangui for up to US$14 per kilogram, making them a major source of cash for rural women. Caterpillars of the mopane emperor moth, *Imbrasia belina*, are also a popular food in southern Africa (Knell, no date). In dry-zone Africa, locusts are a common food.

Transborder trade in edible insects is common among some Southeast Asian countries such as the Lao People's Democratic Republic, Thailand and Viet Nam (Johnson, 2010). Export figures are rarely available, but an enquiry of trade in non-wood forest products between Central Africa and Europe (Tabuna, 2000) showed that France and Belgium annually import about 5 and 3 tonnes, respectively, of dried *Imbrasia* caterpillars from the Democratic Republic of the Congo (valued at an average price of US$13.8 per kilogram in Belgium).

In addition to (or because of) their importance as food, edible insects may also have a favourable impact on the conservation of forest and woodland. Holden (1991) observed a reduced frequency of bushfires in caterpillar harvesting areas in Zambia, as the villagers sought to protect the sustainability of the insect populations. Food security planners and forest managers would gain from a greater awareness of how the value of edible insects in rural economies affects – and is in turn affected by – local natural resource management strategies, including application of fire, pesticide use and conservation of indigenous trees as host species for edible insects.

Insect harvesting, processing and sale are labour-intensive activities requiring no major capital investment or landownership, and as such are within reach of poor people, especially women and children, enabling them to achieve substantial cash gains.

Insects are reared as pet food but rarely farmed for human consumption, and little is known about how to realize the full potential of insects as a food crop. Exceptions include Cambodia, China, the Lao People's Democratic Republic and especially Thailand, where 15 000 households are engaged rearing insects for use as food (Raloff, 2008). Thai farmers who raise crickets full time can take in about US$900 per month, while part-time farming can bring an extra US$90 to $120 per month – not insignificant in a region where per capita gross domestic product is about US$1 000 (IRIN, 2008). Farmers sell the insects to local markets, but increasingly they are also grinding them up for use as a protein supplement in animal feed.

The contribution of insects in the food chain is rarely included in the national food security programmes of those countries where entomophagy is widespread, even though the contribution of insects to overall protein supplies has long been known (e.g. Asibey and Child, 1990). Edible insects are also largely ignored in discussion fora on wildlife management or on strategies to address the consequences of a reduced supply of bushmeat for the diets of forest-dependent people. Including the contribution of edible insects in national-level food security programmes may help to supply the growing demand for protein for humans and for livestock, and particularly help safeguard the food security of forest-dependent people.

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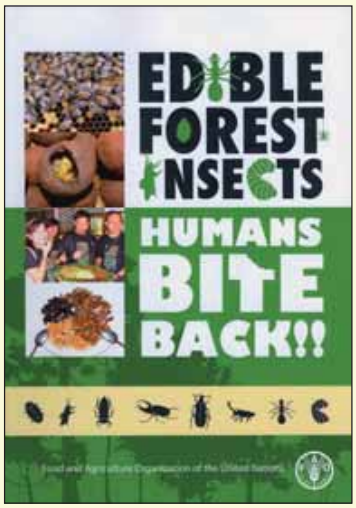
Humans bite back

The new publication *Edible forest insects: humans bite back!* (FAO Regional Office for Asia and the Pacific, 2010) presents the complete proceedings of a workshop by the same name, organized in Chiang Mai, Thailand, in February 2008. It includes chapters on all aspects of entomophagy – social, environmental and economic – including the management, collection, harvest, processing, marketing and consumption of insects, their nutritional value and income-related issues. While the emphasis is on examples from Asia and the Pacific, information is included from other regions of the world as well. This well illustrated publication highlights the potential of edible insects as a current and future food source, documents their contribution to rural livelihoods and explores linkages between edible forest insects and forest management.



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Building on local foundations: enhancing local community support for conservation

E.K. Alieu

Examples from Sierra Leone suggest how traditional practices and by-laws relating to natural resource management could contribute to government conservation strategies and help them benefit from community participation.

WIKIMEDIA COMMONS/L. STARK

In Sierra Leone, local communities often contribute to conservation of natural resources through traditional practices

Although reasons for deforestation and other natural resource depletions are well known, rampant deforestation in the tropics is often blamed on local forest-dependent communities. However when the degraded resources are in scarce supply or completely depleted, it is these same communities that suffer most owing to their heavy dependence on forests for food, shelter, medicines, well-being, etc.

Local community involvement is a prerequisite to successful natural resource management. Local people's use of and proximity to the resources puts them in a good position to provide useful information on past usage and the historical development of the resource. Where communities have been excluded from resource management, it has been less successful (Enters and Anderson, 1999).

Many traditional practices based on local customs and beliefs are effective measures for conservation of natural resources. For example, some traditional beliefs such as food taboos and myths surrounding the use of some trees as fuelwood support the protection of certain plant and animal species. Sacred groves are often preserved from generation to generation and often harbour rare plant and animal species because of restrictions on entry and on most livelihood activities within their boundaries. The ideas underlying the protection and conservation of sacred groves could also be used for forest conservation.

Communities also often contribute to resource conservation or replenishment through by-laws for the conservation of the multiple resources of forests in par-

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ticular and the environment in general. By-laws are rules established by local chiefs in consultation with their subjects and respected by all. Unlike natural resource management policies and legislation by governments, which are a top-down strategy, by-laws are based on traditional practices and are therefore often accepted and adhered to by the whole community. Their contribution to conservation, however, is frequently undocumented and underacknowledged.

This article draws on examples from Sierra Leone and elsewhere to suggest how policy-makers and their development partners could focus on the positive impacts of traditional conservation strategies and operational by-laws as building blocks for the formulation of policies and the promulgation of legislation for sound environmental management. The article is based on literature review and the author's three decades of experience in natural resource management.

TRADITIONAL KNOWLEDGE SUPPORTING CONSERVATION

Shade tree management in cocoa and coffee plantations

Cocoa and coffee plantations are traditionally established under the canopy of "mother trees" (shade trees) which protect the tender seedlings from the direct rays of the sun. The shade trees are then gradually removed through poisoning, after which they drop their dead branches bit by bit with little or no damage to the young seedlings. In this tree elimination exercise, timber trees are also saved to be used later for construction and general carpentry work. This method avoids the simultaneous clearing of large parcels of land which could stimulate the erosion and leaching of nutrients before the young cocoa or coffee plants close the canopy or ground vegetation protects the top soil effectively. The farmers thus inadvertently conserve soils, trees and soil nutrients in this age-old agronomic practice.

Food and tree species avoidance

Although the practice of avoiding the use or consumption of certain species is not intended as a conservation measure, it does protect some animal and plant species from overutilization. For example, the use of *Musanga cecropioides* as fuelwood in eastern Sierra Leone is avoided for fear of lightning striking the house. Some Sierra Leoneans believe that eating a chimpanzee or a monitor lizard could result in scabies. Other species avoided as food in one village included crocodile, duiker, black bush pig, red river hog, monkey and snake (Davies and Richards, 1991). Observation of these customs may diminish in situations of poverty or war (i.e. in the absence of alternative foods) or when people are exposed to Western education and philosophy, which may lead them to abandon superstitions and seek more scientific explanations for food-related illness, such as allergy,

Retention of forest fringe vegetation along river banks and footpaths

In upland rice crop cultivation, farmers leave fringe vegetation along footpaths and river banks. The vegetation ensures a relatively cool temperature for users of the footpaths. Tall forest patches in village peripheries often indicate locations of abandoned settlements. They largely comprise crops such as bananas, plantains, cola nut, breadfruit, mango and cotton trees (Fairhead and Leach, 1995). In addition to having conservation value, patches of vegetation often provide cool drinking water for the communities by the shading the streams and water catchment areas.

In Sierra Leone, this traditional practice was then legislated in the Forestry Regulations (1990), Section 38, which reads: "No land between the high and low water marks nor any land above the high water mark at the bank of both sides of waterways (rivers and streams) extending a distance of 100 feet shall be farmed or cleared of vegetation...." Thus a new legislation was built on a local foundation and readily accepted by the community as an existing practice.

Planting of a tree with the newborn's umbilical cord

Cola nut (*Cola* spp.) is widely used as a stimulant in West Africa and also features in traditional sacrifices, welcoming important visitors and fortune telling (in which the nut is tossed and its fall interpreted). In most traditional homes in rural Sierra Leone, it is common to plant a cola nut to mark the site where a newborn baby's umbilical cord is buried and to know subsequently the age of the child. In the absence of birth certificates, which were very rare until about two decades ago, families protect such trees as their only record of the birth.

The national tree planting drive in Sierra Leone (see Box on p. 24) attempted to introduce other trees besides *Cola* spp. in this practice, but the effort was not very successful, probably because the exotic forest trees used were not believed to have the same economic and cultural importance. Indigenous trees of medicinal or other economic values might have better success.

THE ROLE OF BY-LAWS IN NATURAL RESOURCE MANAGEMENT

Most parts of Sierra Leone have a dual system of governance, involving both chiefs and elected government officials. Most land is under the jurisdiction of chiefdoms, meaning that the chiefs make most of the decisions regarding land use.

Community by-laws are generally well respected by all, and offenders often show remorse while complying with the penalties. The following examples from Sierra Leone may be applicable in other humid West African countries involved in subsistence farming.

Harvesting of wild palm fruits

In Sierra Leone, wild palm fruits for processing into palm oil are normally

National Tree Planting Day efforts in Sierra Leone

Launched in 1985, National Tree Planting Day in Sierra Leone is commemorated on 5 June (World Environment Day) because World Forestry Day (21 March) is too dry for tree planting in Sierra Leone. The programme launches tree-planting activities which continue until 30 September, the official end of the tree planting season, giving the young trees two rainy months before the dry season ensues. Activities are carried out through provincial, district and chiefdom communities.

Over 40 million tree seedlings have been distributed to date. Through official tree planting activities at selected venues, cities such as Bo and Makeni, the provincial headquarters of the Southern and Northern Provinces, are now heavily wooded with *Acacia mangium*, *Gmelina arborea* and other species. Seedlings are also distributed to individuals; in this case exotic species are excluded because most people are not familiar with their value apart from the provision of shade (e.g. for medicines or food). Following two decades of sensitization, the demand for tree seedlings now heavily outweighs the supply, which is limited by government funding, although non-governmental organizations and development projects also support tree planting efforts to some extent.

harvested from March or April until July. The beginning of the harvest depends on the timing of the first rains of the year, which are believed to facilitate palm fruit ripening. To allow farmers to complete the ploughing of their rice fields, the community heads impose bans on palm fruit harvesting until most of the upland rice crop is established. This ban also supports food security objectives by giving food cultivation a priority. Equity considerations aside, palm oil yield is known to be higher when fully ripened fruits are used. Similar by-laws also apply to other communally owned resources that are of economic advantage in poor rural communities.

Wildfire control

Throughout rural Sierra Leone, by-laws govern the use of fires during the critical months of late November to late April, with slight variations. The rules often cover the following.

- Cooking time is restricted to before noon or after 18.00 to avoid times of peak fire hazard.
- Burning on farm sites must involve all neighbours with plots in the immediate vicinity to ensure effective firefighting if necessary.
- Children are restrained from collecting embers to set fires on adjacent farms, lest they drop some along the way.
- Community members are obliged to report fire outbreaks promptly to ensure immediate containment and avert calamity.

Failure to comply with the by-laws incurs penalties whose severity is influenced by the degree of damage resulting from the negligence. For instance, an offender could be forced to replant a burnt-out crop, to reconstruct a burnt-out building or to feed people to assist in such work.

Protection of medicinal plants

In most of rural Sierra Leone, traditional folk medicine remains a main source of health care as modern medical services are not easily accessible, particularly during the rainy season when most rural roads are bad. Traditionally, most rural people rely on traditional medicines because modern medicines, when available, are often prohibitively expensive and medical facilities are poorly equipped in terms of qualified personnel, storage facilities, etc. A study of a Kpaa Mende community in Moyamba District, for example, revealed that over 75 medicinal plants are used (Lebbie and Guries, 1995). Most of these plants are now relegated to sacred groves where shifting cultivation and tree cutting are prohibited. These sacred groves hold great potential for the conservation of rare or even endangered plant species (depending on their size, since smaller groves have less scope in this regard). The laws guiding the protection of sacred groves could apply to other protected areas once the communities agree to protect them.

COMMUNITY PARTICIPATION IN NATURAL RESOURCE MANAGEMENT

Community participation in natural resource management through projects and government programmes seems to be slowly gaining ground with time and experience. Government policies are now being inclusive out of necessity. Traditional management practices normally transcend generations through practical activities, i.e. learning by observing and doing or learning through trial and error. The introduction of improved management practices should preferably build on good practices that already exist, disseminated through effective awareness raising and sensitization activities.

Where conservation measures limit access to resources that communities depend on, alternatives must be offered – for example, compensation payments for the relocation of communities, or development of livestock (small ruminants, pig and poultry programmes and even fish farms) to provide alternative sources of animal protein in compensation for control of bushmeat hunting and trade. Where pressure on the resource from fuelwood harvesting intensifies, demand-side management – the introduction of energy-efficient stoves and

To limit pressure from fuelwood harvesting, more energy-efficient fish-smoking bandas (right) could be introduced as a forest conservation measure

fish-smoking ovens (bandas) – could be instituted as a forest conservation measure in addition to woodlot development. The incentive for adopting such new technology is the money or labour saved by using less fuelwood.

Who to target in the community

Opinion leaders such as heads of religious organizations and community elders have in the past sensitized communities on the wise use of resources, because their views are often well respected. Community heads often influence the activities of all community members, hence they provide an essential way to reach the community. At the local level, peer pressure and respect for elders ensures that potential offenders in the community comply without external intervention.

Politicians can have a positive impact if they support government policy and conservation goals, but can have a negative impact (becoming part of the problem) if they have a vested interest in using the resource or if they apply selective justice in the implementation of by-laws, which could split the community into compliant and non-compliant parties.

The division of household labour puts women directly in charge of trees, which provide food, fuelwood and pharmaceuticals. Since men are more actively implicated in rural-to-urban migration, the role of women in tree care is becoming critical to resource conservation (FAO, 2001). However, in traditional settings, children, youth and women are often scared of voicing their opinions during meetings in the presence of elders. Thus, separate meetings with these groups can elicit their views for presentation through development partners in general meetings involving all.

EXAMPLES OF COMMUNITY INVOLVEMENT IN PROTECTED AREA MANAGEMENT IN SIERRA LEONE

Of the several protected areas established in Sierra Leone before independence, effective community participation in joint resource management has been recorded in the Tiwai Islands Game Sanctuary, Outamba-Kilimi National Park and the Western Area Chimpanzee Orphanage. Other protected areas such as Mamuta Mayorsoh and the Kangari Hills in the Tonkolili District also receive some community support. However the following examples are more significant.

Management of the Tiwai Island Game Sanctuary

Since the declaration of the game sanctuary in 1987, the local community, in addition to being key partners on the management committee, has provided the following voluntary support:

- hosting annual management committee meetings and providing simple accomodation;
- providing labour and local materials for infrastructure development;
- providing tour-guide and interpretation services;
- providing transportation facilities for crossing on to the island;
- providing cooks, hot water and laundry services for visitors;
- reporting on anti-conservation activities.

Local artisans have benefited from the sale of their handicrafts at the visitor centre.

Tiwai Island, declared as a wildlife sanctuary in 1987, is located on the Moa River in Sierra Leone's Southern Province

M. JAKOB

Outamba-Kilimi National Park

Management of Outamba-Kilimi National Park

Traditional rulers of the Thambaka chiefdom of Bombali District aid conservation efforts in Outamba-Kilimi National Park by offering services such as assistance to visitors, reporting on poaching activities, wildfire reporting and containment, and tour-guide and interpretation services. Members of the community performing these services are compensated by tips.

When human-elephant conflict got out of control at Kilimi (an area of only 420 km^2, where the co-existence of people and elephants was difficult), communities there were encouraged to resettle in Outamba, which has a larger area (1 000 km^2). In 1995, the European Union provided US$87 000 to compensate resettled citizens for the loss of their houses, cash crops and land, although the relocation process has been slow. The chiefs provided significant support in handling the human-elephant conflict prior to and even after the relocation of these communities. Following some post-war rehabilitation of the Visitor Centre, funds are now being sourced from the Global Environment Facility (GEF) for additional work at the park.

Western Area Tacugama Chimpanzee Project

Launched in 1995 with initial funding from the European Union and later support from the Jane Goodall Foundation, this project covers 81 ha in the Western Area Peninsula Forests Reserve, located in a part of Sierra Leone that is under only governmental jurisdiction (the Western Area). Chimpanzees seized from illegal owners are rehabilitated here for eventual return to the wild. The cooperation of the local government authorities in protecting the animals is crucial. These authorities work closely with the Wildlife Section of the Forestry Division in the Ministry of Agriculture, Forestry and Food Security in endorsing licences issued by the ministry for various activities in the forest; recruiting honorary forest guards; reporting offences promptly; and apprehending lost chimpanzees and returning them to the sanctuary. Proceeds from visitors now constitute the main share of the project's financial support.

COMMUNITY PARTICIPATION IN RESOURCE MANAGEMENT IN WEST AFRICA AND BEYOND

When local communities realize tangible direct benefits from the resources, they are often willing to protect and police them at little or no cost to management (FAO, 2001; Chhatre and Agrawal, 2009; Odera, 2004). Policy and legislation, solid institutional arrangements, democratic transformation and comprehensive definition of roles are essential for successful stakeholder contributions (Odera, 2004). Constraints to successful community forestry development can include inadequate or insincere decentralization and devolution of functions and conflicting sectoral policies and overlapping mandates.

The following examples showcase community conservation efforts elsewhere in Africa.

A group of 116 volunteer women undertook the restoration of 100 km^2 of the Popenguine-Guéréo natural forest of Senegal in 1987, aiding in the reappearance of 195 species of birds, cerographic antelopes, duikers, striped jackals, monkeys and others (WRM, 2003).

In Côte d'Ivoire, the sacred forest of Zaipobly (12.5 ha), near Taï National Park, is properly managed for the realization of multiple benefits and as a permanent meeting venue. Access and management are governed by traditional powers (WRM, 2002).

The Ik ethnic group of the Karamajong region of Uganda practice traditional natural resource management, establishing guidelines for fire regimes, tree cutting and grass harvesting. They express their dependence on forests in terms of security, agricultural land, water, food security, health-care delivery and place of worship, and they recognize the need to mitigate against overcutting, overgrazing, uncontrolled bush fires and destructive honey collection methods (Rogers *et al*., 2002).

Rural communities are at the centre of forest management in the Gambia, where forest committees are established at village level and take major decisions on forest management issues. A comprehensive management agreement between the communities and the Forestry Department legalizes the arrangement (WRM, 2006).

In Guinea-Bissau, Mali and Senegal, Skutsch and Ba (2010) found that community management of forests yielded carbon benefits and also observed that communities could easily be trained to

DISNEY WORLDWIDE CONSERVATION FUND

The Tacugama Chimpanzee Sanctuary rehabilitates chimpanzees seized from illegal owners for eventual return to the wild

do carbon assessment – repudiating the myth entertained in the past that lack of skills impedes community forestry development.

CONCLUSIONS

Community participation in natural resource management is essential and inevitable. The marriage between policy-makers, funding bodies and the local communities in resource management will continue to be constrained by a variety of factors. However, addressing the concerns of all three parties amicably seems to be the only solution. By-laws governing traditional resource management could form the basis of modern resource management strategies. To ensure their legitimacy, by-laws should be legally recognized in the national legislative system (Lindsay, 1999).

Compensation for community relocation, livestock development projects for wildlife conservation and machinery to encourage lowland cultivation are essential if the negative impacts of poverty and shifting cultivation on forests are to be reduced. Appreciation of local community conservation efforts could be an incentive to further positive efforts, and the provision of alternatives to resources to be conserved is essential. Central government support in legitimizing natural resource management by-laws could ensure sustainability and ensure compliance. ◆

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Can biodiversity conservation go hand in hand with local livelihoods? A case of conflict resolution in Thailand

Rawee Thaworn, L. Kelley and Y. Yasmi

In a case from Kanchanaburi Province, the resolution of 20 years of conflict over statutory versus customary claims to the forest shows how participatory processes can serve to reconcile conservation and livelihood goals.

RECOFTC/RAWEE THAWORN

Villagers describe the escalation and resolution of conflict in Teen Tok

Conservation of biodiversity in tropical forests is inarguably urgent. The world has lost much of its forest, particularly in the past four decades (Bryant, Nielsen and Tangley, 1997). In response, over the past 20 years, international demand for better conservation has grown, reinforced by such global instruments and objectives as the Convention on Biological Diversity and the Millennium Development Goals. The ratio of protected area relative to terrestrial area has increased in turn (UNEP, 2010). In Asia and the Pacific, while reforestation efforts have helped decrease overall forest loss, loss of natural forest has continued (FAO, 2010).

One key question that has remained heavily debated is whether biodiversity conservation can go hand in hand with the livelihoods of local people. Around the world, conflict has consistently accompanied national park development (Coad *et al*., 2008; McNeely and Mainka, 2009; Redford and Fearn, 2007). This article examines a case in Kanchanaburi Province, Thailand, where policy related to national parks was having an impact on people's livelihoods at the local level.

The article challenges the conventional paradigm of conservation, which is one of strict exclusion, premised on the necessity of distancing humans from nature to ensure its protection. This paradigm, based on a conception of ideal wilderness, envisions no role or room for local people. In pursuing it, governments often severely restrict livelihood activities in conservation areas or resettle residents elsewhere, with consequent conflict over the land. In recent years, accordingly, such actions have been challenged as neither ethical nor pragmatic.

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RECOFTC/RAWEE THAWORN

A villagers' home situated within the boundaries of the Sri Nakarin Dam National Park for over 20 years prior to national park establishment: provisional areas for subsistence livelihoods are permitted in protected areas for villagers that settled in that area before the protected area was declared

While marrying conservation and livelihood objectives is neither easy nor straightforward (Brown, 2002; Adams *et al*., 2004), the case described here shows that it can be achieved using a supportive mediation process which can reconcile conflicting goals. Building on research from elsewhere (Berkes, 2007), the article emphasizes that partnership with local communities is a key to the success of forest conservation initiatives.

CONSERVATION POLICY IN THAILAND

Conservation policy in Thailand developed in the 1960s in response to widespread deforestation. Using the National Park Act (Government of Thailand, 1961) as the guiding tool, the Thai State has shifted its focus away from logging and towards forest conservation. This shift is reflected in the 1960 creation of what is now the National Parks, Wildlife and Plant Conservation Department; in the 1989 logging ban; and in the target set by the State for park establishment, which was revised upwards from 15 percent of all land in 1981 to 25 percent in 1994. In pursuit of these targets, 108 national parks have already been gazetted, 40 more are planned and as much as 80 percent of the land is under protection in some provinces (Forsyth and Walker, 2008; Usher, 2009).

The 1961 legislation explicitly forbids that anyone carry on any activity for economic benefit in a national park, unless permission is obtained from the competent official (Government of Thailand, 1961). These activities include many that pertain directly to subsistence and land-based livelihoods. Specifically, Section 16 of the National Park Act states that within the national park, no person shall "hold or possess land, nor clear or burn the forest". It is also forbidden to "collect, take out, or do by any means whatsoever things endangering or deteriorating":

- woody plant, gum, yang wood oil, turpentine, mineral or other natural resources;
- animals;
- orchids, honey, lac, charcoal, barks or guano;
- flowers, leaves or fruits;

Until 1997, the procedure for establishing a protected area was largely perfunctory. A National Parks Committee would decide what land should be protected, and the National Parks, Wildlife and Plant Conservation Department would draw boundaries in a non-discriminating fashion, with neither ground surveying nor public consultation. This led to numerous conflicts, some of which lasted for decades.

Some progress was made with the new Thai constitution introduced in 1997, which includes a clause requiring a more comprehensive approach to park establishment, stipulating that affected stakeholders have a right to participate (Government of Thailand, 1997). The current procedure requires that communities be consulted and allows for the possible exclusion of a community's affected lands from the protected area following consultation and negotiation.

In addition, in 1998 the Thai Government passed a provision to allow for subsistence livelihoods in protected areas, provided that villagers had settled there before the declaration of the protected area.

In 2001, learning from various conflicts over protected areas, the government noted the importance of community involvement in managing parks (Royal Forest Department and IUCN, 2001):

> *The expansion of the national protected area estate through the declaration of new sites and the expansion of existing ones needs to be carefully reviewed... Care must also be taken to avoid creating potential for subsequent social conflict due to the overlap of protected areas with community lands. Communities living in or around national parks must be involved in park management.*

Yet almost ten years later the paradigm of exclusionary conservation persists in the National Park Act. Protected areas now make up around 23 percent of all forests in Thailand (Usher, 2009), and at

least 1 million people live in them. Nonetheless, legislation does not address historic claims. Forcing the exclusion of people with customary claims has had high social costs. Evictions, arrests, home demolitions and armed protests are commonly described (Hares, 2009; Leblond, 2010; Usher, 2009). Protected area policy is still the number-one source of land-use conflict in Thailand. Between 2002 and 2006, of the 91 cases of forest conflict officially filed in Thailand, 81 took place in national parks (Chairos and Kriyulwong, 2007).

THE CASE OF TEEN TOK VILLAGE

Teen Tok Village is located in Kanchanaburi Province in Thailand, roughly 140 km from the provincial capital. Villagers and their ancestors have been settled in the area for 250 to 300 years. The larger community comprises a cluster of six villages, of which Teen Tok is one, situated along the Ploo River near the Sri Nakarin Dam.

The total population of the village is 252 households, with 1 129 people, the majority of whom are Karen Po ethnic minority. The main livelihood of the village dwellers is agriculture, principally rain-fed rice cultivation for household consumption. Approximately 80 percent of the villagers also cultivate field crops (mainly maize), as well as some vegetables and fruit, for sale. Intermediaries generally come to the village to transport their produce to the provincial capital or to Bangkok for sale.

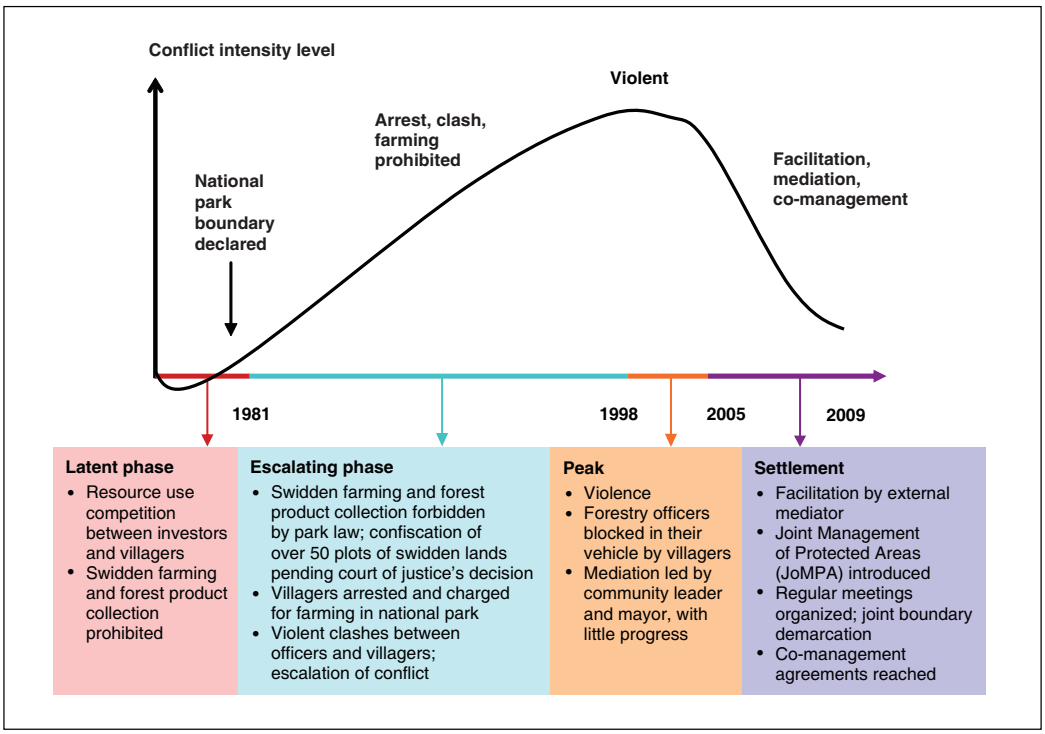
Two protected areas were declared in the area by the government in 1981 – the Sri Nakarin Dam National Park and Chalerm Rattanakosin Forest Reserve – using the non-consultative approach of the time. Both the national park and the forest reserve overlap with the Teen Tok village lands. Consequently, livelihood activities such as farming, hunting and rice cultivation came to be considered illegal and prohibited. This was the start of what turned out to be a long struggle over "who owns the land" in Teen Tok.

The conflict

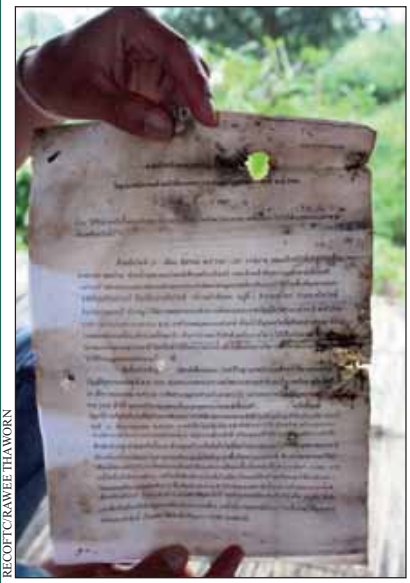
Although low-level competition for resources had existed since the 1960s, conflict between villagers and national park officials began in 1981 (Figure) when the government declared protected areas on land overlapping with that of Teen Tok village. By declaring the land protected, the State claimed a statutory right to the land used by the community, a claim that conflicted with Teen Tok village's claim of customary right.

A second and important cause of conflict was the absence of community consultation prior to the establishment of the two protected areas. The local community in Teen Tok had no opportunity to request that certain resources key to their livelihoods be excluded from the boundaries or included in the park's management plan.

Beginning, then, in 1981, national park officials, enforcing State legislation and adhering to pre-drawn boundaries, began to confiscate the land that villagers were using for swidden farming. More than



Development of conflict in Teen Tok Village



RECOFTC/RAWEE THAWORN

Document for a villager's arrest, confiscation of his land and a 5 000 Baht (US$150) fine for land cultivation, citing the 1961 National Park Act as its basis

50 plots of fallow land were confiscated, and as a result the fallow period for the land that remained in cultivation was shortened and the village's food security reduced. At least three villagers were arrested for continuing to farm on the disputed land.

Distressed by the loss of their land and livelihoods, villagers largely adopted a strategy of everyday resistance. Rather than collectively resist park development over the next 15 to 20 years, villagers mostly acted individually by continuing to cultivate the land. During this period they lived in perpetual anxiety, as recounted by a villager:

> *The day I was felling trees in the swidden field to clear land for paddy cultivation, I was in constant fear and paranoia. Suddenly, I saw the forestry officer approaching me. With panic, I ran as fast as I could and while running for my life, I had to kill two of my most beloved dogs that were barking and running away with me by hitting them on their heads until they died, for fear that their barking would lead the forestry officer to successfully locate and arrest me.*

The number of arrests and land confiscations gradually increased, especially towards the late 1980s and early 1990s. By 1994, villagers had been forced to shorten the fallow period from between five and seven years to between two and three years. In 1995, when forest land was opened to private business investors who wanted to develop a mulberry plantation to raise silkworms and to plant maize, villagers experienced even greater resentment, viewing this decision as a double standard.

In 1999 the conflict escalated again, nearing violence, despite the cabinet provision of the previous year permitting subsistence livelihoods in protected areas. After the arrest of some villagers who were levelling land in preparation for constructing a house, and the detention of forestry officers by villagers for half a day in retaliation, the head of the national park came to negotiate with the villagers. A compromise was reached allowing villagers to cultivate swidden lands for a period of five years. Although these negotiations somewhat improved relations, no lasting solution was achieved.

Reconciliation and agreement

In 2004, the Sueb Nakhasathien Foundation, which had been working in and around Teen Tok since 1990, opened the path to reconciliation. The foundation helped mediate the conflict as part of the Joint Management of Protected Areas (JoMPA) project initiated by the Danish International Development Agency (DANIDA) to test the 1998 provision in pilot sites. Partners in the project included villagers, the Department of National Parks, Wildlife and Plant Conservation, and the Ministry of Natural Resources and the Environment.

Initially, the JoMPA project aimed at establishing mutual understanding between villagers and national park officials. Monthly community meetings for villagers and a village committee were established to act as information-sharing fora. In 2006, the foundation, community members and national park officials, working together, marked forest areas for

Following the exclusion of their cultivated lands from protected area boundaries, villagers are now able to plant and harvest maize

RECOFTC/RAWEE THAWORN

RECOFTC/RAWEE THAWORN

Teen Tok villagers are again able to harvest bamboo from the forest following an agreement with national park officials made during the process of conflict mediation

the village's use within the boundaries of the two protected areas. The boundaries now clearly exclude swidden lands. Within the new boundaries, sustainable collection of non-wood forest products (e.g. medicinal plants, leaves, mushrooms and fruits) is permitted according to regulations established by a village institution and agreed upon by national park officials. Another important agreement, particularly for swidden farming, is that the village committee should have advance notice about boundary checks, which are to be jointly performed by both forestry officers and the community committee. Clearly, park officials have made important concessions, and so have villagers.

Regulations for managing and monitoring activities in the park were also established, along with a system of graduated sanctions for violators, ranging from boycott of an offender's important ceremonies (e.g. weddings or funerals) by other villagers, for example, to informing national park officials as a last resort.

Building on this success, Teen Tok village's Forest Conservation Network has expanded to include neighbouring villages. In 2008, the village created a Forest Protection Volunteer Network with the five other villages in the cluster, to function as a community network for forest protection, forest care, forest fire watch and management for the whole forest area. Over 150 volunteers now regularly conduct forest patrols with the national park officers.

CONCLUSIONS

The case in Teen Tok demonstrates how less exclusionary policy and more dynamic arrangements between local players and managers at the State level can be better for both people and conservation. Not only are 150 villagers now helping monitor the forest for forest crimes, but two decades of antagonism have been reversed.

As regards management, flexibility in position, with concessions on both sides, was crucial towards achieving a resolution. This case also suggests the importance of an external mediator. The presence of the Sueb Nakhasathien Foundation in coordinating and facilitating the JoMPA project was essential, allowing villagers and government officials to understand the perspective of their counterparts.

Conservation approaches that neglect local livelihoods are likely to fail. This article establishes that a participatory approach to the management of protected areas may allow for the reconciliation of conservation and livelihood objectives. Partnership with local communities is vital to the success of conservation initiatives.

A number of generic lessons can be drawn from the case of Teen Tok, which may be useful for broader application in Thailand and elsewhere:

- Early consultations with resident local populations prior to decision-making about land-use changes such as establishment of protected areas should be encouraged. They could draw, for example, from the concept of free, prior and informed consent (FPIC).
- The livelihoods of local communities should be integrated into the management of protected areas.
- In a conflict situation, third-party mediation is necessary to reconcile conservation and livelihood objectives.
- Governments need to recognize and respect community rights to forests and to reform tenure arrangements and land-use policy as necessary to minimize the likelihood of conflict.

The conservation paradigm in Thailand is being revisited in the debate over community forestry. The key argument is over whether communities that rely on the resources contained in protected areas should be allowed to establish community forests within their boundaries. Unfortunately, the 2007 version of the community forestry bill did not include such provisions and so was declared unconstitutional in November 2009. Nonetheless, the 20-year push for meaningful community forestry continues, and it is keeping the issue of customary claims alive in the natural resource discussion – allowing the possibility that it may help to shape a more modern approach to conservation in Thailand. ◆

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RECOFTC/RAWEE THAWORN

A villager of Teen Tok points to the patch of forest the community is hoping to turn into an official community forest with the support of local officials and national legislation

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Conservation governance in Nepal: protecting forest biodiversity and people's livelihoods

T.B. Khatri

To reduce adverse impacts of protected areas on local people and adverse impacts of people on protected areas, Nepal introduced buffer zones whose revenue – often from tourism – is reinvested for local development under the management of community user groups.

FAO/FO-0272/S. WYMANN

Nepal's approach to forest conservation has shifted from strict protection to more participatory practices involving sustainable use

Although a small country, Nepal possesses disproportionately rich biological diversity at the ecosystem, species and genetic levels – a result of the country's unique geography, with rapid change in altitudinal gradient and associated variability in eco-climatic conditions. This biological diversity is closely linked to the livelihoods and economic well-being of rural communities.

Nepal is predominantly an agrarian society, with forestry an integral part of agriculture and rural livelihoods. For instance, crop production is dependent on livestock manure which is sustained by fodder from the forests. Fuelwood is the principal source of rural energy. Forests (including other wooded land) cover 5.8 million hectares, about 40 percent of Nepal's total land area (Department of Forests, 2010; DNPWC, 2009a). The forests range from tropical to alpine scrub and are crucial for maintaining ecological balance as well as meeting the livelihood requirements of the majority of rural people. Forests also contribute significantly to other sectors of the national economy such as agriculture, water resources, environmental conservation and community-based village tourism. Their conservation is important in view of both the number of globally threatened wild plant and animal species and the diversity of ecosystems they represent (MFSC, 2002).

Nepal has witnessed paradigm shifts in forest management approaches since the beginning of the twentieth century, from strict protection to more participatory practices involving sustainable use (Khatri, 2009). The country's forest policies are strongly built on traditional

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practices but have evolved through time and are influenced by national development plans and strategies. In other words, they address both development and conservation imperatives of the country.

This article highlights the country's strategy for participatory conservation, emphasizing a buffer-zone mechanism designed to reduce the adverse impact of protected areas on the livelihoods of local communities and vice versa. It is based on literature review and the author's personal experiences.

MANAGEMENT OF NEPAL'S FORESTS

Almost all of Nepal's forests are owned by the State. Nepal has only 2 360 ha of private forests, and most of these holdings are small (less than 1 ha). Around 21 percent of the forests are now managed as community forests, with a management plan approved by the government. Smaller areas are classified as leasehold, religious and protected forest (see Box and Table 1).

Nepal has made substantial endeavours to manage its natural resources. The government has designated 20 protected areas, including ten national parks, three wildlife reserves, seven conservation areas and one hunting reserve. These protected areas now cover a total of 3.4 million hectares, which is roughly 23 percent of the total land area of the country.

Nepal's first and largest conservation area, the Annapurna Conservation Area, is globally considered a model for conservation and development. With an area of 762 900 ha, it is home to over 100 000 residents of different cultural and linguistic groups. The Annapurna Conservation Area Project (ACAP) promotes integrated conservation and development in which local communities, organized in user groups, are the principal actors and ultimate beneficiaries. To replicate the success of ACAP, the government has designated

Management of Nepal's national forests

Protected areas **are set aside for conservation of flora and fauna.**

Government-managed forests **are managed by the Department of Forests through its own management system.**

Community forests **were implemented according to the Forests Act of 1993, primarily for two reasons: to reverse the harm that came about from the nationalization of the forests in the early 1960s and to empower local communities through usufruct rights. Today, 14 572 user groups are actively engaged in the protection and management of community forests. Almost 800 user groups comprise women's committees, which manage more than 23 000 ha of community forest (Department of Forests, 2010).**

Leasehold forests **are intended to reduce the poverty level of the poorest farmers through the promotion and wise use of forest products. Through a joint initiative with the International Fund for Agricultural Development (IFAD), the Government of Nepal aims to lease forests to 4 918 user groups to improve the income of about 43 800 poor households in 22 districts through integration of forestry with livestock development.**

Religious forests**, which are spread across 22 districts, have been handed over to religious institutions or groups for the conservation and wise use of forest products. The forest products from these forests cannot be used for commercial purposes.**

Collaborative forests **were piloted in eight Terai districts of Nepal as a result of the forestry policy of 2000 to widen stakeholder participation and resource sharing. The initiative includes guidance for a landscape approach to conservation. However, the approach has not yet been incorporated in the Forest Act 1993 to make it binding. Collaborative forests currently have more than 800 000 beneficiaries.**

Protected forest **is a category designated for special purposes. The government can designate any forest area as protected for its religious, cultural or scientific significance. To date only one forest area, at Latikoili in Surkhet District, has been designated in this way, to safeguard an archaeological site.**

Protected area community forests **include all forests in buffer zones and conservation areas. These forests are exclusively protected and managed by local communities to meet basic needs for timber, woodfuel and fodder. They differ from community forests within buffer zones only in that the sale of forest products from these forests is regulated to ensure sustainability.**

TABLE 1. Forest management categories in Nepal

Category	Total area *(ha)*	No. of households involved
Protected areas	3 400 562	
Government-managed forests	1 044 467	
Community forests	1 243 897	1 672 007
Leasehold forests (ultrapoor and industries)	27 540	4 918
Religious forests	574	
Collaborative forests	17 997	136 463
Protected forests	162	
Protected area community forests	92 801	43 504
Total forest land	5 828 000	1 856 892

Source: Department of Forests, 2010; DNPWC, 2009a.

CHITWAN NATIONAL PARK/S.R. BHATTA

Nepal's participatory conservation programmes provide local communities with the motivation to manage and use natural resources sustainably

additional areas such as Kanchenjunga and Manaslu as conservation areas.

Nepal's pioneering experience with participatory conservation programmes (community forestry, conservation areas) has been rewarding and has provided local communities with the motivation to manage and use the natural resources sustainably.

PARTICIPATORY APPROACH TO CONSERVATION IN PROTECTED AREAS: BUFFER ZONES

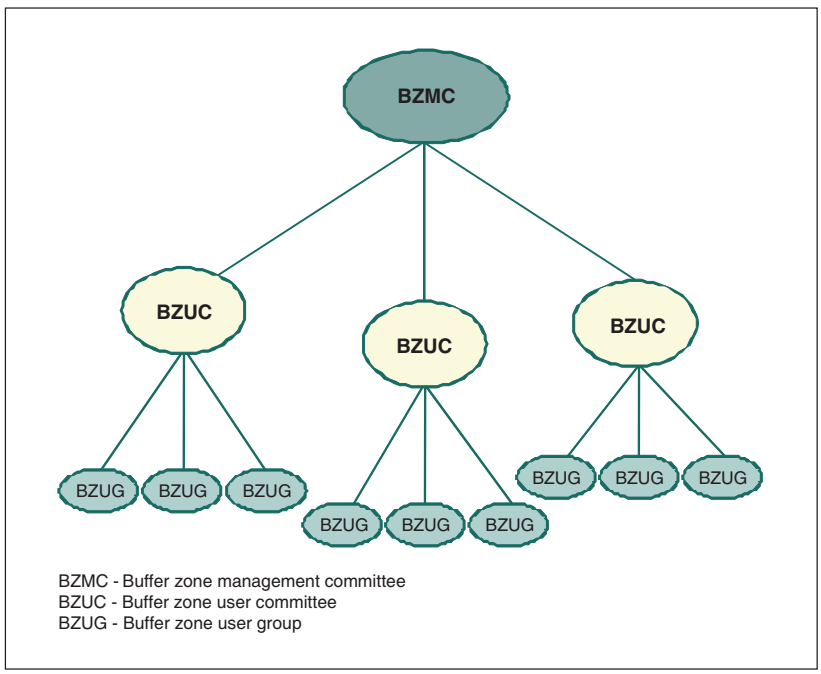
Successful community-based resource management initiatives like the community forestry programme and the Annapurna Conservation Area Project encouraged the Government of Nepal to embark on a participatory approach for protected area management. In 1992, the government amended the National Parks and Wildlife Conservation Act 1973 to authorize park authorities to declare buffer zones at the peripheries of parks and reserves and allow 30 to 50 percent of the revenue generated from park fees (user fees, ecotourism services, etc.) to be reinvested for local development. Subsequently, the Buffer Zone Management Regulations 1996 and the Buffer Zone Guidelines 1999 were framed to facilitate meaningful participation of local communities.

The buffer zones comprise forests, settlements, agricultural land and other land use types. In each park, the buffer zone support unit implements initiatives through community mobilization. The community mobilization principles advocate the formation of community-based organizations such as user groups, user committees and buffer zone management committees. As in ACAP, user groups formed at the settlement level are responsible for the planning, management and supervision of the activities implemented with resources received from buffer zone revenue (Figure 1). As mandated by the Buffer Zone Management Regulations, a share of the revenue received from the buffer zone is to be spent for local development through the user groups (Figure 2).

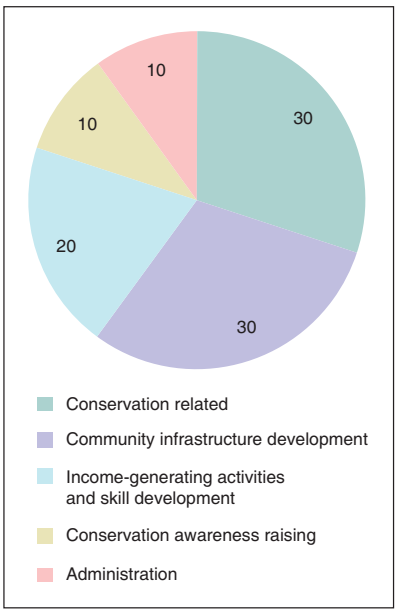
The idea is to reduce the negative impact of local communities on protected area resources and thus help conserve biodiversity by providing alternative livelihood and income-generating opportunities – for example in vegetable farming, beekeeping, animal husbandry (poultry, goats and pigs), handicrafts, souvenir shops, hotels, restaurants and nature tourism – or to compensate local communities for the losses they incur when a protected area is declared.

Since 1998, the government has invested 337 million Nepalese rupees

1
Institutional mechanism of buffer zone institutions



BZMC - Buffer zone management committee
BZUC - Buffer zone user committee
BZUG - Buffer zone user group



2
Budget allotments for investment of revenue received from the buffer zone (%)

Sustainable management of park natural resources presents income-generating opportunities, for example in production and sale of handicrafts

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Biodiversity in the buffer zone is protected through provision of alternative income-generating opportunities for local people

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(US$4.6 million) for nine buffer zone management committees to undertake conservation and development activities (Table 2). Chitwan National Park has received the highest share.

The case of Chitwan National Park

Chitwan National Park was gazetted in 1973 as Nepal's first protected area and is a major tourist destination in Asia. The total area of the park is 93 200 ha.

The Chitwan National Park buffer zone programme started in 1996. The buffer zone area comprises 75 000 ha and is spread across three districts, Makwanpur, Parsa and Nawalparasi (Figure 3). There are approximately 800 settlements within the buffer zone with a population of more than 225 000 people comprising almost 37 000 households. A total of 1 470 user groups (687 female, 724 male and 59 mixed) have been formed at the settlement level; they are federated into 21 user committees. A buffer zone management committee is responsible for the overall management and allocation of buffer-zone resources.

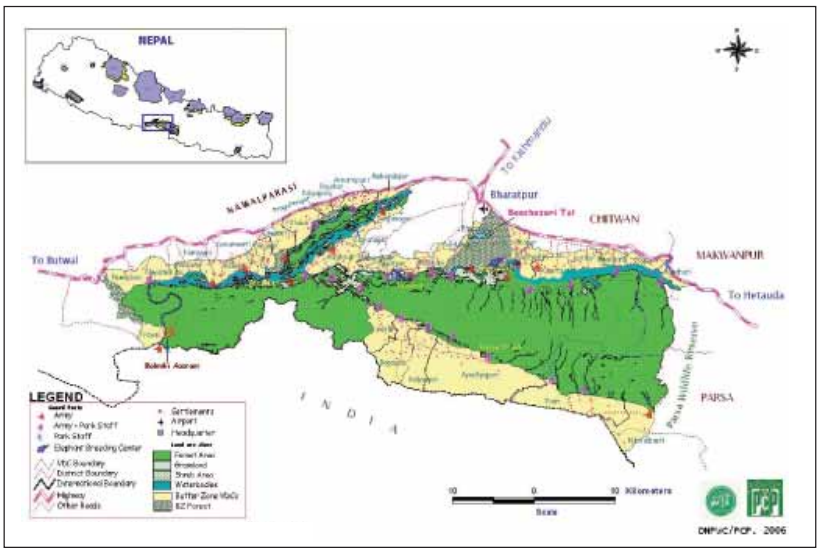
To date a total of 247 million rupees (US$3.3 million) has been invested in a wide range of activities, including but not limited to:

- river control;
- compensation for loss of cultivated land;
- development of infrastructure such

TABLE 2. Revenue reinvested in buffer zones

Protected area	Period of release	Budget released *(rupees)*
Chitwan National Park	1998–2009	247 621 584
Bardia National Park	1999–2007	19 836 157
Langtang National Park	2000–2007	19 531 423
Sagarmatha National Park	2005–2009	40 788 257
Parsa Wildlife Reserve	2008–2009	5 262 188
Suklaphanta Wildlife Reserve	2009	1 109 552
Sheyphoksundo National Park	2009	2 044 951
Makalubarun National Park	2009	1 395 142
Total		**337 589 254** (US$4 624 510)

Source: DNPWC, 2009a.



3
Map of Chitwan National Park and its buffer zone

as roads, trails, schools and irrigation canals;
- barriers to animals such as trenches and solar fences;
- community forest management and wetland management;
- livelihood promotion activities such as vegetable farming, beekeeping, bio-briquette production, poultry farming, fisheries, non-wood forest product based enterprises and development of microcredit and cooperatives;
- community based anti-poaching activities;
- study tours to help local people develop additional livelihood opportunities.

These activities have contributed to improving the buffer zone as habitat for people and wildlife. They have increased its physical capital through infrastructure improvement, its human resource capital through development of capacity for buffer zone management and its financial capital through savings and credit schemes – with a huge social capital as a result.

Buffer zone challenges

Protected areas such as Chitwan, Sagarmatha, Langtang and Bardia National Parks generate substantial revenue from tourism and therefore can afford to reinvest a substantial amount in local development. Despite the progressive policy on participation and empowerment, the revenue to sustain these protected areas largely depends on the flow of tourism. Wherever tourism has been abundant, the revenue has also been abundant. Protected area managers have been able to promote the value of conservation as people have seen and received benefits.

Support is more problematic, however, for other protected areas that are resource poor and have some level of conflicts emanating from wildlife (see Box opposite), even though they are as important for biodiversity conservation as the highly visited areas.

One way to address the resource gap would be to create a basket fund in which revenue generated in resource-rich protected areas could be used to support neighbouring areas that are poorer. But it remains to be seen whether the stakeholders of the resource-rich protected areas would be willing to share their revenue with others in the long term.

DISCUSSION

Participatory management of forest resources represents a true reform of forest governance in Nepal. It has resulted in the involvement of a wide spectrum of stakeholders and pluralistic institutions, including more than 21 000 user groups having over 11 million beneficiaries. Community forestry, buffer zone and leasehold programmes (described in the Box on p. 35) have also contributed to poverty reduction and the improvement of local livelihoods.

Nepal's success in conservation is a product of commitment, stewardship and trust on the part of both the government and local people. However, continued innovation is necessary to replicate and upscale the best practices and lessons learned across the country. Institutional capacity must be reoriented to meet

A share of buffer zone revenue is spent for local development, for example construction of this irrigation canal

CHITWAN NATIONAL PARK/S.R. BHATTA

CHITWAN NATIONAL PARK/S.R. BHATTA

Participatory management of forest resources in Nepal has engaged more than 21 000 user groups having over 11 million beneficiaries

Conservation and wildlife conflict

In Nepal, both politicians and the general public largely view conservation initiatives in terms of protecting nature and wildlife and avoiding conflicts between wildlife and people. Yet with increases in the number of protected areas, human-wildlife conflict has become a serious problem, with crop depredation, physical damage to people and property and human casualties from major wildlife species such as rhinoceroses, tigers and elephants. From 2006 to 2009, 51 people lost their lives to wild animals (Table 3). Such conflicts are a major concern for people living in and around protected and forest areas.

Paradoxically, the success of community forest management has also contributed to the development of conflicts. The middle hills, which were once denuded, are now lush with green cover and again able to harbour wildlife. However, colonization by wild prey species has been slow, and the incidence of child lifting by leopards in the middle hills has risen in the past few years.

Given the incidence of casualties, the government has recently devised guidelines for providing financial compensation for wildlife-related loss of lives, physical damage to people and property, and livestock and crop depredation (DNPWC, 2009b; Table 4).

TABLE 3. Human casualties by major wildlife species, 2006–2009

Year	Number of casualties by species		
	Tiger	Elephant	Rhinoceros
2006	8	7	5
2007	0	14	2
2008	2	6	3
2009	2	0	2
Total	**12**	**27**	**12**

Source: DNPWC, 2009a.

TABLE 4. Compensation guidelines for wildlife-related loss

Category of loss	Compensation *(rupees)*
Minor physical damage	5 000
Seriously wounded	50 000
Loss of life	150 000
Loss of livestock	10 000
Loss of house/shed	4 000
Loss of stored grains	5 000
Loss of food and fruit crops	5 000

Source: DNPWC, 2009b.

changing aspirations of the people for better services and delivery, livelihood improvement, conflict mitigation and their increasing role in the conservation and management of protected areas.

Nepal is a developing country, and its development imperatives – including those in other sectors such as agriculture, water, rural development, energy and transportation – have a direct bearing on its forest resources. The policies of the various sectors sometimes conflict or contradict one another because there is no appropriate mechanism to ensure compatibility during the policy formulation process. Moreover, a national land-use strategy and policy have not yet been formulated, and the demand for forest land for infrastructure development is high. About 23 laws in other sectors contradict forest law.

The natural resources sector has suffered greatly from the political turmoil of the past decade. The sector has been a fertile ground for exploitation by politicians seeking votes; over the years the country has lost a significant share of its forest resources through the practice of providing forested land for resettlement and associated activities. The government should disallow the provision of forest lands and should develop more innovative ideas for assisting genuinely landless people, such as through purchase and distribution of private lands. Nepal cannot afford to lose further precious forest assets. In order for the forest sector to prove its relevance and position itself strongly in the national development agenda, it is urgent to educate and inform policy- and decision-makers on the environmental and economic benefits that forest resources provide (including their contribution to gross domestic product [GDP], local income, livelihoods for forest-dependent people and conservation values) as well as on the new development opportunities to be reaped from climate change and carbon trading. Sensitization and

awareness could encourage lawmakers to make the environment, conservation and development agenda one of the priority areas of the new constitution.

CONCLUSION

Nepal has passed through various stages of experimentation and learning in its bid to conserve and manage its rich biological resources, but its recent participatory biodiversity conservation approach has perhaps been the most instructive and successful. Today, after 13 years of experience with buffer zones, it has become clear that protected area management and local people are working collectively to support and advance each other's needs. In this win-win situation, local people can receive financial support for their community development activities, while protected areas benefit from the involvement of local people in their planning and management. This partnership has resulted in the development of natural, social, financial, human and physical capital – constituting a strong foundation for environmental governance. The integrated and participatory approach has given people a greater appreciation of conservation and a sense of ownership towards the protected areas. ◆

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Returning Manyeleti Game Reserve to its rightful owners: land restitution in protected areas in Mpumalanga, South Africa

M.A.I. de Koning

In a new process for settling land claims in protected areas, government and community land claimants negotiate a mutually acceptable co-management agreement aimed at balancing conservation and development benefits.

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Between 1913 and the early 1980s, forced removals in support of racial segregation caused enormous suffering and hardship in South Africa. The South African Government is now committed to reversing the effects of colonialism and apartheid. The Restitution of Land Rights Act (No. 22 of 1994 as amended) provides for the return of land rights to persons or communities dispossessed after 19 June 1913 without equitable compensation as a result of past racial discriminatory laws or practices. Claims had to be lodged with the Commission on Restitution of Land Rights (CRLR) before 31 December 1998. In total 80 000 land claims were filed from all over South Africa.

Land claims affect many of South Africa's protected areas, State forests and world heritage sites. An estimated 122 land claims on protected areas are outstanding (CRLR, 2007). The appropriate settlement of these claims can have enormous impact on the local economic development of rural areas, where most people still rely heavily on natural resources to keep poverty at bay (Shackleton and Shackleton, 2004). The land restitution process in protected areas will be successful only if a good balance between conservation and development is achieved (de Koning and Marais, 2009).

This article summarizes the results of the negotiation process between government and land claimants over the first land claims on protected areas in the province of Mpumalanga. On 27 February 2010, land claim settlement and co-management agreements were signed for Mdala, Mabusa and Mkhombo Dam Nature Reserves and Manyeleti Game Reserve. The results for Manyeleti Game Reserve are presented in more detail.

LAND RESTITUTION AND CO-MANAGEMENT IN PROTECTED AREAS

Beyond rectification of a historical wrong, clear objectives, such as poverty alleviation and employment generation, are important prior to the settlement of a land claim. In South Africa's land restitution process it is the responsibility of the State and the claimants (individuals, families and communities) to make an informed decision among the options of alternative land, land restitution, financial compensation and/or a combination of these. In most cases the government promotes land restitution as the preferred settlement option for land claimants.

To align the land restitution process in protected areas, the responsible ministers of the Department of Land Affairs (DLA) and the Department of Environmental Affairs and Tourism (DEAT) signed a memorandum of agreement (MoA) in May 2007. For areas that must remain protected in perpetuity, the MoA presents co-management as the only strategy when communities opt for land restitution.

The viability of co-management depends partly on whether the protected area can make a net profit. In most cases this is only possible if management is effective and efficient, the potential for tourism development is high and the right investor can be found. Berkes (1997) concluded that co-management is feasible only if four conditions are present: appropriate institutions, trust

Tourism value / Biodiversity value	High (co-management)	Medium (further assessment)	Low (no co-management)
High	**Co-management** Use socio-economic risk value and current tourism status to identify risk areas	**Co-management** Socio-economic risk ↓ Current tourism ↑ **Part-lease/part co-management** Socio-economic risk ↑ Current tourism ↑ Socio-economic risk ↓ Current tourism ↓ **Lease/Alternative land/ Financial compensation** Socio-economic risk ↑ Current tourism ↓	**Lease** **Alternative land** **Financial compensation**
Medium	**Co-management** Use socio-economic risk value and current tourism status to identify risk areas	**Co-management** Socio-economic risk ↓ Current tourism ↑ **Part-lease/part co-management** Socio-economic risk ↑ Current tourism ↑ Socio-economic risk ↓ Current tourism ↓ **Lease/Alternative land/ Financial compensation** Socio-economic risk ↑ Current tourism ↓	**Lease** **Alternative land** **Financial compensation**
Low	**Co-management** Use socio-economic risk value and current tourism status to identify risk areas	**Co-management** Socio-economic risk ↓ Current tourism ↑ **Deproclamation** Socio-economic risk ↑ Current tourism ↓	**Deproclamation**

Matrix to determine the most feasible land claim settlement option by ranking the value of biodiversity and tourism, taking into account the current tourism record and the socio-economic risk

between partners, legal protection of local rights and economic incentives for local people. Partnerships with the private sector are crucial to make co-management beneficial for all the parties involved. The anticipated benefits for the communities include community equity stakes in tourism concessions; payments of lease fees or revenue shares to communities for the use of their land; preferential employment for local people; local outsourcing, procurement and contracting; and local enterprise opportunities and business training (Wolmer and Ashley, 2003; Carruthers, 2007).

THE MPUMALANGA MODEL

The Mpumalanga Tourism and Parks Agency (MTPA) is a parastatal appointed by the State to manage the provincial protected areas. Of 19 fenced and staffed State-owned protected areas managed by MTPA, 17 are partially or completely under land claim.

Protected areas are decreasingly subsidized by the government, and conservation agencies rely increasingly on their own income generation to sustain operations and to fulfil their mandate of conserving biodiversity. However, it is questionable whether they can manage to do so with the additional expectations of benefit sharing by land claimants. In 2008/2009, MTPA relied on government subsidies for 88 percent of its income, but its long-term target is to rely on these subsidies for only 60 percent of its income in 2016/2017.

From 2007 to 2009, MTPA developed a model for balancing the objectives of biodiversity conservation and increased local economic development in cases of land restitution in protected areas. The model was designed via an extensive literature review and legislative analysis.

The first part of the model is the elaboration of the conservation agency's internal position regarding the land claim. The agency carries out a ranking exercise on the biodiversity and tourism value of the area to assess the preferred land claim settlement option. Areas with medium to low tourism value are considered to have insufficient potential to yield benefits under co-management, as they attract limited numbers of investors and tourism operations generate only an average turnover. Furthermore, the negotiated contracts risk having few pro-poor tourism benefits because operations are risky and because of the lack of competition by investors. Therefore MTPA decided that co-management is only viable for the protected areas with a medium to high tourism value, regardless of their biodiversity value. For other areas, options include land restitution with MTPA leasing the land back from the claimants, alternative land, financial compensation or, where both tourism and biodiversity values are low, deproclamation of the protected area, permitting a change in land use (see Figure).

In the first part of the model, the conservation agency also establishes its internal position with regard to the preferred set-up of co-management.

The second part of the model design is the development of a consolidated position among relevant government departments, based on the conservation agency's internal position.

The third part is the elaboration of generic land claim settlement and co-management agreement frameworks, based on the consolidated government position. The agreement frameworks refer to the respective legislation involved, and they must be legally compliant. The final versions need to be approved by the relevant departments to form the basis for negotiations between the government stakeholders and the land claimant representative structures.

The model design was tested in seven protected areas managed by MTPA, selected for their relatively high biodiversity and high tourism value and therefore considered to have potential for successful co-management.

Negotiation process

The negotiation of land claim settlements and co-management agreements between the conservation agency and land claimant representatives is facilitated by methods such as ranking of primary and secondary stakeholders, participatory mapping with communities, exposure visits, role-playing and socio-economic assessments. Ideally these activities are all conducted within a team consisting of land claimants, MTPA staff and officials of the Regional Land Claims Commission. The process enables the land claimant representatives to make informed choices within the legal framework. It makes it possible to tailor the land claim settlement option and agreements to specific situations and to win the acceptance of a majority of claimants regarding the proposed agreements and way forward.

In certain cases the land claimant representatives need additional information to decide which land claim settlement option is preferred for a given protected area, such as the current tourism record; a socio-economic risk assessment of the environment in which the protected area is located; and financial figures to make projections on current and future net profit calculations. The matrix shown in the Figure is a comprehensive tool that can help land claimant representatives understand the logic determining the most feasible land claim settlement option for their specific situation.

The inclusion of inputs from the land claimant representatives has made it possible to make some generic improvements to the agreement frameworks. For example, the co-management committee is given real decision-making power as long as decisions fall within the approved management plan for the protected area (which is made by MTPA in conjunction with the land claimants and approved by the Mpumalanga Department of Economic Development, Environment and Tourism). Socio-economic assessment proved to be a good tool for easily identifying certain risk areas such as unrealistic community expectations; a lack of strong community structures; lack of access to infrastructure, services and support organizations; claimants living relatively far from the reserve; and conflict with the local municipality. Although the process was costly and lengthy for the conservation agency, it ensured improved communication, understanding and trust between the future co-management partners, that is, the land claimants and the conservation agency.

THE CASE OF MANYELETI GAME RESERVE

One of the protected areas where MTPA applied the model described above is the Manyeleti Game Reserve. This 22 750 ha game reserve, situated along the western boundary of the Kruger National Park, has been claimed by 253 claimant households of the Mnisi community who are represented by the Manyeleti Conservation Trust. The Mnisi community, a branch of the wider Shangaan, settled on

Negotiation of the land claim settlement and co-management agreement between the government and the claimants in Manyeleti Game Reserve

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unoccupied land at Manyeleti (meaning "place of the stars") in 1922 and used it for grazing and subsistence farming. They brought three young mahogany trees with them and planted them where the game reserve is today.

In 1964 the apartheid government removed the Mnisi people from their land without their consent and without compensation, and developed the land as a game reserve for black people, who were barred from the neighbouring Kruger National Park.

The reserve is a prime game-viewing destination, owing to unhindered migration of the "big five" – African elephant (*Loxodonta africana*), black rhinoceros (*Diceros bicornis*), Cape buffalo (*Syncerus caffer*), leopard (*Panthera pardus*) and lion (*Panthera leo*) – and other species of wildlife between Manyeleti, Timbavati and Sabie Sands Game Reserves and Kruger National Park. The vegetation is generally open savannah and mixed lowveld bushveld with dense riverine vegetation and forests following the watercourses. Tourism is already well established, with nine tourist concessions currently operating in the reserve, and it has potential for expansion. The reserve's high tourism value and medium biodiversity value suggested that co-management could be a viable option, and in the negotiation process the land claimants decided to opt for land restitution with co-management.

Possible risk areas identified in the socio-economic assessment include a relatively high number of neighbouring communities having expectations for jobs and the lack of access to services. Advantages include the good relationship between the claimants and the tribal authority; the good relationship with the local municipality; strong leadership and community structures in the area; community cohesion; and the relatively low expectations of the claimant community. The socio-economic assessment confirmed that co-management could be a feasible model as long as the expectations of the wider community are managed; MTPA and the Manyeleti Conservation Trust can address this risk area through a public participation process about the management plan, including its financial projections.

On 24 February 2010, the majority of the claimant households resolved to mandate the current board of trustees of the Manyeleti Conservation Trust to sign the agreements on their behalf; one of the conditions was that the existing trust be augmented by four claimant members. The land claim settlement and co-management agreements were signed simultaneously in an official ceremony on 27 February 2010.

The signed agreements stipulate that the land in Manyeleti Game Reserve will be restored to the claimants and the area managed in accordance with the finalized co-management agreement and the management plan for the game reserve. The current landowner (in most cases the Department of Land Affairs and/or the National or Provincial Department of Public Works) will transfer the title deed to the Manyeleti Conservation Trust within one year after the signing of the agreements. In the case of a dispute, the 253 claimant households can replace the current board of trustees or opt for a new legal entity representing their interests. Certain conditions of use will be registered against the title deeds to be transferred, such as the obligation that the properties must remain under conservation and cannot be physically occupied by the new landowners.

MTPA and the Manyeleti Conservation Trust jointly establish the management plan and a co-management committee for the overall strategic management of the game reserve consisting of three representatives each. Day-to-day operational management remains the responsibility of MTPA. The State agreed to provide planning and development grants of up to US$880 per claimant household and 25 percent of the value of the land, to enable the claimants to undertake business

Community resolution in Manyeleti Game Reserve: the majority of the claimant households give their consent to the board of trustees of the Manyeleti Conservation Trust to sign agreements on their behalf

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developments (such as the development of a community-owned lodge) and/or to obtain equity in tourism concessions on the game reserve. Existing and future community public-private partnership contracts should be negotiated within the co-management committee, for maximization of pro-poor tourism benefits and the best interests of the protected area.

Neighbouring communities should benefit from the game reserve according to the National Environmental Management Protected Areas Act (No. 57 of 2003). It was decided that the communities most closely associated with the reserve and neighbouring communities within a radius of 5 km should benefit from access, resource use and employment opportunities according to an agreed ratio. It was recognized that excluding neighbouring communities, mainly of Shangaan and Pedi people, could cause conflict and instability in the area, as many of these communities rely on the reserve for their subsistence.

Benefits package for rightful landowners of Manyeleti Game Reserve

The following benefits accrue to the new landowners.

- ***Infrastructure and assets.*** The new landowners are granted ownership of all immovable infrastructure and fixed assets.
- ***Sharing of revenue.*** Landowners receive 100 percent of the net profit made by the game reserve as the entire area is claimed. The net profit is calculated by deducting all costs related to the management of the game reserve from its annual revenue (including the State subsidies).
- ***Ecotourism and other developments.*** Existing tourism concessions will be reviewed to maximize pro-poor development benefits and to ensure the overall sustainability of the game reserve. The nature and extent of new developments will be determined by the co-management committee. All lease/concession fees are included in the net profit calculation.
- ***Equity in tourism concessions.*** Equity is to be obtained via development grants and negotiations with the private sector around existing and future community public-private partnerships.
- ***Tourism levy.*** A levy to all visitors to the game reserve will be charged for the benefit of the landowners.
- ***Use of biological resources.*** The landowners and other resource users are allowed to use biological resources in limited quantities during certain periods, as determined by the co-management committee in accordance with the management plan.
- ***Access to the game reserve.*** The co-management committee can authorize access to sacred burial sites, the use of biological resources and a reduced gate entrance fee over certain periods.
- ***Proceeds from game.*** Proceeds generated from the sale of game and hunting are included in the net profit calculation.
- ***Local management capacity.*** Landowners and neighbouring communities have an exclusive opportunity, in a proportion of 60:40 percent, to be employed in unskilled positions in MTPA job vacancies on the game reserve. Landowners and neighbouring communities will be granted preference in procurement of goods and services, subject to their levels of skill. Ecotourism management and biodiversity conservation skills will be transferred through bursaries (scholarships) and learnerships (training programmes combining theory at a college or training centre with on-the-job practice) so that over time the landowners will also qualify for skilled positions.

CONCLUSIONS

Although it is too early to say how well the co-management arrangement will work, the negotiation process adopted in Mpumalanga shows clearly that a consolidated government position, agreed upon by all relevant government stakeholders, can help to keep the land restitution process in protected areas within the legal framework. The model developed by MTPA may assist other government agencies, especially State-subsidized conservation agencies in South Africa, to manage land restitution in protected areas within their financial and staffing constraints.

It is recommended that government support all the options indicated in the Figure, which is not the case at present. Most alternatives to co-management are currently still unclear and/or not feasible. The lease option appears to be difficult in the protected areas that are currently State-owned, because the State is not bought out when the land is returned, as is the case in private nature reserves. Because State subsidies for protected areas are declining rather than increasing, there is a limited chance that the government will approve payment of lease fees. Unfortunately, it is still difficult for the conservation agency to convince the Regional Land Claims Commission that despite the political drive for restoration of land title, it is not always the most suitable option for land restitution in protected areas, and that in certain cases the options of alternative land and/or financial compensation should be pursued. This is especially true for areas of irreplaceable biodiversity with limited development potential that are important for the public and cannot be compromised. In these cases co-management can provide only limited tangible benefits for the land claimants because no net profit is generated.

The methods that were developed to work out the generic agreement frameworks helped the land claimants make informed choices within the legal

framework and tailor the settlement options and agreements to their specific situations. Where the feasibility of the chosen land claim settlement option is doubtful, there should be flexibility to review the agreements after a certain period, and the possibility of other, more feasible alternatives.◆

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Switzerland's Mountain Forest Project: bringing volunteers to work in the forest

D. Elmer

Unskilled volunteers help with forest management activities while learning about protection forests and why it makes sense to maintain them.

BERGWALDPROJEKT

Construction of access trails, Entlebuch, Switzerland

In Switzerland, a healthy mountain forest is recognized as a major resource in the life and leisure of the surrounding communities and a protector against avalanches, erosion, rockslides and floods. But environmental factors such as storms have decreased the vitality of the mountain forests in recent decades.

The Bergwaldprojekt (Mountain Forest Project), a Swiss non-governmental organization, organizes volunteer work in mountain forests. The first such initiative was undertaken under the auspices of Greenpeace Switzerland in 1987 and expanded with support from the World Wide Fund for Nature (WWF) Switzerland in 1988. In 1990 the founders set up an independent non-profit Swiss foundation, Stiftung Bergwaldprojekt. Today, about one-third of the funding for the project comes from the government (especially communes, or municipalities, which own most of the forest and pay a contribution for the work carried out) and two-thirds from private donors and foundations. Stiftung Bergwaldprojekt has spawned initiatives in Germany (1993), Austria (1994), Ukraine (2006) and Spain (Catalonia, 2007), which now have their own organizations. Since 1987 the project has organized 8 000 days of volunteer work in Switzerland alone.

The volunteers help with the construction of access trails, dry stone walls to protect against erosion and fences to protect against wildlife browsing; they tend the forests, plant trees or clear stump areas. No forestry knowledge is required to carry out these activities. The participants are instructed by experienced project leaders.

The volunteers – individuals, school classes, service clubs and corporate volunteer groups – come for one day, a few days or a whole work week. They stay in simple cabins, which they are also responsible for cleaning at the end of their stay. A work week typically includes a half-day excursion led by a local forestry expert, and concludes Friday evening with a round of feedback. The project provides food, tools and everything the volunteers need, except

Credit Suisse volunteers construct fencing against wildlife browsing, Chur, Switzerland

BERGWALDPROJEKT

Doris Elmer works for the Bergwaldprojekt (Mountain Forest Project), Trin, Switzerland.

BERGWALDPROJEKT

Credit Suisse volunteers clear a stump area, Chur, Switzerland; by collecting twigs and branches in sheltered piles, they help to favour regeneration, to avoid flooding and landslides by preventing blockage of streams, and to conserve biodiversity by providing habitat for small fauna

in the case of corporate volunteers, whose costs are covered by the corporate partners.

With the help of the volunteers, forest owners get work done that wouldn't be done otherwise because the mountain terrain often prevents the use of forestry machinery, making the work labour intensive. Forest owners are usually surprised at the quality and amount of work that unskilled volunteers can perform – one of the reasons for their lasting involvement with the project. The project also gives forest owners the welcome possibility to explain why and how different types of work contribute to the population's well-being and safety.

Working in the forest, the volunteers experience nature with all their senses and learn that spending their taxes on the protection forests is a cost-effective way to shield the population and infrastructure from natural dangers. This hard-learned realization is the main reason for Switzerland's strong forest law.

Awareness of the Bergwaldprojekt is mainly spread through the Web and by word of mouth, although the project approaches corporate partners directly. Instead of preaching to the converted, the project aims at the most diverse audience possible. It brings together people with different views, offering them the opportunity to work as a team and discuss interesting issues. This promotes mutual understanding, social skills and a sense of personal responsibility. Additionally it is a lot of fun! The volunteer experience made such an impression on one 18-year-old volunteer that she decided to study forest engineering and is now a leader in the Mountain Forest Project (Fahrni, 2009).

Volunteers in 2009 included, among others, more than 1 000 Credit Suisse employees (Credit Suisse, 2010). Every Credit Suisse employee is entitled to dedicate one working day on full pay to helping charitable projects. The Mountain Forest Project is one of seven partner organizations in Switzerland that the bank works with on corporate volunteering projects of different kinds. Abandoning their urban offices for a day, volunteers with the project assist in protecting young saplings from grazing by deer and other animals, in reclaiming overgrown forest trails and debarking felled trees to prevent bark beetle infestation. At the end of the day, the volunteers have the satisfaction of having contributed to creating the necessary conditions for the growth of a healthy mixed forest that can once again offer reliable protection in the face of future natural disasters.

Goals for the future of the project include reaching out to other target groups and larger numbers of participants, and encouraging the transfer of responsibilities for project preparation, organization, funding and implementation to local committees.

Further information is available at: www.bergwaldprojekt.org

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Peeling off bark to prevent bark beetle infestation, Trin, Switzerland

BERGWALDPROJEKT

Forest-based ecotourism in Costa Rica as a driver for positive social and environmental development

A. Bien

Ecotourism can be a major force in promoting forest conservation.

S. MARTINDALE

The success of ecotourism in Costa Rica is due in part to the country's biological diversity and range of habitats

Ecotourism has led the way in the growth of Costa Rican tourism since the 1980s, significantly changing the country's economy and outlook for development. The term "ecotourism" refers to responsible tourism in which tourists are in direct personal contact with nature and the local culture, learn about them and have a net positive environmental and social impact (see Box). Ecotourism can be practised in any type of natural environment, but in Costa Rica much of it depends on and benefits from the country's various types of forest, and can thus be considered "forest ecotourism".

Costa Rica's tourist industry came into existence primarily with the development of ecotourism. Subsequently, it has diversified into many categories such as adventure tourism, rural community tourism, health tourism and conventional sun-and-sand tourism. These activities tend to boost one another, given that a foreign tourist normally spends ten days in the country and practises activities associated with three to five of the various types of tourism. The country's tourist industry is now mature and diversified, receiving 2 million visitors each year (as compared with the country's 4.5 million inhabitants) and encompassing a whole range of sectors and activities, with a wide distribution of income (ICT, 2009a, 2009b). Tourism provides 22 to 25 percent of the country's foreign currency and 7 percent of its gross domestic product (Banco Central de Costa Rica, 2008, 2010). It is estimated that up to 53 percent of income from tourism may be attributable to ecotourism and related activities (ICT, 2009a).

The success of ecotourism in Costa Rica depends in part on certain natural attributes and cultural characteristics of the country, such as its biological diversity and range of habitats, combined with more than 100 years of sci-

Definition of ecotourism

Costa Rica's National Chamber of Ecotourism (CANAECO, n.d.) defines ecotourism as follows:

Ecotourism is a specialized section of responsible tourism, which promotes and supports nature conservation and cultural values of destinations, it interprets them for the customer, supports the socio-economic improvement of the local communities, and seeks to sensitize and satisfy customers, in an ethical manner. It maintains its activities with a design and a scale appropriate to the surroundings, and offers to its customers a direct and personal contact with nature and the local culture.

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entific research, a substantial national education system, a strong network of protected areas and a body of biologists and naturalists with the interest and ability to communicate their knowledge to other people (Bien, 2002). Moreover, Costa Rica, unlike its neighbours, does not have a history of war and violence. Although the country has less biodiversity, a narrower range of habitats and far fewer cultural resources than almost all of its neighbouring Latin American countries, creative, innovative entrepreneurial approaches have combined with historical factors to help Costa Rica situate itself as one of the world's prime ecotourism destinations (Programa Estado de la Nación, 2007).

Approximately 14 percent of the country's area is in State-owned protected areas, mostly national parks and biological reserves. At least another 12 percent is privately owned land in other categories of government-declared protected areas in which private ownership is tolerated or encouraged (forest reserves, wildlife refuges, protected zones and private nature reserves) (SINAC, 2010; SIREFOR, 2010; Jiménez, 2003). Perhaps 4 percent is privately owned forest land outside official protected areas. Nearly all overnight tourism is on private land, as national parks and biological reserves do not generally provide lodging.

Guiding by trained biologists who can interpret the environment attracts tourists and helps make nature tourism an important tool for forest conservation

G. EISENSCHINK

BIRTH OF COSTA RICAN ECOTOURISM

The transformation of Costa Rica into an ecotourism destination owes much to study-abroad programmes in biology and natural sciences which took foreign students to forested areas. Starting in the 1960s and 1970s, hundreds of biology students from the United States of America went to Costa Rica to study tropical ecology with the Organization for Tropical Studies (OTS) at the La Selva Biological Station and the Tropical Science Center's Monteverde Cloud Forest Reserve. The students from these and similar programmes encouraged others to learn about the country's beauty, peacefulness and environmental attributes; they and their friends and families became the main clientele for nature-based tourism in the 1980s (Laarman, 1986). In the early 1980s, some biologists trained by OTS, both Costa Rican and foreign, recognized the market potential and realized that nature tourism could be an important tool for forest conservation and for reducing the rural poverty that often led to deforestation. OTS graduates trained the first guides for the Monteverde reserve and many nature tour operators. Other biologists set up ecolodges and private reserves such as Rara Avis, founded in 1983.

The international demand for nature-based tourism, which had begun with OTS students and researchers, was strengthened by articles in the mainstream press by journalists covering the Central American wars who were stationed in neutral Costa Rica throughout the 1980s. The Nobel Peace Prize awarded to Costa Rican President Oscar Arias in 1987 reinforced the image of a peaceful country that has had no military since 1948.

Some tour operators and hoteliers who had established businesses earlier in other market segments, such as the river rafting specialists Costa Rica Expeditions, moved towards accommodating the growing demand for nature-based tourism. In the late 1980s, Costa Rican entrepreneurs such as the Chacón family, who had set up fishing and recreation camps in the 1960s for Costa Ricans, began to receive international tourists interested in the country's unusual habitats and natural history. They realized that with the help of biologists they could interpret the environment and attract more international tourism.

TOURISM IN SUPPORT OF SUSTAINABLE DEVELOPMENT

Although the first nature tourists to Costa Rica visited existing sites established for other purposes, the initial focus of ecotourism entrepreneurs in Costa Rica was on demonstrating that the sustainable use of forests for tourism would generate more income than clearing them

for livestock rearing and agriculture. Before the boom in tourism, the price of forest land was much lower than that of farmland, whereas today, in ecotourism zones such as Sarapiquí, Monteverde, La Fortuna and the Osa Peninsula, land with old-growth forest cover and tourism potential is worth more than deforested land. Moreover, the involvement of local communities in ecotourism activities has been influential in changing their attitudes towards forests. Rural inhabitants now often see forests as potential wealth rather than impediments to development. Consequently, many of these people are now active conservationists.

Twenty years ago, "improving" a property meant clearing it of forest. Traditionally, and up to 1995, the law awarded the holders of uncultivated land the right to register their ownership after ten years of continuous, unchallenged possession, as long as "improvements" could be demonstrated. Since 1995, however, a new forestry law requires owners to demonstrate that they have protected all forested land on the property. The forestry law also recognizes ecotourism as an activity to be encouraged on privately owned forested land. Both modifications to the law were directly promoted by ecotourism entrepreneurs and the owners of private nature reserves.

These groups formed two associations to exercise political pressure. The first, the Costa Rican Network of Private Nature Reserves (Red Costarricense de Reservas Naturales Privadas), has had a major influence on the country's forest policies since 1995, especially with regard to payment for ecosystem services and the importance of avoided deforestation to mitigate climate change. It acts as a counterweight to the timber sector's influence on policy; both represent the private forest sector, but from diametrically opposed positions. Today the forest conservation sector, concerned with private and ecotourism reserves, probably has more economic weight in Costa Rica than the timber sector.

The second association, the National Chamber of Ecotourism (Cámara Nacional de Ecoturismo, CANAECO) was founded in 2003, with a political sphere of influence focused more on the tourism sector and the Costa Rican Tourism Board (Instituto Costarricense de Turismo, ICT). CANAECO works to maintain Costa Rica's position as a prime ecotourism destination and to ensure that conventional tourism development is based on the principles of sustainability – and also to ensure that the expansion of all-inclusive mass tourism and the growth of housing developments disguised as tourism do not threaten the country's reputation and role as a destination for nature-based tourism. To enhance the country's image and improve environmental performance, CANAECO has launched a programme in association with the National Fund for Forestry Financing (Fondo de Financiamiento Forestal, FONAFIFO) to reduce carbon emissions from the country's tourist industry.

Nearly all investment in private nature reserves and ecolodges is from the private sector. While the government is highly supportive of these efforts in principle and has facilitated the promotion of certified businesses and access to international fora, there is no mechanism for direct government support except through payment for environmental services of forests supporting conservation in private reserves. These payments can help improve the finances of an ecotourism operation, but they are far from the sort of capital required for construction and start-up costs.

ENGAGING LOCAL PEOPLE IN TOURISM AND CONSERVATION

While ecotourism matured according to its own business model, farming and indigenous communities became interested in ecotourism as an alternative or a supplement to their often marginal sources of income. They formed organizations, cooperatives and associations to promote rural community tourism, including ecotourism, in local forests. The activities of these groups succeeded in positioning community-based rural tourism as the fourth segment of the priority tourism market for the country, achieving a market penetration of 5 percent in 2009 (ICT, 2009a). For example, the Central American Association for Economy, Health and Environment (ACEPESA), the National Network of Ecotourism Cooperatives (COOPRENA) and the Costa Rican Association of Community-Based Rural Tourism (ACTUAR) publish a guide to rural community tourism, organize an annual rural community tourism fair and promote the groups' activities for the domestic tourism market and foreign tour operators.

Effective training and cooperative marketing by these organizations have been indispensable in helping many rural families, cooperatives and communities achieve the necessary quality of service and economies of scale to enter the tourism market without abandoning their traditional agricultural or fishing activities or accruing excessive debt. In the most successful instances, these initiatives have helped to improve the communities' income and their appreciation, understanding and conservation of natural resources, especially those associated with forests. An unexpected positive effect of the growth of rural tourism and ecotourism in Costa Rica has been in motivating young people to continue their formal education and to return to their home towns to work in tourism or conservation, rather than migrating to the capital (Programa Estado de la Nación, 2007).

At the root of ecotourism's rise to economic importance is the fact that Costa Rica now has hundreds of private nature reserves, in many of which tourism helps finance conservation (Aldermn, 1990; Langholz, 1996; Langholz, Lassoie and Schelhas, 2000). Such conservation areas, in addition to the State-owned protected

S. MARTINDALE

Private nature reserves help conserve habitats (partly through financing from tourism), improving protection of wildlife: a tourist encounters a tapir at Rara Avis Rainforest Lodge and Reserve, Costa Rica

areas, constitute important biological corridors that help maintain the existence and distribution of major populations of plant and animal wildlife. With greater conservation of habitats, there is greater protection of forest wildlife. Where rural inhabitants previously saw wild animals only as potential hunting prey, they now appreciate them for their intrinsic value, even beyond the economic value assigned by tourism – as can be seen in the rehabilitation of the population of macaws in the Puerto Jimenez community on the Osa Peninsula (Guittar, Dear and Vaughan, 2009) and of quetzals in the Cerro de la Muerte area (Sugaya, 2006).

CONCLUSIONS

Some of the lessons learned in almost 30 years of ecotourism in Costa Rica can be applied to other destinations. The main point is that ecotourism is a commercial activity, so it must be profitable. If it is not profitable, all its social, environmental and economic impacts will be negative, whereas a profitable business can balance the inevitable negative impacts with positive ones.

All tourism consumes water, electricity, fossil fuels and other resources, as well as producing solid waste, sewage and greenhouse gas emissions. Poorly implemented tourism can also lead to increases in prostitution, drug use and slum creation, while damaging cultural and natural resources. However when properly implemented, tourism can minimize the inevitable consumption of resources and waste, while creating genuine positive impacts on cultural heritage (such as reinforcing living cultures or conserving historical and archaeological patrimony) and enhancing the conservation of biodiversity and natural protected areas. These positive impacts can be sustained in time and allocated sufficient economic resources only if the tourism activity is also sustainable as a successful and profitable business, irrespective of size.

Organizations and governments that promote ecotourism and community tourism can apply this lesson by providing the business tools and capacity building necessary for success – in areas such as bookkeeping, reservation management, hygiene and client services. Another lesson is that training must always be recognized as an investment. In particular, the training required to produce excellent guides is a key to successful ecotourism. Finally, the security of the country can be an important contributing factor.

Ecotourism is not a panacea for all the challenges of development and poverty alleviation. Some individuals and entire communities have become indebted and impoverished when a government or organization has encouraged them to abandon their traditional activities in favour of tourism. Many business and marketing skills are needed to achieve success; developing these skills takes time and needs working capital while the market becomes established and the ancillary services required for tourism are developed. Patience and realistic expectations are required.

Furthermore, the ecotourism market is dynamic and requires ongoing development of the product, which in turn requires creativity and innovation. Joint marketing of medium- and small-scale initiatives can help to meet the challenges of increased competition from other countries, high costs and the demand for sophistication. The need for cooperation in marketing and for capacity building for businesses and communities leads to the conclusion that although competition may come from outside the country, internal competitiveness needs to be boosted, through perseverance, ethical practices and authentic products (Báez, 2003).

Costa Rica's experience has shown that ecotourism can be a major force in promoting natural resource conservation and respect for local communities. It can make a substantial contribution to reducing rural poverty and improving the rural population's level of formal education and its attitudes to natural resource conservation. However, like any complex economic activity, it requires capital, knowledge and patience. ◆

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The view from above: canopy walks around the world

L. Schweitzer Meins

A research tool becomes a popular form of ecotourism: suspended walkways in forests around the world bring people into the canopy for research and adventure.

In 1917, United States naturalist William Beebe elegantly described the treetops as "another continent of life remain[ing] to be discovered". Forest canopies are thought to contain as many as 40 percent of plant species, to intercept up to about 25 percent of precipitation and to provide pollination valued at around US$12 billion per year (Global Canopy Programme, 2002). They have also become a new frontier for tourism. Forest walkways, originally constructed for research, are increasingly visited by people seeking a novel experience and a spectacular view.

While evidence of scientific interest in the forest canopy can be traced back hundreds of years, the first recorded expedition into the treetops was made in 1929, by an Oxford University expedition in Guyana (then British Guiana) (Mitchell, 2002). Early canopy researchers applied mountain-climbing techniques to scale large old-growth trees in temperate and tropical forests. In the ensuing 80 years, methods for conducting aerial forest research evolved to include pulley systems, hot-air balloons, airships, towers and large industrial cranes. Today, forest walkways provide a safe way for scientists to ascend to the crowns and set up long-term study sites, while also limiting damage to trees and the organisms that inhabit them. These walkways range in construction from rope and wood bridges to steel-trussed suspension walkways and platforms, and are generally reached by stairs or ladders. State-of-the-art construction uses adjustable cables and braces that allow trees to grow normally. The research sector has in some cases invested hefty sums into the building of these walkways in order to enable scientists to explore the still relatively unknown world of forest canopies.

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The Capilano Bridge in North Vancouver, British Columbia, Canada, soars 70 m above the Capilano River and is one of several bridges connecting parts of the canopy walk

WIKIMEDIA COMMONS/LEONARD G.

Other investment has come from private entrepreneurs, governments and development institutions responding to a fast-growing ecotourism market. The Iwokrama Canopy Walkway in Guyana, for example, was funded by the Canadian International Development Agency and cost US$180 000 (Iwokrama Canopy Walkway, 2010). Other projects have cost many millions of dollars.

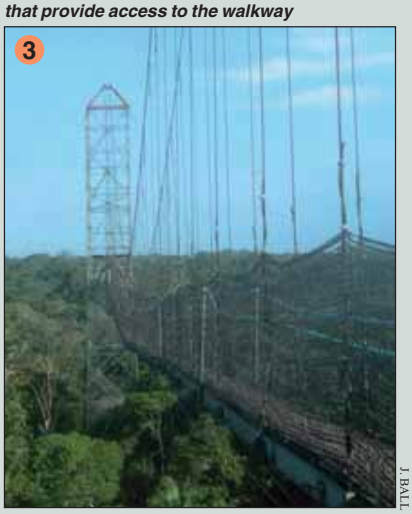
Most commercial canopy walks are managed through cooperative partnerships between various combinations of local non-governmental organizations (NGOs), national and international development organizations, government (national and local) and private business. The cost of admission can range from as little as US$3 to more than $60, depending on the location, length of the walk and type of experience; in some developing country contexts, local people are charged less.

People travel from around the world to immerse themselves in the green world high above the ground. Canopy walks give people the opportunity to view trees and forests from a different perspective, helping them to connect with and learn about the role of forests in maintaining air quality, regulating precipitation and mitigating climate change. They have thus proved to be a useful tool in teaching the importance of environmental conservation.

The Sky Walk in the Monteverde Cloud Forest in Costa Rica is constructed of six suspension bridges connected by trails

D. VAN DER MADE

One of three towers supporting the 275 m long Canopy Walk at the Sacha Lodge in the Ecuadorian Amazon, containing stairs that provide access to the walkway



J. BALL

While a canopy walk may not be for those who have vertigo, most operators stress that their walks are safe, though visitors are generally informed that they ascend at their own risk. Some countries where ecotourism has acquired major economic importance, such

S. CADMAN

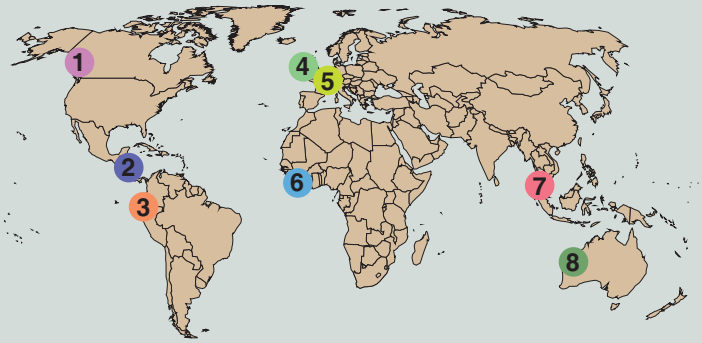
The Xstrata Treetop Walkway at Kew, United Kingdom, offers views of the London skyline – a fine example of a canopy walkway in an urban setting

BAUMKRONENWEG

Family-oriented events such as concerts and sport events are organized around the all-wood Baumkronenweg (treetop way) in Innviertel, Austria

R. WEBSDALE

The Valley of the Giants Tree Top Walk in Western Australia soars 40 m in the air, allowing visitors a great view of the endemic tingle trees (eucalypts)



Suspended between trees to allow visitors a spectacular view, this 40 m high rope walkway is found in the Kakum National Park near the Cape Coast in Ghana

FAO/FO-4792/J. LEBEUNE

This aluminium alloy canopy walkway in Pasog, Malaysia was constructed in 1992 as a collaborative project between the Forest Research Institute of Malaysia and Japan's National Institute of Environmental Sciences

FAO/FO-5894/K. SHONO

as Costa Rica, have passed laws requiring operators to institute safety measures such as nets beneath walkways or vigilance by rangers.

Canopy walks are found around the globe, in a variety of forest types and climatic zones and in both rural and urban settings. If all types are considered, they probably number in the hundreds (see CCA, 2005). The Tree Top Walk in the Sedim River Recreation Park in Kulim, Kedah, Malaysia, stretching 950 m, is promoted as the world's longest. Yet each one offers a different perspective and different learning opportunities for scientists and tourists alike. Some examples are pictured here.

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REDD-plus and biodiversity: opportunities and challenges

L. Miles and B. Dickson

Action for reducing emissions from deforestation and forest degradation under the new global climate change agreement (REDD-plus) can also favour biodiversity conservation, but these additional benefits will depend on how REDD-plus is planned.

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Any new global agreement on climate change mitigation under the United Nations Framework Convention on Climate Change (UNFCCC) will include action on reducing emissions from deforestation and forest degradation, plus conservation and enhancement of forest carbon stocks and sustainable management of forest (REDD-plus). REDD-plus should make funding available for developing countries to support forest-related emission reductions and foster carbon sequestration within forests. The magnitude and scope of the funding and the responsibilities of participating developing countries will depend on the final form of the agreement.

While the main purpose of REDD-plus is to mitigate climate change, REDD-plus actions can yield additional benefits for people at local to global scales. The multiple benefits include ecosystem services such as biodiversity conservation, economic benefits such as fuelwood supply, and social benefits arising from the REDD-plus process itself (such as capacity building and improved governance). Benefits can include improvements over the present situation or avoided losses (for example, if more biodiversity is retained with a REDD-plus project or programme than without one). This article focuses on the factors influencing the outcomes for biodiversity conservation.

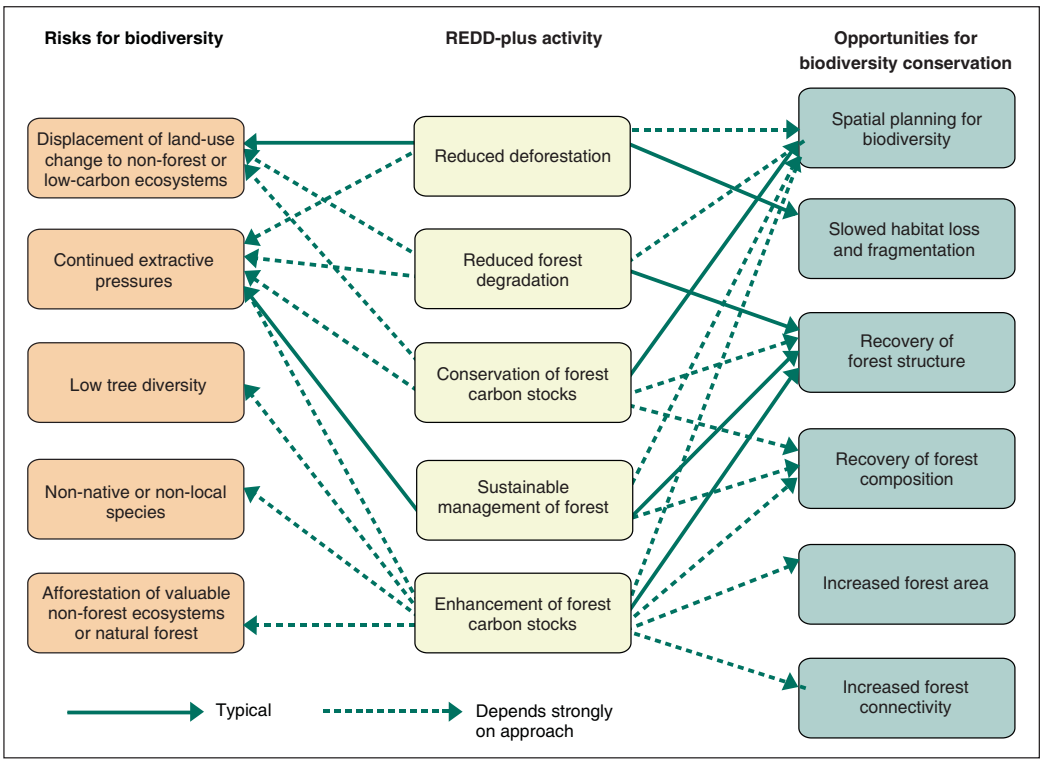
Globally, at least 50 percent of terrestrial species are found in forests, most of them in the tropics (Millennium Ecosystem Assessment, 2005). By mitigating global climate change, a successful REDD-plus mechanism would also benefit vulnerable biodiversity in ecosystems worldwide. There is some evidence that biodiverse forests are likely to be more resilient to climate change, thus underpinning the long-term success of REDD-plus (Thompson *et al.*, 2009).

FAO/FO-6149/S. SCAGLIA

This farmer's reforestation efforts contribute to conserving the threatened fauna and flora of the Brazilian Atlantic

However, like any large-scale influence on land use, REDD-plus creates not only opportunities but also risks for biodiversity (Figure). Its impact on biodiversity will be affected by the type of activity, the location and the approach used. Multiple benefits can thus be considered at every stage of REDD-plus design and implementation, and at all scales – global, national and site.

Questions of equity apply not only to the direct financial benefits that may arise, but also to the multiple benefits



Major opportunities and risks for biodiversity conservation from the five REDD-plus activities proposed in the Ad Hoc Working Group on Long-term Cooperative Action (AWG-LCA) draft of December 2009

of REDD-plus. The location of the sites and approach to the activities concerned will also affect who benefits or loses from REDD-plus. In general, poorer people are more likely to be dependent on forest resources than the more well-off within the same rural communities, and women and men often rely on different resources for their subsistence and livelihoods (Ferraro, 2002; Campbell *et al*., 2008). Involving a wide range of stakeholders at the local scale in developing and implementing REDD-plus activities will help to make sure that these groups are not disadvantaged.

At this early stage for REDD-plus, some countries are launching demonstration projects to test approaches to reducing forest carbon emissions. Some of these projects can also be used to improve understanding of impacts on biodiversity. They could also offer opportunities to use monitoring data to evaluate adaptive management approaches for improved biodiversity outcomes.

POLICY CONTEXT: THE SCOPE OF REDD-PLUS

The UNFCCC negotiations on a post-Kyoto agreement have yet to result in a decision on the form that an international REDD-plus mechanism will take. For an effective mechanism to emerge, both a new international agreement under UNFCCC and a ready (in the sense of willing and prepared) set of REDD-eligible countries will be needed. Widespread readiness to engage in REDD-plus would make it possible for a large proportion of the world's tropical forest to be covered under the mechanism from the start, reducing opportunities for international displacement ("leakage") of emissions and improving the chance that REDD-plus will yield true benefits for the climate.

Major areas still to be agreed upon include the mode of international financing, which could be market based, fund based or a mixture of the two, and the method of deciding the reference levels for forest emissions against which success will be judged (e.g. negotiation, historical records or projections of business-as-usual trends). The scale of funding will do much to determine the area of forest covered, and thus the risk of land-use change displacement between countries.

The range of activities encompassed by any UNFCCC decision on REDD-plus will shape the opportunities and risks for biodiversity. The negotiating text presented at the meeting of the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA) in Bonn, Germany in June 2010 proposes that the following range of activities be eligible under a REDD-plus scheme (UNFCCC, 2010):

- reducing emissions from deforestation;
- reducing emissions from forest degradation;
- conservation of forest carbon stocks;
- sustainable management of forest;
- enhancement of forest carbon stocks.

The AWG-LCA draft (UNFCCC, 2010) also includes a list of environmental and other "safeguards" to ensure the multiple benefits of REDD-plus. REDD activities should:

- be consistent with the conservation of natural forests and biological diversity (i.e. not involve the conversion of natural forests, incentivize the protection and conservation of natural forests and their ecosystem services and enhance other social and environmental benefits);
- complement or be consistent with national forest programmes (i.e. forest policy frameworks) and relevant international conventions and agreements;
- involve transparent and effective governance;
- respect the knowledge and rights of indigenous peoples and members of local communities;
- involve full and effective participation of these and other stakeholders;
- address the risk of reversals and reduce displacement (leakage) of emissions.

Nothing would prevent eligible countries, or donors funding the development of REDD-plus strategies, from setting conditions that are more detailed or stringent than those stipulated in the eventual UNFCCC guidance.

NATIONAL PREPARATION FOR REDD-PLUS

National-level decisions during the design and implementation of a REDD-plus programme will influence the outcomes for biodiversity (see Box). A major consideration is the effect of REDD-plus on land use, both through direct action to manage forest carbon stocks and through any displacement of land-use change from forests covered under REDD-plus to other ecosystems. Such potential displacement, such as development of new croplands in savannah rather than forest, can pose an additional threat to biodiversity (Miles and Kapos, 2008).

Policies that tackle the drivers of deforestation on a national scale could include changes to agricultural incentives, logging moratoria and payments to "suppliers" of carbon stocks. These are relatively unlikely to generate internal displacement of deforestation and forest degradation pressures from one area to another.

Other approaches will be implemented only in selected regions or sites (e.g. afforestation and targeted law enforcement). In this case, best practice involves a map-based priority-setting analysis to support zoning or land-use planning. In this way, the total set of potential sites is identified and the most valuable sites for carbon and additional benefits are tackled first. Priority-setting analysis can also offer a focus for community engagement with REDD-plus.

An analysis focused on maximizing REDD-plus success (i.e. maximizing carbon sinks or minimizing carbon losses) for minimum costs may miss the opportunity for substantial biodiversity benefits at little extra cost (Miles and Kapos, 2008; Grainger *et al.*, 2009). For a given carbon outcome, a strategy that conserves or creates a greater mix of different forest types over a wider area is likely to deliver greater conservation gains (Miles, 2007; Strassburg *et al.*, 2009; Venter *et al.*, 2009). However, there will often be trade-offs between cost, conservation and carbon outcomes. Some areas of biodiversity conservation concern are likely to be more costly to conserve than others – for example, biodiversity "hotspots" by definition hold a high number of endemic species but experience a high level of threat (Myers *et al.*, 2000).

Some spatial allocation decisions may need to be made before such an analysis is available, for example siting of demonstration projects. In this case, the following rules of thumb can be considered to favour biodiversity conservation (Harvey, Dickson and Kormos, 2010):

- Prioritizing the retention of threatened high-biodiversity forests over other activities such as reforestation or sustainable management of pro-

How countries can plan for biodiversity benefits in their REDD-plus preparations

- **Acquire and share data needed to understand the current and potential distribution of biodiversity and, where possible, its value for ecosystem service provision and beneficiaries.**
- **Assess likely biodiversity impacts as part of cross-sectoral policy analysis undertaken to identify workable solutions to forest carbon loss.**
- **Take biodiversity into account in the selection of REDD-plus locations, i.e. through a map-based priority-setting analysis.**
- **Take the likely impacts on biodiversity into account when selecting REDD-plus activities and approaches.**
- **Include stakeholders that depend on biodiversity and forest ecosystem services in REDD-plus decision-making.**
- **Define goals for biodiversity conservation in the REDD-plus strategy and, where feasible, at site scale.**
- **Identify institutional responsibilities for these goals, and build capacity to meet them as needed.**
- **Design cost-effective monitoring systems to allow assessment of progress towards the goals.**
- **Plan for adaptive management to address unwanted declines in biodiversity.**

duction forests will typically bring greater and more rapid gains for both biodiversity and carbon conservation.

- Where carbon stocks and ecosystems are similar between forest areas, prioritizing connectivity of forests will yield better results for biodiversity conservation.

REDD-PLUS ACTIVITIES AT SITE SCALE

At any site, the opportunities and risks for biodiversity will depend on the type of REDD-plus activity undertaken (see Figure) and the approach used to implement it, including specific management practices such as the extent to which biodiversity conservation is planned for, managed for and monitored. For example, physically excluding human access to a site previously used for extraction of timber or fuelwood is likely to benefit wildlife (Bowen-Jones and Pendry, 1999; Meijaard *et al.*, 2005). The long-term sustainability of such an approach is, however, doubtful (Bruner *et al.*, 2001). Reducing emissions from degradation through community forest management is likely to produce better results for carbon over the long term, while biodiversity outcomes will depend on the design and implementation of the chosen management regime.

Reducing emissions from deforestation

Reducing loss of natural forest will yield significant and multiple benefits, which include the retention of ecosystem services: moderating river discharge, erosion and sediment fluxes; protecting soil resources which contain essential nutrients for plant growth; purifying water; and providing a habitat for flora, fauna and microbial communities (Stickler *et al.*, 2009). Each of these ecosystem functions is valuable for biodiversity conservation as well as for human well-being.

Deforestation in UNFCCC language is defined as a change in land use, not only in vegetation cover. Land-use change is the primary cause of biodiversity loss worldwide (Wood, Stedman-Edwards and Mang, 2000). As the main cause of deforestation is conversion to agriculture, many approaches to reducing deforestation focus on the agriculture sector – for example, increasing the productivity of existing agricultural land to reduce the total area required, or increasing the long-term sustainability of techniques and thus the time that land remains productive. The effect on biodiversity within the agricultural landscape itself varies according to the technique.

Other approaches focus on protecting forests, for example through incentives or enforcement of land-use regulations, which have the advantage of directly addressing the goal of reducing deforestation. The main risk of these approaches is that the driver of land-use change may not be affected, causing leakage of the problem to another area. Ecosystems and countries that are not involved in the REDD-plus mechanism are particularly likely to be at risk (Miles and Kapos, 2008).

In both cases (agriculture and protection), spatial priority-setting would assist in targeting the forests of greatest conservation concern.

Reducing emissions from forest degradation

Reducing degradation of forest carbon stocks can in many cases lead to a recovery of forest structure, with consequent positive results for biodiversity as niches are restored and resource availability increases. Common causes of forest carbon loss include logging, fire, forest wetland drainage and extreme weather events such as hurricane damage or drought. These causes can be linked to one another, with logging, drought and drainage increasing the susceptibility of forest to fire (Nepstad *et al.*, 2008). Only anthropogenic causes of degradation are strictly relevant to REDD-plus under UNFCCC.

Improvements in governance and law enforcement related to timber extraction may take a number of forms. For example, a successful logging moratorium would yield carbon and biodiversity benefits, at the cost of timber production.

Other improvements in forest governance will promote reduced emissions where logging continues. For example, reduced-impact logging has far lower

Reducing degradation of forest carbon stocks – for example losses caused by fire – can often lead to a recovery of forest structure, with consequent positive results for biodiversity

FAO/FO-6896/W. PRAJANTHI

climate impacts than conventional logging (Putz *et al*., 2008). Regulated and/or certified logging concessions that require these practices can protect some biodiversity and carbon values while realizing some timber values (Chomitz *et al*., 2006; van Kuijk, Putz and Zagt, 2009).

Better management of fire use in agricultural practices should help reduce another cause of forest degradation (Aragao and Shimabukuro, 2010). In most forest landscapes, control of fire benefits biodiversity and related ecosystem services. However, some plant and animal species in fire-adapted ecosystems (e.g. tropical woodlands and savannahs) depend on periodic burning (Stickler *et al*., 2009).

In swamp forest areas subject to drainage, restoration of the water table will slow carbon emissions from peat decomposition and reduce the likelihood of underground fire, as well as being a first step towards restoring forest ecosystems (Parish *et al*., 2008).

Conservation of forest carbon stocks

The approaches used in carbon conservation can build on those used in biodiversity conservation even if the primary aims are different. These approaches include increasing the number or enhancing the management of protected areas, community conserved areas (CCAs) and forest reserves (including some production forests) and supporting community-based natural resource management. Moreover, systematic conservation planning tools are among the most widely used spatial priority-setting tools (e.g. Game and Grantham, 2008).

Financial support for conservation of carbon stocks in intact forests could support REDD-eligible countries with high forest carbon stocks and low current deforestation rate. If forest conservation initiatives are not undertaken here, the risk of international leakage to these countries would threaten the global success of REDD-plus. Other countries may also choose to include forest carbon conservation in their REDD-plus approaches.

Action on protected areas, CCAs and forest reserves would help to protect primary forest biodiversity adequately. While strict protection may reduce access to forest resources for local people, community conserved areas may enhance and preserve forest access (Coad *et al*., 2008). Protected areas are demonstrably able to withstand agricultural expansion and logging pressures, especially when sufficiently funded and managed with the consent of local communities (Clark, Bolt and Campbell, 2008). However, they can only form part of a REDD-plus strategy, as they do little to address the drivers of deforestation; displacement of these pressures is still a risk.

Sustainable management of forest

The term "sustainable management of forests" is used in the draft AWG-LCA text on REDD-plus without definition. By inference, in this context the term appears to refer to the sustainable management of forest for timber production (i.e. carried out in such a way as to maintain constant levels of carbon stocks over multiple logging cycles). This is the meaning referred to in the following discussion. Approaches to sustainable management of forest for timber include reduced-impact logging, ecoforestry, enhanced regulation of logging and application of certification standards.

If the sustainable management of forests for timber includes activities that reduce depletion of carbon stocks and enhance forest resilience, it could benefit biodiversity if it is implemented in forests that currently have unsustainable rates of harvest. Introducing logging (even at sustainable levels) in old-growth forest areas can, however, harm biodiversity (Putz and Redford, 2009; Harvey, Dickson and Kormos, 2010).

Reduced-impact logging, ecoforestry and other techniques for sustainably managing timber production forests require better training for forest managers and workers, but deliver substantially greater ecosystem and biodiversity benefits than conventional logging techniques. REDD-plus funds could provide an opportunity to transform the forestry sector to meet the goals of sustainable management.

Reduced-impact logging techniques deliver substantially greater ecosystem and biodiversity benefits than conventional logging

FAO/FO-0832/N. WINKLER

Enhancement of forest carbon stocks

The REDD-plus activity that has given rise to the greatest concerns about possible harm to biodiversity is forest carbon stock enhancement. This activity could involve restoring carbon stocks in degraded forests or creating forests where none currently exist. The approaches used and the locations where forests are created or restored will determine the effects on biodiversity.

There is some uncertainty over whether "enhancement of forest carbon stocks" as mentioned in the AWG-LCA draft decision (UNFCCC, 2010) actually includes afforestation and reforestation (IUCN, 2009; RECOFTC, 2009) or only refers to enhancement of stocks within existing forest (Angelsen, 2009). Here, it is assumed that afforestation and reforestation activities are included. The main international funds for REDD-plus readiness also make this assumption (Miles, 2010).

The development of plantation forests may lead to the loss of biodiversity that was formerly present. In general, it may do less harm, or even create benefits, if plantations are composed of diverse, native species (Harvey, Dickson and Kormos, 2010) matched to the site, and are more akin to restored ecosystems than to monoculture landscapes (Brockerhoff *et al.*, 2008).

Concerns have been expressed about the possibility that the REDD-plus mechanism will incentivize the replacement of natural forests with plantation forests. The draft includes a safeguard to address this concern, stating that REDD-plus activities should not lead to the direct conversion of natural forests.

Relative to more intensively managed forests, forest restoration and rehabilitation of degraded natural forests involve a greater emphasis on healthy ecosystem functioning together with an eventual increase in carbon stored (Sajwaj, Harley and Parker, 2008). Biodiversity and water quality are particularly likely to improve with more natural forest structure and composition. The trade-off is the speed of carbon accumulation, which may be slower than in areas newly afforested or reforested.

In selecting locations for new forest areas, giving greater weight to areas close to existing forest can help to meet conservation objectives by increasing connectivity between forest patches, providing some resources for wildlife resident in natural forest and providing buffers around natural forest to lessen human impact there (e.g. Bali, Kumar and Krishnaswamy, 2007). Even plantations of non-native species can offer some support to biodiversity conservation in this way.

CONCLUSIONS

Different approaches to REDD-plus planning and implementation have different implications for forest biodiversity and the people and ecosystem services that depend on it. Planning at an early stage for positive outcomes for biodiversity and other multiple benefits can avoid inadvertent commitment to a suboptimal or actively harmful course of action. Making use of appropriate tools and putting policies in place to safeguard and enhance biodiversity can increase the benefits from REDD-plus, sometimes at little additional cost. The identity, magnitude and receivers of the biodiversity benefits and harm associated with REDD-plus will depend on the scope, location and type of REDD-plus activities, as well as on the approaches used to address specific biodiversity issues. Consultation, engagement and buy-in of stakeholders, from national government to local communities, is critical both for the overall success of REDD-plus and to ensure that different biodiversity values are understood.

At the national level, it is useful to identify the potential value of biodiversity and the groups that place value on it, so as to maximize its value to the nation and its forest-dependent communities, to demonstrate added value to funders and sometimes to facilitate complementary conservation finance. However, in a future scenario where REDD-plus funds are successful in conserving forests, the best use of limited biodiversity conservation funds may be to protect low-carbon and non-forest ecosystems from the displacement of land-use change pressures (Miles and Kapos, 2008), rather than to support REDD-plus.

REDD-plus needs to move forward swiftly if it is to achieve useful climate change mitigation results, despite major gaps in knowledge about tropical biodiversity and its response to environmental change. Monitoring and adaptive management to reduce any negative impacts observed will be of particular help in ensuring biodiversity benefits from REDD-plus. ◆

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A collaborative programme for sustainable trade in tropical timber

P.S. Tong, M.S. Schmidt and S. Johnson

ITTO and CITES work together to ensure survival of threatened species and sustainable incomes for people involved in timber trade.

J. GROGAN

Mahogany (*Swietenia macrophylla*), shown here in Brazil, is one of the most valuable tropical timber species listed in CITES

Unsustainable harvesting, combined with habitat loss and the complex silviculture of many tropical tree species, has created threats to the long-term survival of a number of commercially important tropical timber species. It is essential that trade in these species be consistent with their sustainable management and conservation. For this reason, more than 30 tropical tree species are now listed in the appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES, which entered into force in 1975, was designed to ensure that international trade in specimens of wild animals and plants that are listed under the convention is legal, sustainable and traceable.

A collaborative programme of the secretariats of the International Tropical Timber Organization (ITTO)[1] and CITES is helping countries implement the convention for tropical timber species. The programme (which began in 2006 and is supported by a European Union-led multi-donor grant to ITTO) assists participating countries to:

- improve management and regulation of trade in tropical timber species;
- improve forest management to ensure survival of threatened species and sustainable incomes for local communities and others involved in timber trade;
- increase regional cooperation in research, silviculture and CITES compliance;
- integrate knowledge on sustainable forest management and species conservation to provide a coherent policy framework.

The tropical timber species listed in the CITES appendices are subject to different degrees of regulation, based on a system of permits and certificates. Species listed in Appendix I are threatened with extinction, and international commercial trade in specimens of such species taken from the wild is generally prohibited. Species listed in Appendix II are not threatened with extinction, and international trade in these species can occur under certain conditions – i.e. when it is found that acquisition is legal and that the trade will not be detrimental to the survival of the species in the wild. Appendix III listings are made at the national level (without requiring the voting by Parties necessary to list a species in Appendix I or II) and basically enable countries

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[1] ITTO is an intergovernmental organization established in 1986 under the International Tropical Timber Agreement (1983) with a mandate to promote sustainable development through trade, conservation and best-practice management of tropical forests.

to indicate that a species is of conservation concern and to start monitoring the volume of specimens exported.

The activities of the ITTO-CITES programme – presented in the Table – focus on the tropical timber species currently listed in CITES Appendix II that are most traded internationally: *Pericopsis elata* (afromosia or assamela) in Africa, *Gonystylus* spp. (ramin) in Asia, and *Swietenia macrophylla* (bigleaf mahogany) in Latin America. The programme also includes a few activities concerning other species such us *Cedrela odorata* (Spanish cedar, also from Latin America and listed in CITES Appendix III), *Aquilaria malaccensis* (an agarwood-producing species from Southeast Asia listed in Appendix II) and *Intsia* spp. (merbau), a currently unlisted species that is of conservation concern in some Asian countries. In addition, the programme scope has recently been expanded to support implementation of CITES requirements for *Prunus africana* (African cherry, a species primarily used for its medicinal bark, listed in Appendix II). The range States do not at present allow export of specimens of this species; the programme will assist Cameroon (formerly the main exporter) to improve management so that trade can recommence.

In addition to the country-level activities shown in the Table, the programme also addresses information sharing and closer cooperation among agencies responsible for implementing and enforcing CITES-related legislation. Several national and regional workshops have been held to share experiences and strengthen communication among authorities and interested stakeholders, including the private sector.

Many of the programme's activities focus on strengthening countries' capacity to produce accurate and reliable non-detriment findings (NDFs). The NDF is a conclusion by the agency in charge of scientific aspects of CITES implementation in a country (the Scientific Authority) that the export of specimens of a particular species will not have a negative impact on the survival of that species in the wild. NDFs are an essential part of the requirements for trade in species listed under the convention, but many tropi-

Activities of the ITTO-CITES collaborative programme

Country	Species	Activity
Africa		
Cameroon	*Pericopsis elata*	Rehabilitation of plantations
		Sustainable management in forest concessions
	Prunus africana	Non-detriment findings
Congo	*P. elata*	Inventory in a production forest
Democratic Republic of the Congo	*P. elata*	Raising awareness of CITES and its implementation texts
		Training on the verification of CITES permits and the use of "CITES Wood-ID" software (designed to aid in wood recognition by customs authorities)
Asia		
Indonesia	*Gonystylus* spp.	Improving inventory design to estimate growing stock
		Assessing silvicultural systems – review of current practice and resumption of measurement of existing permanent sample plots
		Exploratory assessment of the population distribution and potential timber uses of *Gonystylus* species other than *G. bancanus*
		Review of harvest and trade – CITES compliance, Tri-National Task Force on Trade in Ramin, trade control and monitoring
Malaysia	*Gonystylus bancanus*	Non-detriment findings report – a quantitative assessment in two selected permanent forests of Sarawak
		Generation of spatial distribution maps using hyperspectral technology and determination of sustainable level of harvest in production forests of Peninsular Malaysia
		Developing a DNA database to facilitate identification of ramin origin, Sarawak, Malaysia
		Sawn timber and plywood recovery study in Peninsular Malaysia
	Gonystylus spp.	Development of a monitoring system using radio frequency identification (RFID) tags, an automated detection and notification mechanism for tracing timber, in Peninsular Malaysia
	Gonystylus spp., *Aquilaria* spp. and *Intsia* spp.	Quantification of dry and wet inland forests to improve management of species of conservation concern, based on the fourth National Forest Inventory in Peninsular Malaysia
Latin America		
Bolivia	*Swietenia macrophylla*	Studies on population density of mahogany and forest harvesting impacts on natural regeneration and diameter growth
Brazil	*S. macrophylla*	Long-term studies of population dynamics and regeneration ecology to support sustainable forest management in the Amazon
		Ecology and silviculture in the western Amazon
		Management of mahogany shoot borer (*Hypsipyla grandella*) in the states of Pará and São Paulo
Peru	*S. macrophylla* and *Cedrela odorata*	Evaluation of commercial stocks and strategy for sustainable management
		Design, validation and adjustment of methodology for monitoring and evaluation of stocks
Guatemala and Peru	*S. macrophylla*	Support compliance with CITES regulations – in-country technical assistance for the development of national timber yield tables for standing volume and export-grade sawnwood
Bolivia, Brazil and Peru	*C. odorata*	Market study to evaluate main export and domestic markets and end-uses

cal countries face problems in collecting and analysing the required information for timber species. In 2008, the ITTO-CITES programme co-sponsored the first International Expert Workshop on CITES Non-Detriment Findings, held in Mexico, to discuss the methodologies, tools, information and expertise needed to formulate NDFs for species in all CITES-listed taxonomic groups, with a special working group on timber species.

The joint ITTO-CITES programme has improved the capacity of authorities responsible for implementing the convention in both exporting and importing countries, the cooperation and involvement of the private sector with these authorities, and the CITES-related knowledge of local populations participating in projects implemented under the programme. CITES participating authorities in all countries have reported that they have seen changes in local people's awareness of the need to manage and conserve the listed species, and improvements in their approaches to doing so, since the project started. Requests for funding under the project are increasing and now greatly exceed the available resources. Both ITTO and CITES are committed to continuing this collaborative partnership to improve the management and conservation of listed tropical timber species.

Ramin* (Gonystylus *spp.*) *trees left standing in a cleared peat swamp landscape in Sumatra, Indonesia, as Indonesian law prohibits their removal

ITTO PD 426/T. PARTOMIHARDJO

Six Regional Forestry Commissions meet

FAO's six Regional Forestry Commissions, established between 1947 and 1959, bring together member countries in each region every two years to address the most important forestry issues and advise FAO on regional forestry priorities. Between February and June 2010, all six commissions held their biennial meetings, in preparation for the twentieth session of the Committee on Forestry in October 2010. The reports and documentation can be viewed at: www.fao.org/forestry/46199

African Forestry and Wildlife Commission and first African Forestry and Wildlife Week. The seventeenth session of the African Forestry and Wildlife Commission (AFWC) met in Brazzaville, the Congo, from 22 to 26 February 2010. Concurrently, the commission also observed the first African Forestry and Wildlife Week, giving intergovernmental and non-governmental organizations a chance to present their activities and plans in forestry and opportunities for collaboration.

Under the theme "African forests and wildlife: response to the challenges of sustainable livelihood systems", the AFWC session highlighted the need for greater attention at the policy level regarding the important contribution of the forestry and wildlife sectors towards poverty reduction and national economic development, as well as the urgent need for increased resource allocation.

Main areas of discussion included:

- the role of non-wood forest products (NWFPs) in food security and poverty reduction – with focus on the need to strengthen legal frameworks, inventories and the capacities of small NWFP enterprises, and to include NWFPs in poverty reduction and food security programmes;
- the important contribution of protected areas and ecotourism to improved livelihoods for local communities – with focus on promoting equitable sharing of transparently generated revenues;
- climate change – with endorsement of sustainable forest management as the basis for the forest sector's ability to make a significant contribution to climate change mitigation and adaptation, and emphasis on the role of national forest programmes in this regard;
- forest and wildlife management for economic development, including a specific request that FAO assist countries in human-wildlife conflict mitigation and equitable sharing of benefits.

Countries of the region also expressed the need for methodology for evaluating trees outside forests; support in implementing REDD (reducing emissions from deforestation and forest degradation); and dialogue between forestry and agricultural institutions to improve sustainable land use.

Near East Forestry and Range Commission. Most Near Eastern countries have low forest cover but extensive areas of sparse trees. Recognizing the importance of achieving balance among policies concerning forests and grazing lands, the nineteenth session of the Near East Forestry Commission endorsed a change in name and mandate, becoming the Near East Forestry and Range Commission. The session was held in Hammamet, Tunisia, from 5 to 9 April 2010, concurrently with the first Near East Forestry Week. The theme was "Forest and range: adapting to global changes for sustainable development".

The meeting reviewed recently published guidelines for good forestry and range practices in arid and semi-arid zones of the Near East (see www.fao.org/docrep/012/al040e/al040e00.pdf). Other sessions addressed fire management, the potential of oil-producing trees for energy production, forest policy and sustainable development, rangelands and biodiversity conservation, and wildlife and protected area management.

An in-session seminar was held on assessing risks and vulnerability to climate change of the forestry and range sectors. Given the vulnerability of the region to climate change, the commission drew attention to the need for information and capacity building to help the countries of the region access climate change funds and strengthen their mitigation and adaptation activities, and to raise awareness among decision-makers of the pivotal role of forests and rangelands in climate change adaptation.

The commission noted in particular the need for support to national forest programmes, climate change, forest and rangeland policy, wildlife and protected areas, forest fires, forest protection, afforestation and rangelands rehabilitation. It also drew attention to the importance of recognizing the role of local knowledge in national policies and programmes.

European Forestry Commission. The potential of European forests for climate change mitigation and adaptation, wood energy and forests and water were the central themes of the thirty-fifth session of the European Forestry Commission (EFC), which took place in Lisbon, Portugal from 27 to 29 April 2010. The meeting recognized that attention on forests is at an all-time high as a result of recent climate change negotiations. It noted the potential for the International Year of Forests, 2011, to help further raise the profile of forests and forest-related issues.

Over a quarter of the carbon stored in the world's forests is found in the pan-European region. The session looked into ways and means of bridging the gap between the mitigation potential of European forests and their current low share in carbon markets. The need to create an enabling policy environment for forest adaptation measures by small forest owners was also recognized. The commission recommended that FAO consider developing a global network to assist countries in implementing their international commitments related to forests and climate change.

The commission noted the need to improve knowledge and data collection on wood energy, with a view to clarifying its environmental impacts and potential in sustainable energy

production. The benefits of payment for ecosystem services schemes for the forest and water sectors were especially noted, and further work to enhance their implementation was recommended.

To improve intersectoral understanding, EFC agreed to engage in dialogue with the water, energy and climate change sectors. To maximize synergies, the commission agreed to include the activities of *Silva Mediterranea* in its integrated programme of work and recommended to expand the mandate of the Working Party on the Management of Mountain Watersheds to include issues related to forests and water.

North American Forest Commission. Communicating the role of forests in climate change adaptation and mitigation was a main theme of the twenty-fifth session of the North American Forest Commission (NAFC), held in Guadalajara, Mexico from 3 to 7 May 2010.

Canada presented the findings of a recent study on the potential of biofuels, bioenergy and biomaterials to revitalize the Canadian forest sector, highlighting the value of partnership among sectors (forests, energy, chemicals, bioproducts). The United States of America outlined its new administration's national vision for forest management since 2008. Mexico reported on its development of forest governance models, monitoring systems and verification criteria to pave the way for REDD-plus and to generate long-term incentives to attract investment in the forest sector.

The commission reviewed the work of its many active working groups: on atmospheric change and forests; fire management; watershed management; forest insect pests, diseases and invasive plants; forest inventory, monitoring and assessment; forest genetic resources; and silviculture.

The commission highlighted fire management, climate change and water as the key issues for forestry in the region, and also called for the development of methodologies for valuing forest externalities in national forest inventories.

Latin America and Caribbean Forestry Commission. The Latin American and Caribbean Forestry Commission (LACFC) held its twenty-sixth session from 24 to 28 May 2010 in Guatemala City, Guatemala.

The session emphasized:

- initiatives for improving forest governance, institutions and legislation;
- the importance of strengthening forest health institutions (both governmental and academic) and improving regional collaboration to address forest pests and diseases, as they are a cross-border issue;
- capacity strengthening in national forest inventories, since information on the state of forest resources in the region is generally inadequate or dispersed, making it difficult to estimate the forest sector's real contributions;
- the need for additional funding for community forestry, as involving communities is fundamental for sustainable forest management.

An area of concern was the appropriation and improper use of forest genetic resources in the region. The commission expressed the need for stronger exchange of knowledge and experience among countries regarding *ex situ* conservation of these resources and the development of legal instruments governing their protection and related intellectual property. Access and benefit sharing and use rights relating to traditional knowledge were emphasized.

Sign the petition to end hunger

About 1 billion people in the world suffer chronic hunger. FAO's "1 billion hungry" project is a major communications campaign to rally global support for an end to hunger. The goal is to obtain 1 million signatures by the end of November 2010. Celebrities such as actor Jeremy Irons, musician Chucho Valdés and athlete Carl Lewis have lent their support to the campaign. You can lend yours by signing at: www.1billionhungry.org

FAO launched the publication *Casos ejemplares de manejo forestal sostenible en América Latina y el Caribe* (exemplary cases of sustainable forest management in Latin America and the Caribbean), carried out under the auspices of LACFC. The study describes 35 success stories in the region, selected by a panel of experts over two years of intensive work based on 11 mimimum criteria. The commission welcomed a proposal for a second phase of the project, to focus on knowledge transfer and national capacity building.

An in-session seminar on climate change, organized jointly with NAFC, emphasized that it is necessary to intensify efforts on adaptation, and not only mitigation. The session emphasized that sustainable forest management is a prerequisite for adapting forests to climate change.

Asia-Pacific Forestry Commission. The twenty-third session of the Asia-Pacific Forestry Commission (APFC) reviewed the many intersessional activities implemented during the preceding two years, including completion of the second Asia-Pacific Forestry Sector Outlook Study, regional forest policy studies, three forest policy short courses, a forest law enforcement and governance (FLEG) stocktaking exercise and numerous activities of the Asia-Pacific Forest Invasive Species Network. Bhutan hosted the session in Thimphu from 9 to 11 June 2010.

The meeting highlighted efforts in the region to prevent and mitigate the impacts of forest fires, pests and diseases; promote ecotourism; improve watershed protection; and ensure clean and reliable water supplies. Noting the increased emphasis being given to forest ecosystem services, the commission requested that FAO help develop methodologies to include evaluation of these services in national forest resource assessments.

The meeting emphasized the value of public-private partnerships in helping the forest sector contribute to poverty alleviation, economic recovery, employment and rural development.

APFC noted strong synergies between REDD and biodiversity conservation, and emphasized the need to develop tools for assessing forest degradation, forest fragmentation and related biodiversity loss, inviting further efforts to harmonize forest-related definitions.

The commission welcomed the emergence of various multilateral FLEG initiatives, including among others the Asia Forest Partnership and the Responsible Asia Forestry and Trade (RAFT) programme, and called for additional regional dialogue on FLEG.

Prior to the meeting, a three day workshop was held to explore how the concept of gross national happiness, pioneered by Bhutan, could be used in place of gross domestic product (GDP) as a measure of forest value to reflect the full range of benefits that society derives from forests.

Another side event addressed the challenges and issues of managing forests in small island developing States (SIDS), where forests and trees are especially crucial to social and economic development.

Workshop examines challenges of new trade measures in Europe

World trade of wood and paper products, including value-added products, has doubled over the past ten years. China is the main driver of the global timber trade, having rapidly become the major importer of roundwood and the major exporter of value-added wood products.

European regulations affecting the trade of timber products are evolving quickly. Reognizing the need to monitor this evolution closely because of its potential impacts on the entire forest sector, the United Nations Economic Commission for Europe (UNECE) and FAO, together with the World Trade Organization (WTO), organized the workshop “Emerging Trade Measures in Timber Markets”, held on 23 March 2010 in Geneva, Switzerland.

The workshop provided a comprehensive overview of the increasingly complex regulatory framework affecting trade of wood and products. More than 100 stakeholders participated from government, industry, trade associations, intergovernmental and non-governmental organizations and academia.

In addition to debate on trade measures such as tariffs and export taxes, participants discussed the emergence of non-tariff measures aimed at curbing illegal logging and favouring the use of timber harvested from sustainably managed forests, such as certification systems and public procurement policies. The meeting also addressed subsidies, notably those that encourage the use of renewable energy based on woody biomass.

Participants recognized the importance of phytosanitary measures in trade, as the global escalation of trade of all goods, often in wooden packaging or on wooden pallets, increases the risk of the spread of harmful insects and diseases. The International Standard for Phytosanitary Measures No. 15 (ISPM 15) concerning wood packaging material was presented, in connection with the WTO Agreement on the Application of Sanitary and Phytosanitary measures.

For a full report and presentations, see: timber.unece.org/index.php?id=270

Fruits of FAO support to poplar planting in China

Support from FAO to an Italian funded project promoting poplar cultivation in China culminated in the conclusion of a formal Memorandum of Understanding between China and Italy in early 2010. The project, supported by FAO as Secretariat of the International Poplar Commission (IPC), promotes poplars for sustainable livelihoods and land use and has become an example of successful international transfer of germplasm, science and technology.

In Siyang County, Jiangsu Province, the project has enabled a remarkable economic transformation, showing how forestry and agroforestry can provide a successful way to address poverty, hunger and environmental degradation. Since the 1970s, the

planting of poplars on more than 100 000 ha of flood plains and marginal lands has increased Siyang's tree cover from 7 to 48 percent.

The sustainable management of poplars in smallholder woodlots and agroforestry systems has led to a thriving local wood industry in Siyang. The resources of the poplar plantations account for 50 percent of the county's gross domestic product.

In addition, around 1 million people in Siyang now benefit from the ecosystem services of poplar forests in restoring marginal flood plains and stabilizing the banks of the Yellow, Huai and Yangtze rivers. Large expanses of planted poplar trees now protect agricultural fields from floods, wind, sandstorms and soil erosion. The trees also store carbon, mitigating climate change.

In recognition of the role of poplars in rural development, Siyang County has created the world's only historic Poplar Museum, which highlights the catalytic role played by FAO, IPC and Italian cooperation. It was founded on the exact spot where the first two Italian clones were planted in Siyang. Local authorities hold a biennial poplar festival that attracts more than 100 000 people, with national media attention. At the festival in May 2010, the State Forestry Administration of China presented Siyang County with an award for outstanding environmental achievement and the nickname "Hometown of Poplar Culture".

Dissemination of popular DVD continues

The multimedia presentation *Forests and climate change: a convenient truth*, co-produced by FAO and the Forestry Commission of the United Kingdom in 2008 in all FAO official languages, has now been translated into additional languages – e.g. Czech, Danish, Italian, Japanese, Nepali and Vietnamese – through efforts by partners in many countries.

The informative presentation is available on FAO's Web site, on YouTube and on a much-reprinted DVD which can be ordered from FO-publications@fao.org. Illustrating its value as a teaching tool, a partner in New Zealand has sent a copy to every secondary school in the country.

Parties to CITES debate sensitive wildlife conservation issues

Outcomes of the fifteenth Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) included the listing of *Aniba rosaeodora* (rosewood) and *Bulnesia sarmentoi* (holywood) in Appendix II (which permits international trade under certain conditions), as well as listings of five species of tree frog, the unicorn beetle and several Madagascar plant species, among others. The session was held in Doha, Qatar from 13 to 25 March 2010, with attendance of about 1 500.

African countries negotiated an African elephant action plan, but controversy arose over some countries proposing (unsuccessfully) to permit sale of stockpiled ivory or downlisting of some African elephant populations to permit trade under certain conditions.

Another sensitive debate centred on the extent of CITES's mandate with regard to domestic trade policies that may have implications for international illegal trade. Concerns were raised that internal trade of captive bred tigers in China (where policy promotes farmed animals as substitutes for wild ones) could stimulate medicinal demand for tiger parts and thus potentially instigate poaching across the range and illegal international trade. The revised resolution on conservation and trade in tigers and other Appendix I Asian big cat species includes greater reporting requirements on the nature and scale of trade, which represents a step towards clarifying the role of CITES in addressing the intersection between international and domestic trade threats to protected species.

Roughly 5 000 species of animals and 28 000 species of plants are currently listed in three CITES appendices and thus protected against overexploitation through international trade. For more on CITES, see the article on p. 64.

CBD technical body addresses forest and wildlife issues

2010, the International Year of Biodiversity, is a momentous year for the Convention on Biological Diversity (CBD). In the lead up to the tenth meeting of the Conference of the Parties (COP-10) – scheduled for 18 to 29 October 2010 in Nagoya, Japan – the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) held a fruitful fourteenth session in Nairobi, Kenya, from 10 to 21 May 2010. More than 700 participants attended. SBSTTA adopted 18 recommendations for submission to COP-10, of which a number are relevant to forests and wildlife.

Discussions of forest biodiversity centred especially on possible development of biodiversity safeguards under REDD (reducing emissions from deforestation and forest degradation; see article on p. 56) and improvements in forest biodiversity reporting and monitoring. The debate also addressed consideration of indigenous and local communities' rights and participation in the

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development of REDD biodiversity safeguards. Proposed work includes collaboration with FAO, the United Nations Forum on Forests (UNFF) and other CPF organizations on streamlining forest-related reporting.

The relationship between climate change and biodiversity loss was a central issue at SBSTTA 14. Attention focused on mainstreaming climate change issues in CBD and on ensuring that biodiversity concerns and approaches are integrated appropriately in other processes, especially the United Nations Framework Convention on Climate Change (UNFCCC). Delegates debated whether CBD should provide guidance for the development of REDD biodiversity safeguards and/or be involved in their implementation and monitoring. However no conclusion was reached on this point, as some preferred to wait until the issue is negotiated under UNFCCC.

Another prominent topic was the linkages between protected areas and climate change adaptation and mitigation. While some countries called for caution to avoid undermining the primary biodiversity conservation objective of protected areas, others thought that highlighting the adaptation and mitigation services of protected areas could be beneficial, helping to attract funding for biodiversity conservation. SBSTTA recommended that COP-10 invite parties to identify areas that are important for both biodiversity conservation and climate change mitigation/adaptation, while recognizing that biodiversity conservation remains the primary objective of protected areas. SBSTTA also called for exploring how funding opportunities for climate change adaptation and mitigation could contribute to the implementation of the programme of work on protected areas. Discussions of CBD's work programme on protected areas also drew attention to the need for enhanced involvement of indigenous and local communities and benefit sharing.

SBSTTA recommendations on mountain biodiversity also emphasized climate change adaptation and mitigation issues, including *in situ* and *ex situ* conservation of species under threat from climate change, reducing deforestation and restoring degraded forest ecosystems; establishment of conservation

corridors and connectivity; and cooperation among parties in developing regional strategies on animals that could cause conflict with humans, in particular large predators.

Under the topic of sustainable use, a bracketed recommendation calls on the COP to request that the CBD Executive Secretary convene, in collaboration with FAO, UNFF and other members of CPF, an Ad Hoc Technical Expert Group on sustainable use in agriculture and forestry. Delegates debated the scope of its eventual mandate, and settled on expanding it to include "non-timber forest resources".

SBSTTA invited parties and governments to implement the recommendations of the Liaison Group on Bushmeat for more sustainable use of bushmeat, taking into consideration customary sustainable hunting practices for indigenous and local communities' livelihoods.

Other SBSTTA recommendations addressed, *inter alia*, inland water, marine and coastal biodiversity; agricultural biodiversity; biofuels; biodiversity of dry and subhumid lands; invasive alien species; and incentive measures, as well as post-2010 goals and targets. The meeting also launched the third edition of the Global Biodiversity Outlook.

UNESCO World Heritage Committee releases updated list of protected sites

At its third session in Brasilia, Brazil from 25 July to 2 August 2010, the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Committee added 21 new sites to the World Heritage List, including four natural areas partly consisting of forest land.

UNESCO encourages the identification, protection and preservation of cultural and natural heritage with universal value to humanity. The Convention Concerning the Protection of the World Cultural and Natural Heritage, adopted by UNESCO in 1972 and ratified almost universally, allows sites to be inscribed on the World Heritage List, which signifies that the international community will cooperate in their protection. The convention aims at securing the financial and intellectual resources needed to protect these sites. The treaty also stipulates the listing of threatened sites on the List of World Heritage in Danger.

The forested sites newly added to the World Heritage List are:

- six areas of China Danxia – erosional landforms characterized by spectacular red cliffs – in subtropical southwestern China, conserving subtropical broadleaved evergreen forests and hosting many species of flora and fauna, about 400 of which are considered rare or threatened;
- the pitons, cirques and remparts of Réunion Island, France, a part of La Réunion National Park whose rugged terrain includes escarpments, gorges and basins with humid subtropical forests and cloud forests that are natural habitat for a wide diversity of plants, presenting a high level of endemism;
- the Putorana Plateau in the Russian Federation, an isolated mountain range including pristine taiga and forest tundra, crossed by a major reindeer migration route;
- the Central Highlands of Sri Lanka, whose montane forests are home to an exceptional range of flora and fauna including several endangered species such as the western-purple-faced langur, the Horton Plains slender loris and the Sri Lankan leopard.

In addition, four sites were added to the List of World Heritage in Danger, including the Rainforests of Atsinanana in Madagascar and the Everglades National Park in the United States of America. The Everglades had only just been removed from the danger list in 2007, but was reinstated because since then, a significant reduction in water flow to the park has resulted in increased nutrient pollution.

Experience in dune fixation

Fighting sand encroachment – lessons from Mauritania. C.J. Berte. 2010. FAO Forestry Paper No. 158. Rome, FAO. ISBN 978-92-5-106531-0.

One of the main challenges of desertification is encroachment of moving sands, which has devastating environmental and socio-economic impacts. It reduces arable land, grazing land and availability of water resources, threatening agricultural productivity and yields and the food security and standard of living of local populations. Other impacts include large-scale migration of people, infrastructure damage and substantial economic losses. Mauritania, as one of the most severely affected countries in sub-Saharan Africa, has accumulated a great deal of experience in combating sand encroachment over the past several decades. This publication synthesizes the lessons learned, particularly in the implementation of a recently concluded project for the rehabilitation and extension of the Nouakchott Green Belt, carried out by FAO and the Government of Mauritania with support from the Walloon Region of Belgium.

The publication describes sand encroachment processes and control techniques from preliminary studies to nursery methods to dune fixation techniques – both mechanical and biological – and protection of reforested areas. Project management and institutional aspects are also addressed, with an emphasis on the use of a participatory approach. Annexes include profiles of local woody and grassy species used in sand dune fixation, and tables used to manage activities and budgets and monitor progress, which can serve as a model for future efforts.

The lessons described in this book can be adapted to other countries facing similar challenges. The publication will be of interest to technicians, project managers, local communities and indeed all stakeholders engaged in combating desertification.

The publication is available online at: www.fao.org/docrep/012/i1488e/i1488e00.htm

Forest industry and climate change

Impact of the global forest industry on atmospheric greenhouse gases. R. Miner. 2010. FAO Forestry Paper No. 159. Rome, FAO. ISBN 978-92-5-106560-0.

Commissioned by FAO and the International Council of Forest and Paper Associations, this publication examines the numerous and complex connections between the global forest products industry (taken here to include roundwood production, pulp and paper, and wood processing) and the global carbon cycle, with the objective of characterizing the carbon footprint of the sector. Each chapter attempts to quantify a main type of industry

New editions of FAO statistical publications

FAO Yearbook of Forest Products 2008. 2010. Rome, FAO. ISBN 978-92-5-006544-1.

The yearbook is a multilingual compilation of statistical data on basic forest products for all countries and territories of the world. This sixty-second issue contains annual data on production and trade in forest products for the years 2004–2008 and on directions of trade in 2007 and 2008. Also available online: www.fao.org/docrep/012/i1521m/i1521m00.htm

Pulp and paper capacities – survey 2009–2014. 2010. Rome, FAO. ISBN 978-92-5-006597-7.

This annual survey presents pulp and paper capacities by country and by product, and production tables by country. It is based on the survey replies of country correspondents (mostly pulp and paper associations or paper companies) from 34 countries, representing about 70 percent of the world's paper and paperboard production. Also available online: www.fao.org/docrep/012/i1666t/i1666t00.pdf

impact: carbon sequestration and storage in forests and forest products; greenhouse gas emissions from manufacturing facilities or from electricity producers supplying these facilities; other emissions attributable to product manufacturing, product transport and use; emissions associated with end-of-life management; and emissions avoided elsewhere in society, when, for example, forest products substitute more greenhouse gas intensive alternatives or displace fossil fuels. Detailed calculations supporting the analysis are provided in an annex. A second annex provides an overview of carbon accounting of harvested wood products for national greenhouse gas inventories under the Kyoto Protocol.

The analysis finds that the industry's main sources of emissions are manufacturing (mostly because of fossil fuel consumption and electricity purchases) and disposal of used products in landfills.

Globally, the impact of the industry on carbon in forests cannot be described quantitatively because of the lack of data in many parts of the world and the complexity of the industry's raw material supply chain. Data from some countries, however, suggest that sustainable forest management practices can be effective in keeping forest carbon stocks stable over time. Some of the carbon removed from the forest remains stored in forest products, providing significant benefits. Indirect greenhouse gas benefits resulting from the activities or products of the forest products industry, while difficult to measure, can be large and could be increased.

The publication can be downloaded at: www.fao.org/docrep/012/i1580e/i1580e00.htm

Bioenergy: legal frameworks ...

Case studies on bioenergy policy and law: options for sustainability. E. Morgera, K. Kulovesi & A. Gobena. 2009. FAO Legislative Study No. 102. Rome, FAO. ISBN 978-92-5-106455-9.

Sound policy and legal frameworks for bioenergy are necessary to ensure that socio-economic and environmental sustainability considerations are taken into account in the production, promotion and use of bioenergy, with a view to minimizing risks of negative impacts and maximizing benefits in the immediate and long term.

Through a series of country case studies, this publication aims at identifying specific recommendations for policy-makers and legal drafters to ensure that policy and legal instruments on bioenergy contribute to food security, rural development and environmental sustainability.

The study begins by mapping out international commitments that are relevant to bioenergy production, promotion and use, with special emphasis on three areas of international law: trade, climate change and biodiversity. The international legal instruments were selected based on their likely influence in shaping national legal frameworks for bioenergy. They are addressed to varying degrees in the case studies.

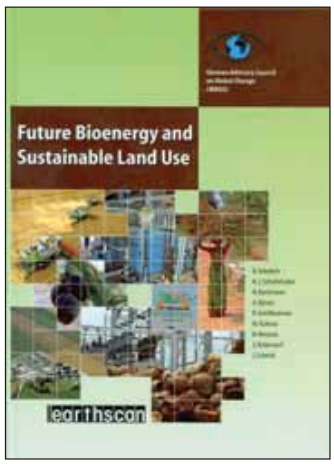
Part II consists of the case studies, which profile bioenergy policy and legislation in Argentina, Brazil, Estonia, Mexico, the Philippines, the United Republic of Tanzania and Thailand. Part III compares and analyses the main findings and explores legal and other options for ensuring economic, social and environmental sustainability in bioenergy development.

The publication is available online at: www.fao.org/docrep/012/i1285e/i1285e00.htm

... and issues of sustainable land use

Future bioenergy and sustainable land use. R. Schubert, H.J. Schellnhuber, N. Buchmann, A. Epiney, R. Grießhammer, M. Kulessa, D. Messner, S. Rahmstorf & J. Schmid. 2010. London, UK, Earthscan. ISBN 978-1-84407-841-7.

Compiled by the German Advisory Council on Global Change (WBGU), an independent, scientific advisory council to the German Federal Government, this large and detailed report examines the issues surrounding bioenergy from a global perspective and demonstrates how the sustainable use of bioenergy can help minimize risks to food security, nature



conservation and climate change. WBGU sees bioenergy as having the potential to contribute up to one-quarter of the world's present primary energy consumption and suggests that bioenergy policy should be geared primarily towards climate change mitigation and the elimination of "energy poverty".

The first section describes some sustainability constraints for bioenergy using the concept of "guard rails", which are quantitatively defined damage limits for a range of both ecological and socio-economic variables. Exceeding these limits would be intolerable or potentially catastrophic. Subsequent chapters include analyses of land use trends, bioenergy systems and the competition for land use for energy crop cultivation. The report distinguishes among traditional biomass use, biogenic wastes and residues, and energy crops. It also assesses more than 60 bioenergy pathways, from resource extraction to energy delivery. The final chapters discuss global bioenergy policy in detail and recommend a broad range of criteria for bioenergy standards in production and trade.

For policy-makers, this book opens with an 18-page summary and closes with five detailed recommendations for further research and six recommendations for policy and regulatory action.

Two on tenure

Forests for people – community rights and forest tenure reform. A.M. Larson, D. Barry, G.R. Dahal & C.J.P. Colfer, eds. 2010. London, UK, Earthscan. ISBN 978-1-84407-918-6.

Since 1985, governments in developing countries have transferred tenure rights for at least 200 million hectares of forests to communities living in and around them. Among the reasons for this apparently international trend is the growing recognition that forest conservation, environmental sustainability and enhanced livelihoods for those that have traditionally depended on forests can be complementary goals.

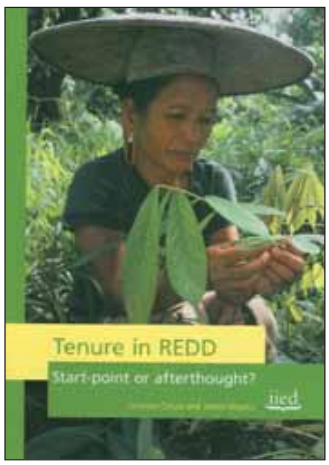
Based on the findings of a three-year study in over 30 communities in ten selected countries in Asia, Africa and Latin America, this book synthesizes what is known about efforts to grant new tenure rights to communities living in or near forests. The findings are not simply presented as country case studies, however; rather, each chapter draws on findings from across a range of countries to address themes that are central to forest tenure reform. Issues covered include the processes and outcomes of granting new rights; the roles of local organizations, regulators, regulations and markets; and the specific outcomes for livelihoods, forest condition and social equity. Each chapter includes a literature review that grounds the analysis of field research in the historical and cultural context.

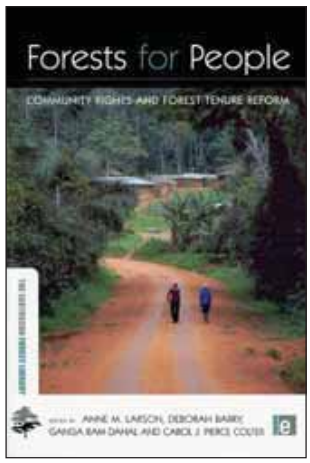
Forests for people is a scholarly and succinct analysis of forest tenure reform based on evidence from around the world. As such it is an important resource for those working in forest policy reform, both planners and practitioners.

Tenure in REDD: start-point or afterthought? L. Cotula & J. Mayers. 2009. Natural Resource Issues No. 15. London, UK, International Institute for Environment and Development (IIED). ISBN 978-1-84369-736-7.

As new mechanisms for reducing emissions from deforestation and forest degradation (REDD) are being negotiated in international climate change talks, resource tenure must be given greater attention. Tenure over land and trees – the system of rights, rules, institutions and processes regulating their access and use – will affect the extent to which REDD and related strategies will benefit or marginalize forest communities.

This short report draws on experience from seven highly forested tropical countries (Brazil, Cameroon, Democratic Republic of the Congo, Guyana, Indonesia, Malaysia and Papua New Guinea) to develop a typology of tenure regimes across countries. It explores tenure issues in each country and identifies key challenges to be addressed if REDD is to have an equitable and sustainable impact. Individual chapters address governance; land and carbon rights; State ownership; private ownership and use rights; customary rights and indigenous people; community ownership; and sharing of



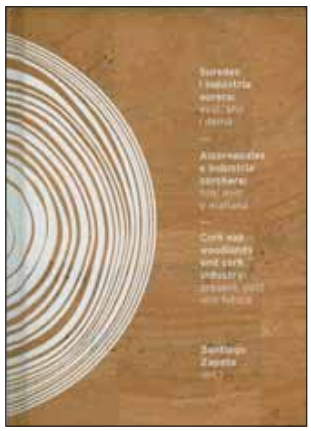


benefits. Some general recommendations are made for the effective development of REDD strategies. An annex provides detailed country profiles outlining the context of land and forest tenure issues.

All about cork

Cork oak woodlands and cork industry: present, past and future. S. Zapato, ed. 2009. Barcelona, Spain, Museu del Suro de Palafrugell. ISBN 84-923581-3-0.

This large multilingual book is a collection of 49 research papers presented at the International Congress of Cork Plantations, Factories and Traders, held in February 2005 at Palafrugell, Spain. Subtitled *present, past and future*, the collection is divided into two parts – forestry and industrial aspects (28 papers) and economy and history (21 papers). Authors include university researchers and cork industry representatives based in France, Italy, Portugal, Spain and Tunisia. Themes include silviculture, production growth models, pests and diseases, propagation techniques, harvesting, quality control, fire management, manufacturing, economic analysis, agroforestry, industry standards and aspects of the history of industrial development and international trade in selected cork-producing Mediterranean countries.



The papers are published in Catalan, English, French, Italian, Portuguese or Spanish, but each includes an English abstract. This attractive publication is illustrated in colour and bound with a unique cork veneer cover. It will be of interest to cork specialists in research and industry, as well as those with more historical interests.