

A review of sustainable forestry management as a tool for meeting conservation goals:

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Great ape habitat in tropical forests – an ecosystem under threat.

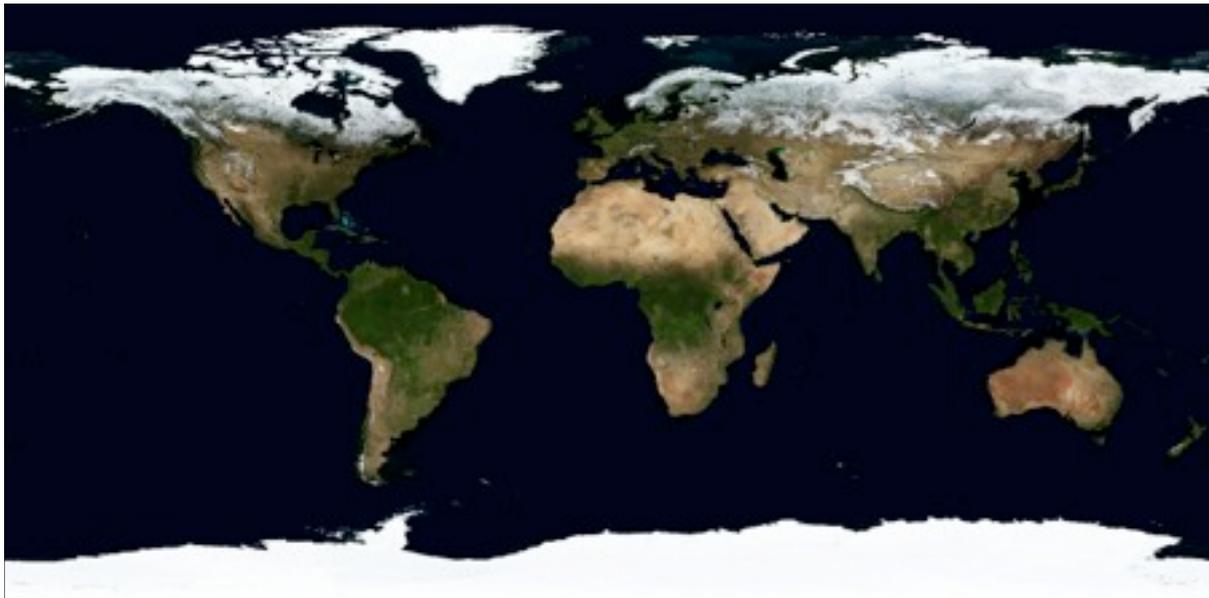


Figure 1 'Blue marble' image showing global forested areas. Copyright: NASA Visible Earth team. <http://visibleearth.nasa.gov/>

Tropical forests cover almost 14 million km² globally, extending from the neo-tropics and the vast rainforests of Amazonia through Africa and Asia across to the islands of the Pacific region (Figure 1) These are truly remarkable places; home to the richest terrestrial biodiversity on the planet, as well as providing a host of vital ecosystem services and values of significance locally and globally (Gardner, Barlow, Chazdon *et al.*, 2009). At the same time these forests are under tremendous pressure. They are greatly reduced in comparison to their former extent and continue to suffer high rates of deforestation and degradation (Table 1.1).

The forests of South-East Asia are amongst the most ancient on the planet, dating back over 70 million years. They stretch from Indochina, through the Malay Peninsula, across to the islands that make up Indonesia and the Philippines and encompass in excess of 2 million km². These forests represent an area of outstanding biodiversity value; Indonesia alone holds a remarkably rich biological heritage; home to 10% of the world's known plant species, 17% of bird species, 16% of reptiles and amphibians, 25% of all fish as well as 12% of all mammal species including the critically endangered Sumatran orangutan (*Pongo abelli*) (Critical Ecosystem Partnership Fund, 2001). They are also home to an estimated 90 million forest dependent people (Colchester & Fay, 2007). Only a century ago, the country was densely forested, with trees covering an estimated 80-95 percent of total land area. Widespread deforestation, however, has taken its toll and today this figure has fallen to well under 50% (Bradshaw, Sodhi and Brook, 2009). The most recent

Global Forest Resources Assessment (FAO, 2010) indicates that over half of Indonesia's remaining forests are earmarked for production of which half again are primary forest, the majority of which are in Papua and Kalimantan, a stronghold for the endangered Bornean orangutan (*Pongo pygmaeus*). Similar patterns of loss are seen in the biodiverse forests of Malaysia. Between the 1950s and 1990s, Malaysia experienced significant deforestation such that in the thirty years to 1992, the total forest area in Peninsular Malaysia declined from 65% to 46%. Today, most of Peninsular Malaysia's primary forests have been logged, while Sarawak has also experienced significant deforestation. By the early 1990s, about 60 percent of Sarawak's land had been licensed for timber extraction and large areas have since been logged. Increased land pressure from urbanization and agri-business in Peninsular Malaysia and Sabah has meant the major timber productions have shifted to Sarawak where human populations are less dense and forests not yet depleted (Jomo, Chang and Khoo, 2004).

Table 1.1 Forest cover and deforestation rates

| | Central Africa | South East Asia |
|---|----------------|-----------------|
| Forest Cover 1990 (thousand ha) | 268,214 | 247,260 |
| Forest Cover 2010 (thousand ha) | 254,854 | 214,064 |
| Deforestation rate 1990-2000* | -0.26% | -1.03% |
| Deforestation rate 2000-2010** | -0.25% | -0.41% |
| Production Forests 2010 (Thousand ha) | 59,844 | 104,526 |
| Conservation Forests 2010 (Thousand ha) | 37,311 | 38,655 |

*Global rate 0.2% ** Global rate 0.13% FAO 2011b

Central Africa: Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Republic of the Congo, Rwanda, Saint Helena, Ascension and Tristan da Cunha, Sao Tome and Principe

Southeast Asia: Brunei, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, Viet Nam

Developed from FAO 2010 and FAO 2011b.

The forests of South-East Asia have undergone extensive development over the last 20 years and as a consequence are severely restricted compared to their former extent. By contrast the Congo Basin in Central Africa is home to the second largest block of moist tropical forest on earth and covers almost 2 million km² of vast and often uninterrupted forest. Within these forests are found an incredible wealth of biodiversity; home to such emblematic species as the common chimpanzee (*Pan troglodytes*), western gorilla (*Gorilla gorilla*), bonobo (*Pan paniscus*) and forest elephant (*Loxodonta cylotis*). People are also an intrinsic part of this ecosystem with approximately 12 million sparsely distributed throughout the humid forests of the region, representing a diverse range of ethnic and linguistic groups including indigenous forest pygmy populations such as the Baka, Batwa and Mbuti (Joiris, 1998; Couillard, Gilbert, Kenrick *et al.*, 2009).

The pressures on tropical forests are largely driven by people's ever increasing desire for land and resources. Although these are global demands they are

compounded by the relative poverty, population growth and development needs of the forested regions. South-East Asia is very densely populated compared to the Congo Basin countries (121 people/km² compared to 24 people/km²) although the African region has a significantly higher population growth rate at 2.7% percent pa (SE Asia 1.2% pa). Both regions also have a similar proportion of rural people (51% and 64% respectively) with substantially below average per capita incomes by global standards (4,742 and 1,865 USD per person per year contrasts with a global mean of 10,384) (FAO, 2011a).

In these circumstances it is easy to understand why governments can see forests as presenting a valuable resource to help meet development goals. It is also the case that in remote rural forest areas there are often few other employment opportunities. The forestry sector is a significant employer with more than 2 million employed in the tropical timber sector globally, more than half of these in South-East Asia (FAO, 2011a). Forestry contributes almost 20 billion USD to the region's economy annually. For the Congo Basin, the figure is 1.8 billion USD which although smaller than that for South-East Asia, represents a similar proportion of GDP (FAO, 2011b).

Of course these numbers represent only the readily measureable economic value: the subsistence and informal economy benefits would represent a significant addition, while many more depend on the goods and services the forest provides that are less easily assigned a monetary value. Tropical forests have supported people's livelihoods for thousands of years and in the Congo Basin, for example, more than 90% of the people living in the region depend to varying extents directly on forest resources for food, fuel, income, timber and medicine (FAO, 2011b). In addition forests continue to provide vital services on which humans and wildlife depend such as regulation of climate; control of floods and erosion, disease and water quality; pollination; biological control of pests; supporting services such as soil formation and nutrient cycling; cultural and recreational services as well as having an intrinsic value itself.

Illegal logging is also a major concern affecting tropical forests with significant implications across the social, environmental and economic spheres: It undermines the rule of law and promotes corruption, costs governments in developing nations vast amounts in lost tax revenues, contributes to the funding of armed conflict and leads to increased environmental degradation (Brack, 2003; Cheng & La Clue, 2010). Illegal logging itself is driven by some of these same issues, including corruption, inconsistent government policies and lack of enforcement. In Asia illegal timber is estimated to be worth around US\$10-15 billion per year at the expense of the legal market. Illegal logging in Indonesia is estimated to cover between 40 to 88 percent of wood production, with China a substantial importer of this illegal wood and distributor worldwide. A recent report by UNEP/Interpol highlights that the issue of illegal logging is not declining and is closely linked to international crime syndicates with evidence that it could represent up to 30% of globally traded timber (higher in certain producer nations). These issues must be addressed for the future of forests and if efforts to promote sustainable development and good governance in forested nations are not to be undermined (Nellemann, 2012).

The value of tropical forests to life on the planet is clear, as are the pressures that face them in an increasingly resource-hungry world. Many governments and forest managers have identified forestry as having a key role to play in enabling the development of forest-rich countries (COMIFAC, 2005). At the same time many urge

that any forestry development must be sustainable and maintain the ecosystem services and values outlined above (ITTO/CBD, 2010). Can forestry be conducted in such a way as to meet these seemingly disparate goals? To answer this question requires an exploration of the evidence that logging can be sustainable and, if so, what mechanisms or incentives exist to promote its implementation?

Is sustainable forestry management a realistic solution to meeting multiple development and conservation goals?

The potential impacts of forestry operations on forests, biodiversity and the associated ecosystem functions they provide has been recognized for some time. Actions to try and mitigate these impacts while also utilising the forest as an economic resource have also been implemented; these have come to be defined under the term 'sustainable forestry management' (SFM). What exactly SFM represents is, to some extent in the eye of the beholder and has evolved over time. It is perhaps best thought of as a goal with the aim of maintaining the diverse values and services the forest provides rather than a set of prescriptive management actions. At the formation of the International Tropical Timber Organization (ITTO) in 1986, sustainability of forest management was described largely in terms of continuity of timber supplies to the market. Little mention was made at this time of social and environmental sustainability and certainly biodiversity was not an explicit concern. Within the sector the concept of sustainability itself has developed and the current ITTO definition reflects this. It now encourages its members, who represent over 90% percent of the tropical timber trade, to manage their operations in such a way so as to provide, 'a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment'. (ITTO/CBD, 2010)

The wider concept of environmental and social sustainability has progressed over the last 25 years, and a more holistic definition of what SFM should encompass is provided by the UN:

Sustainable forest management as a dynamic and evolving concept aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations. It is characterized by seven elements, including: (i) extent of forest resources; (ii) forest biological diversity; (iii) forest health and vitality; (iv) productive functions of forest resources; (v) protective functions of forest resources; (vi) socio-economic functions of forests; and (vii) legal, policy and institutional framework. (Source: UN (2008), Resolution 62/98)

Despite a broadly agreed international consensus that SFM should be the vision that guides forest managers, it has gained limited traction in tropical forests to date. An illustration of this is that only 7% of permanent forest estates within the International Tropical Timber Organization's (ITTO) member countries are considered to be responsibly managed (Blaser & Sabogal, 2011). Conventional/intensive logging is still therefore the predominant choice amongst the majority of forestry operations that likely give little priority to long term sustainability (Putz, Dykstra and Heinrich, 2000; Shearman, Bryan and Laurance, 2012). One of the main reasons, cited by timber companies, preventing them from adopting an SFM approach is the prohibitive cost

of implementation and a corresponding lack of realistic incentives to do so (Putz *et al.*, 2000). These are valid concerns that must be addressed by those keen to see SFM become the norm; companies are businesses that must remain economically viable if they are to succeed. What incentives exist to promote the uptake by timber companies of sustainable forestry practices?

Incentives for SFM

A number of options exist that seek to increase the implementation of SFM within tropical forests. These range from the development of voluntary guidelines through market-linked certification systems to the establishment of policy or legislative instruments.

Voluntary guidelines:

A number of trade organizations exist to promote the development of the tropical timber sector and over the last 10-15 years have moved towards incorporating sustainability as a goal. These organizations help develop technical guidelines, training and financial support for countries and industry to help implement more sustainable practices in the sector:

The International Tropical Timber Organization (ITTO) was established in 1986 to promote the protection and sustainable management of tropical forests and looks to balance the need for economic development with environmental and social safeguards. ITTO is a voluntary organization that helps develop and promote better practices of trade, use and management of the tropical forest. In 1993, following the development of the Convention on Biological Diversity (CBD), ITTO produced Guidelines on the Conservation of Biological Diversity in Tropical Production Forest. Since this time ITTO has collaborated with the IUCN (International Union for Conservation of Nature), revising the ITTO guidelines and providing additional protocols to forestry companies for conservation management (ITTO/IUCN, 2009).

The Association Technique de Bois Tropicaux (ATIBT) is an organization that supports the development of and capacity building in the tropical timber industry in Central Africa. Formed in 1951, it has increasingly adopted an approach that is grounded in SFM. ATIBT is closely affiliated to the Association Interafricaine des Industries Forestières (IFIA) which focuses on specific support to over 300 companies working in the Congo Basin.

However most recent estimates of <7% uptake of SFM in 2011 might suggest that guidelines and encouragement alone do not provide sufficient incentive to drive widespread change in the sector.

Certification:

Forest certification has been promoted as a market based mechanism giving incentives to timber producers to implement more sustainable practices. The certified product is produced to a designated set of standards and thereby commands either a market premium or, in other cases, market access. Although there are at least seven certification bodies worldwide, the Forest Stewardship Council (FSC) is the key international certification scheme in the tropics, an independent non-profit NGO

and the only truly global certifier of tropical forests that carries the support of a broad base of environmental NGOs (Gullison, 2003; Nussbaum & Simula, 2005). Since its foundation in 1993, the FSC has certified over 159,798 million hectares of forest, in more than 80 countries (Forest Stewardship Council, 2012a). To date, this represents the equivalent of 5% of the world forest concessions although, as Table 1.2 makes clear, uptake in tropical forests has been less extensive.

Table 1.2 Summary of extent of FSC certified forest in Congo basin and South East Asia

| Region | Area of FSC certified forest | |
|------------------------------|------------------------------|-------------------------|
| | 1000 ha | Proportion total forest |
| Congo basin ¹ | 4,992 | 0.023 |
| South East Asia ² | 1,902 | 0.01 |

1. Cameroon, Republic of Congo, and Gabon

2. Cambodia, Indonesia, Laos, Malaysia, and Vietnam

Data from FSC (2013) and FAO (2010, 2011b).

Certification involves three main activities: standard setting, accreditation of third party certifiers, and certification of the timber companies' management processes. FSC standards take the form of ten principles and associated criteria and indicators, developed through a multi-stakeholder process, that relate to explicit legal, operational, social and environmental targets that forest management must meet. These serve as the basis for monitoring and reporting and as a reference for assessment of actual forest management by third party auditors. FSC has global standards which serve as a basis for the development of relevant regional or national standards (Forest Stewardship Council, 2012b). Each standard setting body has a programme that accredits these standards and provides an assurance that the third party certifiers are competent; for example ASI carries out this service for FSC.

Although certification uptake in tropical regions has been increasing over the last few years, it still represents a tiny fraction of overall production forest area. This could relate to a perception of lack of sufficient demand for certified products combined with front-end costs associated with achieving certification. Despite this, FSC certification has been more successful than any other improved forestry model to date in improving management practices, in particular with regard to biodiversity, and has encouraged many stakeholders to modify their approach to logging (Sheil, Putz and Zagt, 2010). A major contribution of the scheme is as a driver for change not only among forestry professionals but also by consumer countries. This is a trend confirmed by the increasing demand for FSC products on the international market (Forest Stewardship Council, 2012a).

Consumer country measures:

Recently it has been recognized that policies within tropical timber consumer countries could be a potent tool for driving change in environmental and social standards in the tropical timber sector, in particular in addressing the myriad issues associated with illegal logging. Policies that seek to ensure that timber is produced in accordance with producer country laws - including wildlife, forestry and indigenous people's rights - could make a significant contribution to addressing one of the major threats to wildlife in tropical forests.

Bilateral agreements between timber producing countries and consumer countries help ensure legal and sustainable supplies of timber. A major example is the EU Forest Law Enforcement Governance and Trade (FLEGT) process linked to the EU 'due diligence' regulation designed to stop illegal timber entering the region's markets. This combines a licensing system with capacity-building measures for verification and enforcement in producer countries. The FLEGT process is realized through voluntary partnership agreements (VPAs) negotiated on a country-by-country basis with Ghana one of the earliest in 2009. Since then Cameroon, Republic of Congo and Indonesia are amongst those who have signed VPAs. Each agreement is country-specific and defines concepts of legality and standards of production and verification with producer countries committing to legislation changes as required. The VPA lists criteria, indicators and verifiers that will form the basis for enforcement, an approach resembling the voluntary forest certification process but applying to all of a country's timber production, including domestic trade. A licensing process, under a designated licensing authority and overseen by independent verifiers is designed to ensure compliance. The process places strong emphasis on legality, governance, transparency and local stakeholder involvement and differs from other mechanisms in its countrywide coverage and strong capacity-building aspects. Several other bilateral trade agreements exist between, for example Australia and Papua New Guinea, and between Indonesia and China although it has been noted that these are yet to be associated with any change in exporters' behaviour and, if purely free trade based, the lifting of trade barriers may actually exacerbate existing situations (Brack & Buckrell, 2011).

At present a fraction of timber traded internationally is licensed and/or verified as being legally harvested (approximately 8% of forests globally (FAO, 2010); a fact recognized in measures taken by the EU and US to try and ensure only legal timber enters their markets. In the US this takes the form of the Lacey Act which extends the concept of illegality of goods imported or exported in the US to include definitions of illegality in their country of origin, making it unlawful to: 'import, export, transport, sell, receive, acquire or purchase in interstate or foreign commerce ... any plant taken, possessed, transported or sold ... in violation of any foreign law ...' with the onus on importers to verify that their goods are legitimately sourced. Within the EU this comes under the due diligence regulation which places the responsibility for verifying legality on to the supplier that first puts the product on the EU market. Timber produced under a VPA is automatically approved. This system came on line in 2013 so how it functions remains to be seen.

Within developed nations the state is a major purchaser of goods and services, accounting for an estimated 10% of GDP (Brack, 2008). Many states have sought to use this purchasing power to ensure that the public sector purchases only legal and sustainable timber. These include Belgium, Denmark, France, Germany, Japan, the Netherlands, New Zealand, Norway and the UK. Within the UK certified timber now accounts for 80% of the timber product market (UK Timber Trade Federation, 2012) a substantial portion of which is thought to be driven by public procurement policies which can act as major drivers for suppliers (Simula, 2006). Procurement policies have the advantage of being more easily legislated for and implemented than the other methods described above.

Although not a consumer nation policy, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is increasingly being used by

states to ensure that trade in listed timber species is legal, sustainable and traceable. Around 350 tree species are listed under CITES Appendices, and trade in their products is therefore subject to regulation to avoid utilization that is incompatible with their survival. CITES is also working with ITTO to promote sustainable forest management and to build the capacity of developing states to effectively implement the Convention as it relates to listed tree species.

All consumer country driven measures (in common with certification schemes) are dependent on the quality and implementation of the standards and criteria they use. They are also vulnerable to weak enforcement and to fraud – for example anecdotal evidence has noted a suspiciously large volume of FSC certified goods coming from China (Brack & Buckrell, 2011). Properly implemented, however, they have the potential to be a potent driver promoting legal and sustainable production of tropical timber as well as improving forest governance in producer countries.

Producer country measures:

For many tropical timber-producing countries, sustainability underpins the concept behind the management of their national forest estate. In Cameroon, for example, the adoption of the 1994 forestry laws meant that forestry concessions had to be managed on the basis of approved Forest Management Plans (FMPs) that should ensure sustainable use of the resource and avoid social and environmental damage. Similar measures exist in other countries, although the gap between policy and application is always a difficult one to bridge. In Cameroon, Cerutti & Tacconi (2008) draw attention to weaknesses in the FMP system highlighting deficiencies in both the regulatory framework and its implementation and conclude that although laudable in its aims, the production of FMPs alone do not ensure the application of SFM and improved outcomes in the forest.

Possible future measures:

The possibility of climate change mitigation activities under a putative Reduced Emissions from Deforestation and Degradation (REDD) mechanism is a potential future incentive for sustainable forestry management. This would seek to reduce carbon emissions from forest landscapes and mobilise funds to do so. Discussions regarding the development of a REDD (++) framework have included options for reducing emissions through more sustainable forestry practices which could have carbon storage benefits. Social and biodiversity safeguards are expected to be part of any REDD framework, however negotiations for a global agreement have proved difficult and are unlikely to be concluded for some time. That said, voluntary or national mechanisms are still an option and this is an area that could lead to interesting developments (Putz, Zuidema, Synnott *et al.*, 2012). The Forest Investment Programme (FIP) is an example of a donor-led funding stream that seeks to support SFM within a REDD framework (Forest Investment Programme, 2012). Operating under the UNFCCC and managed through the Multilateral Regional Development Banks it has four key objectives of note that support SFM and should also reinforce efforts such as FLEGT:

- Promote forest mitigation efforts, including protection of forest ecosystem services
- Provide support outside the forest sector to reduce pressure on forests

- Help countries strengthen institutional capacity, forest governance, and forest-related knowledge
- Mainstream climate resilience considerations and contribute to biodiversity conservation, protection of the rights of indigenous peoples and local communities, and poverty reduction through rural livelihoods enhancements

It involves eight pilot countries including major forested nations and great ape range states, the DRC and Indonesia. Over US\$600 million has been pledged to the fund and although to date limited disbursements have been made, the FIP has the potential to provide significant support for forest conservation.

Various means have been developed to promote the adoption of SFM in tropical forests. As yet no single 'best approach' exists to ensure sustainable forestry practices although the field has seen some developments over the last few years that may lead to more widespread adoption of SFM and control of illegal practices. From a conservation perspective it is essential that any laws, guidelines or standards relating to sustainability take effective account of biodiversity. Certainly, without putting tangible and realistic incentives in place, SFM practices will remain the preserve of the few rather than the standard for tropical forestry as a whole.

Does implementing sustainable forest management contribute to conserving tropical forest biodiversity?

Does the application of SFM practices deliver the 'win-win' for tropical forest management, reconciling profitable utilization of the resource with '*...maintaining and enhancing the economic, social and environmental value of the forest...*' characterised in the UN's seven elements? More specifically is there evidence that SFM maintains or enhances biological diversity in tropical forests?

At its core, timber production is the harvesting of trees from forest landscapes to produce wood and wood products. If the starting point is a primary forest, maintaining or enhancing timber yields would require harvesting cycles of 50-100 years minimum (Brienen & Zuidema, 2007). For a concessionaire with a 20-40 year lease this is simply not feasible and so other strategies must be applied if unsustainable depletion of the forest resource is not to be the rule (Shearman *et al.*, 2012). Selective or reduced impact logging (RIL) seeks to address this through limited extraction rates and stem diameter while minimising collateral damage associated with the removal of larger, more valuable trees, see Figure 2. (Sist *et al.*, 2003). RIL guidelines have been available for some time and are typically required under certification schemes (Putz, Sist, Fredericksen *et al.*, 2008a). While RIL techniques have been found to reduce damage to remaining vegetation and soils and as a consequence maintain some ecosystem services such as carbon storage (Putz *et al.*, 2008b), it is important to highlight that it does not address some key issues related to biodiversity conservation, generally those linked to the indirect impacts of tropical forestry (Table 1.3).

Figure 2 Logging operations in Cameroon. © ZSL/Pallisco.

Timber production in tropical forests can have a range of effects on the biodiversity found there. These can be thought of as the direct impacts associated with the operation of harvesting trees and the indirect impacts that happen as an unintended consequence of the timber production enterprise. Over the last 10-20 years much research has been directed towards understanding the potential impacts of logging activities on wildlife in tropical forests. This is a particularly challenging area and as a consequence it has proven difficult to draw conclusions regarding the impact of specific logging practices that are broadly applicable across the sector. This is partly due to the sheer complexity of life found in these forests, compounded by the innate variability of study sites, logging techniques used, species responses as well as study methods used. Disentangling the interactions between these and the potential direct and indirect impacts has proved very difficult. Thus an overview of the literature will often give inconsistent or at times even conflicting results.

Table 1.3 Summary of direct and indirect impacts of logging on biodiversity

| Direct impacts | Indirect impacts |
|---|---|
| Damage related to tree felling on remaining vegetation and soil. Collateral damage to biodiversity and disrupts regeneration as future crops and seeds are destroyed. | Facilitates access to previously remote forested areas which increase anthropogenic pressures from hunting and poaching, migrant farmers' settlements, illegal logging & trade. |
| Damage related to skid trail and infrastructure development can lead to increased soil erosion and habitat fragmentation | Increased risk from exotic/invasive species (e.g. enrichment planting of exotic species) and domestic animals. |

Impact on the forest's structure and reduction in canopy cover continuity: gaps, microclimate shift, change of understory density and forest composition favouring light-loving vines and pioneer vegetation. Increase risk of human wildlife conflict and associated problems.

Opening up the canopy and reducing tree density can dry out the forest floor and understory, increasing the risk of forest fires. Increase in traffic and pollution.

Typically studies that focus on responses in species' population parameters depend very much on the traits of the studied species. Species with highly specialized requirements show significant adverse impacts, such as in studies looking at the impact of logging on terrestrial and bark-gleaning insectivorous birds or bats (Putz *et al.*, 2000; Peters, Malcolm and Zimmerman, 2006), while those looking at impacts on species with more generalist needs will see less of a negative effect (Johns, 1997). Similarly a temporal effect can be seen, whereby patterns in responses observed immediately after logging can change as time passes. In a study from Indonesia, for example, after an initial decline related to the disturbance of the logging process; primates seem to cope relatively well, particularly if they have a generalist diet; sun bear, however, suffer if fruiting tree diversity is not maintained and most of their recorded range is therefore within primary non-logged forest; ungulates, as generalist herbivores, seem to be able to adapt to the change and partially benefit from the increase of grazing areas as the canopy opens up; although it should be noted that all these changes are confounded in the face of hunting (Meijaard, Sheil, Nasi *et al.*, 2005). A long-term study on the effects of conventional logging on primates in Uganda conducted over 28 years, by Chapman & Lambert (2000), has shown that after the initial loss (mostly due to juveniles lost in tree felling process) and structure disruption (avoidance of recently logged areas), most primate species recovered and survive relatively well within a selectively logged concession and in surrounding areas, again, as long as hunting pressure remained low (Box 1 focuses on great apes).

Studies that look at changes in measures of diversity or species richness overall similarly can show different trends; for example Lewis (2001) saw no change in the diversity and structure of butterfly assemblages in logged areas in Belize while a study by Summerville & Crist (2001) saw marked differences between logged and undisturbed forests amongst moths in North American forests. To some extent the patterns associated with observed impacts on species depend on where and when you look.

Box 1. Focus on great apes and logging

The tropical forests of Central Africa and South-East Asia are home to the remaining great ape species. Protected areas encompass only 10 to 15% of the range of African apes - common chimpanzee, bonobo and the two gorilla species - and less than 20% of the two orangutan species in Indonesia and Malaysia. These areas are significantly smaller than the 30-40% of the great apes' range found in logging concessions. Moreover, all these species are threatened with extinction and classified as endangered or critically endangered on the IUCN Red List (Tutin, 2008; Walsh, Tutin, Oates *et al.*, 2008). As a consequence the crucial role that the management of these logging concessions will play for the great apes is evident and widely acknowledged (Tutin, Stokes, Boesch *et al.*, 2005; Morgan & Sanz, 2007; Meijaard & Sheil, 2008).

But what impact does logging have on the great apes and is there evidence that SFM can play a role in mitigating this and help to secure their future? Early studies on orangutans suggested that they were restricted to primary forest and that population densities in selectively logged areas were significantly reduced (Rijksen, 1978; Felton, Engstrom, Felton *et al.*, 2003). Recent studies offer conflicting evidence but suggest that orangutans can persist in selectively logged forests (Knop, Ward and Wich, 2004). A study by Marshall, Nardiyono, Engstrom *et al.* (2006) in East Kalimantan found that orangutan population density in logged forest was positively correlated with the distance to the nearest villages with known hunters and with the density of fruit trees, concluding that the presence of hunting was the most significant factor affecting the species. These findings are corroborated in work by Husson, Wich, Marshall *et al.* (2009) who found little difference between orangutan populations in selectively logged and unlogged areas, although population densities were lower in conventionally logged sites. Of note again is that any adverse effects in selectively logged sites were attributed to the indirect impacts of logging, particularly associated hunting. Although most studies have focused on the Bornean orangutan, a few studies have noted that the Sumatran species is less tolerant of logging, possibly due to their more specialized dietary requirements (Husson *et al.*, 2009; Van Kreveld & Roerhorst, 2010; Hardusa, Lameirab, Menkena *et al.*, 2012). Bornean orangutans, by contrast, survive well outside protected areas such as in FSC certified concession Dermakot in Sabah, Malaysia (Payne & Prudente, 2008). A recent study also highlights behavioural changes that could have a potentially deleterious impact on the species. For Sumatran orangutans, changes in forest structure and food source density (particularly fig trees and lianas) associated with logging mean that individuals spend more time harvesting food, and less time resting, which could have a negative impact on reproductive success (Hardusa *et al.*, 2012). The most significant threat facing the two orangutan species, linked to logging, is hunting. Effectively controlling hunting and good law enforcement have been identified as the key activity alongside fruit tree protection, and habitat management to mitigate the negative impact of logging on orangutans and probably other wildlife in South East Asian forests (Meijaard *et al.*, 2005; Marshall *et al.*, 2006; Husson *et al.*, 2009).

Studies focusing on African apes have failed to identify a consistent pattern of the impacts of logging. Morgan & Sanz (2007) assert that the effects associated with conventional logging concessions have definite negative impacts on ape populations, while the impacts of selective logging remain less clear. Studies have focused on the western gorilla (*Gorilla gorilla*) and the common chimpanzee (*Pan troglodytes*), respectively classified as critically endangered and endangered on the IUCN red list, largely because these species' range overlaps with the regions where the vast majority of large-scale commercial forestry occurs. The main finding of a study carried out by Putz, Blate, Redford *et al.* (2001) was that, in most cases, after the initial disturbance had passed, gorillas seemed to be relatively unaffected and in some selectively logged areas population increases were recorded. This was thought to be a consequence of the process of after-logging regeneration seen in herbaceous and other blooming vegetation, a finding consistent with that in other studies (Arnhem, Dupain, Vercauteren Drubbel *et al.*, 2008; Clark, Poulsen, Malonga *et al.*, 2009). Gorillas can also be found in high densities in well managed FSC certified concessions and do not seem affected by road or human disturbance as long as hunting pressure remains low (Clark *et al.*, 2009; Van Kreveld & Roerhorst, 2010)

For chimpanzees the picture is less clear; studies have found populations to increase, decrease and show no change in response to logging (Blumenthal & Reynolds, 2004; Hashimoto, 2005; White &

Perhaps evaluating measures of biodiversity under differing management systems might better illustrate the value of SFM. Again, demonstrating the impact of a specific management regime on a forest in terms of biodiversity is problematic. Detecting trends in wildlife populations over time is costly and inherently difficult, while proving the counterfactual is not easy. Would observed trends have happened regardless of management intervention? Evidence does, however, support the concept that populations of many species are significantly lower in conventionally logged concessions than those that are selectively logged, of which, the best model is certified forest.

Clark *et al* (2009) report findings of a long term study that sought to tease out the different effects of direct and indirect impacts of logging on the abundance of a suite of species in northern Congo, in which they found significant populations of wildlife in logged forests, although still less than in unlogged areas. They noted a similar pattern to that noted by Meijaard, Sheil, Nasi *et al* (2005) in that many species increased in abundance after the initial disturbance of logging had passed, linked perhaps to the opening up of the canopy and new growth, with numbers returning to previous levels with time. Several additional factors influenced species abundance, namely proximity to protected areas and distance from roads and settlements. This likely reflects a widely recognized feature for wildlife conservation in tropical forests - that hunting pressure is crucial (Fa, Ryan and Bell, 2005). In fact, illegal and unsustainable hunting indirectly linked to logging operations represents a far more important threat to species conservation than direct logging impacts (Milner-Gulland & Bennett, 2003; Meijaard, 2007; Meijaard & Sheil, 2008). The opening up of forests for logging with associated roads and expansion of local human populations is linked to increased pressure on wildlife from hunting (Wilkie, Sidle, Boundzanga *et al.*, 2001; Fa *et al.*, 2005; Laporte, Stabach, Grosch *et al.*, 2007). Even on certified concessions, hunting can increase and effective action to control this is absolutely essential if conservation goals are to be met (Poulsen, Clark and Bolker, 2011).

Wildlife population density is reported to be higher in certified forests than in any other logging system and, in a few cases, wildlife density is higher in certified forest than some protected areas (Clark *et al.*, 2009; Van Kreveld & Roerhorst, 2010). An extreme example is the Dermakot FS concession in Sabah, Malaysia where the density of large mammals is higher within the concession than in the surrounding protected areas. This is likely explained by improved law enforcement on the concession (e.g. effective patrols and guarded roads) and highlights not only the need for better management of protected areas but also the opportunities that good management of timber forest can offer conservation (Van Kreveld & Roerhorst, 2010). Again this suggests that controlling hunting is crucial and certification bodies such as FSC, having faced criticism from NGOs (FSC Watch, 2008), have worked with civil society to update their standards and explicitly make control of hunting an obligation of the certificate holder.

Overall, the evidence does suggest that while conventional logging appears to have a negative impact on biodiversity, sustainably managed forests can make a significant contribution to conservation, though it is important to stress that they are not a substitute for unlogged primary forests and the protected area network (Clark *et al.*, 2009; Gibson, Lee, Koh *et al.*, 2011; Woodcock, Edwards, Fayle *et al.*, 2011). This is now increasingly recognized both within the conservation sector and further afield; the CBD for example has noted “the importance of appropriate voluntary

market-based certification schemes to the conservation and sustainable use of forest biodiversity” (IUCN, 2005; Morgan & Sanz, 2007; Christopherson, Belair and Nasi, 2010).

Thus far we have highlighted the threats facing forests and their biodiversity and the role that logging plays in this. At the same time the evidence suggests that adopting a sustainable approach to forest management, in controlling hunting and implementing reduced impact logging can mitigate these impacts and balance the needs of development and conservation. Incentives exist for forest managers to implement an SFM approach but how to we move from this to practical implementation of activities that realise SFM goals?

Sustainable forestry management for conservation in the Congo Basin

The reality facing wildlife conservation in the tropical forests of the Congo Basin is that it must succeed in a climate of increasing competition for land and resources. People have been an intrinsic part of the forest ecosystem in Central Africa for tens of thousands of years; our hunting, harvesting and subsistence agriculture have influenced the dynamics of these forests over this long period. Today, however, as human populations grow and the global demand for natural resources increases, our impact on these forests and the scale of change effected has never been greater. The stereotype of vast ‘pristine’ forests unaffected by people is largely a myth and today the Congo Basin is increasingly a matrix of human-influenced land uses: agriculture, timber production, mining and agro-forestry are all expanding. These bring with them infrastructure development and demographic shifts that have the potential to seriously threaten the future of the forest, its biodiversity and the ecosystem services they provide. To secure these values it is vital that we respond to these changes, acknowledging their benefits to the economies and peoples of the region and explore ways in which development can be sustainable and reconciled with ensuring the persistence of a healthy functioning forest ecosystem for future generations.

Many of the threats related to large-scale land use change are linked to the activities of industry, so it is crucial that conservationists engage with the private sector to mitigate their impact. Traditionally the private sector, and in particular industries like tropical timber production, and conservationists have been perceived as ‘enemies’ with goals that are apparently at odds with one another. But this needn’t be the case. If the urgency of implementing sustainable practices within the private sector is evident, and the incentives to do so exist, the mechanisms by which this can be achieved are less clear. Below we explore how to engage the timber sector in achieving conservation goals – essential, perhaps, if a future is to be secured for the forest of the Congo Basin and the people and wildlife that depend on it.

Timber production at present represents the dominant land use in the Congo Basin forests, encompassing over 30% of the total remaining forested area, substantially larger than that set aside as protected areas for conservation (see Figure 3). (Laporte *et al.*, 2007). The potential impacts of logging on wildlife are outlined above; directly as a consequence of the operations of tree harvesting, and the more significant indirect impacts through opening up and fragmenting the forest leading to increased unsustainable hunting with expanding local human populations and easier access to the forest. To address these threats and sustainably manage the forest, the direct impact of the essential activities of timber harvesting must be minimized while the avoidable indirect impacts are eliminated. For this to be achieved there must be incentives for the sector to act: relying on business practice to change simply because it’s ‘the right thing’ is unrealistic. Second, the operational changes necessary to apply effective SFM move beyond the areas of existing forestry competencies, meaning capacity needs across the sector will have to be addressed. Potentially more significantly, a paradigm shift in attitudes will be needed to alter

what the sector views as the essential activities involved in tropical timber harvesting and concession management.

Can apparently conflicting goals – biodiversity conservation and maximizing economic benefits from forest exploitation - be reconciled and ultimately met by shared objectives that can become part of core tropical timber forestry operational practices?

The motivation for conservationists to support the adoption of environmentally and socially sustainable practices in the forestry sector might seem obvious but less evident why the timber industry in Central Africa might implement such changes. As outlined above, incentives do exist for the sector to apply SFM; guidelines such as those developed by the ITTO encourage sustainable trade, use and management of forest resources; consumer country policies act as drivers for ensuring that timber is produced in compliance with producer country laws (and, in the case of FLEGT, seek to build countries' capacity to develop and implement those laws); national laws in relation to forestry and wildlife detail legal obligations; while market driven mechanisms such as the FSC's certification scheme also provide incentives for improved forestry practice.

However, a major gap exists in the translation of policy into practice in terms of the technical and human capacity to realise the aims on the ground: How exactly should forestry operations be adapted to meet certification standards? How can a timber company practically and effectively mitigate the impact of its operations on wildlife populations? What action can and should a company take to ensure illegal hunting is not taking place within their concessions? How should the timber sector engage with other stakeholders? These are only a few of the questions that need to be addressed if the gap between policy and effective social and environmental outcomes on the ground is to be bridged. And finally, how best to engage with the timber industry to address these issues and implement truly effective SFM that realises conservation goals in the production forests of Central Africa?

Working with the timber sector to achieve conservation goals – the Wildlife Wood Project case study:

Paul De Ornellas, Eric Arnhem, Oliver Fankem and Chris Ransom. Zoological Society of London

In exploring how the timber industry might be engaged in managing their activities for conservation goals we will focus on four key areas:

1. Developing partnerships for effective sustainable forest management
2. Understanding the context of wildlife management and logging operations
3. Developing and implementing tools and approaches to reduce the impact of timber production on wildlife
4. Opportunities and challenges – lessons learned and the way forward

This will be illustrated using case study examples primarily drawn from the Wildlife Wood Project (WWP) one potential model for how such a relationship might work. The WWP was initiated by the Zoological Society of London in 2007 as a partnership between the society and the private sector with the goal of ensuring that timber production forests contribute to conservation in the forests of the Congo Basin. As a model the WWP has evolved over the five years of its existence but the experiences and lessons learnt over this period provide insights into how such a partnership might work. It is not the intention to imply that the model outlined here is the only approach that can work in the context of tropical forest management, merely to use it as an example of some of the issues that can arise and illustrate opportunities and constraints for what an NGO-private sector partnership can achieve.

Developing partnerships for effective sustainable forest management:

There is potential for engagement with the timber sector to take a number of forms, ranging from contractors delivering specific services to a company through to more developed, formalized and longer term partnerships. A formal partnership as distinct from a short-term contract represents a greater commitment and therefore carries potential greater benefits in terms of what can be achieved but also greater risks for all parties. Understanding how different parties might view such a partnership is important to developing a productive relationship.

From the perspective of the timber company any partnership must fit with a successful business model for utilizing forest resources. For those companies seeking to meet certification standards, implement best practice guidelines as industry leaders, or comply with national forestry/wildlife laws, a partnership with an NGO could make a sound business case (see Box 2). Potential benefits include:

- Managing reputational risk in a sector vulnerable to being perceived negatively by environmentally aware consumers in developed countries.
- Access to the social and environmental knowledge and scientific expertise that conservation organizations bring to complement existing forestry skills within the logging company. This expertise should help the company meet legal and certification standards relating to these areas and thereby enable access to additional markets and price premiums.
- Adopting a more sustainable approach to forest resources that comes with working with a conservation NGO should enable a business that depends upon those resources to sustain profitability in the longer term.

There are of course potential risks to the timber company:

- Additional burdens that a longer-term commitment might represent if logistical or financial support is part of a partnership agreement.
- Companies that commit to 'raising the bar' in terms of social/environmental management under a partnership leave themselves potentially exposed if they then fail to meet those commitments. Paradoxically a company which engages with a conservation NGO may be held to higher standards than one which doesn't.

From the perspective of a conservation NGO a partnership with the private sector must deliver conservation goals, typically improved conservation status of species and ecosystems. Large areas of Central African forest are managed by timber companies, so for conservation goals to be realised these companies must be engaged. At the same time for an NGO, partnership with the timber sector similarly carries both potential benefits and risks:

- Engaging the capacity of the timber sector is the key opportunity. Production forest represents a substantial portion of remaining forest with high biodiversity value, managing these to maintain conservation values would be a major achievement.
- Timber companies have the logistical capacity to manage forest concessions in remote areas where national authorities often have little ability to enforce national laws. Harnessing company capacity could bring significant conservation benefits.
- Constructively engaging with the private sector and therefore national economic development can mean that the NGO and its aims are taken more seriously in wider decision making processes. The NGO can be seen to depart from the stereotype perception as 'anti-development' and the conservation message can become more mainstream.
- A partnership can provide logistical and potentially financial support to conservation activities over a longer period than the typical project cycle of one, three or five years that can constrain the not-for-profit sector.

On the potential debit side:

- Reputational risk is a major concern. By engaging in a partnership with the private sector an NGO leaves itself open to criticism if that relationship doesn't

deliver or being ‘guilty by association’ with any negative press directed towards the private sector partner.

- An NGO can find itself being subsumed into company activities that can distract from its own aims and objectives. Similarly an NGO can find itself open to exploitation in providing services for a timber company that the company might otherwise have to engage in itself or pay consultants to do.
- By working with a timber company an NGO can find itself under pressure to compromise its position whether overtly or covertly as a consequence of working closely on the ground and ‘understanding’ the difficulties their partner faces in implementing best practice. At the same time, of course, a better understanding of the constraints the private sector faces should ideally lead to more suitable and effective recommendations and, ultimately, better outcomes.

Box 2. Industry perspectives on NGO partnerships

Richard Feteke (Forestry manager at Pallisco)

Pallisco was one of the first companies to take concrete steps to responsibly manage resources. This approach involved acquiring new skills so, to provide these, partnerships were established with biodiversity organizations (Antwerp Zoo, ULB, Nature + and WWF). In 2008, FSC certification was secured and the Wildlife Wood Project established with ZSL to help further develop skills in wildlife management, in particular to implement wildlife monitoring as per FSC standards.

More recently, on the advice of ZSL, Pallisco has signed a publicly available wildlife management policy including a commitment to implement a wildlife management plan. The partnership with ZSL is expected to continue to support the validation and implementation of the wildlife management plan and build on existing work.

Overall, Pallisco has found the support from its partnerships have contributed to finding solutions to new situations for which it has not yet developed skills. One potential fear regarding partnerships from the perspective of the timber company partner is that recommendations are not always seen as pragmatic. These problems can be avoided through good communication between the company and the partner (R. Feteke, personal communication, 2012).

Charles Bracke (Certification manager at SFID/Rougier)

To comply with the environmental and social requirements involved in implementing forest management plans and achieving FSC® certification, Rougier has for several years used expertise provided by external consultants but increasingly also specialized NGOs, both local and international. Implementing joint actions on the ground has resulted in a rapprochement between private companies and NGOs that historically have not been used to working together. Today, these partnerships have developed so that the environmental and social commitment of those companies certified or seeking certification has been greatly improved. This point has also been highlighted recently by auditors from ASI audit with regard to all certificates issued FSC® in the Congo Basin. The WWP collaboration between ZSL and SFID, helps to improve wildlife management in production forests in Central Africa, through: (1) supporting forest certification to take better account of wildlife in providing reliable bio-indicators for monitoring and (2) assisting forestry company partners to develop and implement concrete measures to improve wildlife management in their concessions. Key areas of collaboration in the SFID-Rougier concessions in Cameroon are: (1) monitoring of animal populations and concerted development of a program for the conservation of biodiversity and (2) capacity building of staff through training methods for monitoring wildlife and illegal activities in tropical forests (C. Bracke, personal communication, 2012).

Short-term service delivery or consultancy type contracts can represent a less complicated work relationship and avoid some of the risks outlined above. However they also fail to deliver the long-term commitment and sustained additional benefits

that a partnership can offer. Of course they are not mutually exclusive; a mix of both could be the best option whereby specific services for the timber company can be delivered under contract by an NGO within the framework of a wider partnership with longer-term goals for both parties.

Partnerships represent a commitment to working together between parties to achieve common objectives and it is essential that all parties are clear regarding what each hopes to achieve, what is expected of them under any agreement and, equally importantly, what they expect from the other parties. Thus it is essential the terms of any partnership must be clearly established and agreed in advance to avoid a mismatch in expectations of what is being undertaken and the potential for later conflict. Typically partnerships are outlined in Memoranda of Understanding, documents agreed and signed by both partners. These are not legally binding but represent a framework for how the partnership will work and can help ensure that both parties benefit from the relationship and minimise the risks; outlining shared objectives, financial and/or logistical commitments, intellectual property rights, reporting and grievance mechanisms etc.

Ultimately the key to a successful partnership is that all parties have a genuine commitment to achieving the shared objectives (See Box 3).

Establishing the WWP partnership:

The Wildlife Wood Project was initiated by ZSL as a way of helping the tropical timber industry achieve more sustainable practices that contribute to conservation to the biodiversity of the Congo Basin. Initially this sought to develop pilot models of how FSC certification principles and criteria and SFM could be implemented, and to ensure sustainable wildlife management in working timber concessions. Identifying willing, suitable partners to develop long-term working relationships within a supportive national context was the first step.

ZSL had identified Cameroon as a suitable country in which to establish the WWP given the high biodiversity value of its forests, a progressive environment for forestry (see Cameroonian context) and support expressed by Cameroonian national institutions. Potential industry partners were favoured if they already had FSC certification or were in the process of working towards becoming certified. Although it could be argued that this meant working with companies already achieving high standards for the sector it should be borne in mind that the initial aim of the project was to develop models that, having demonstrably worked, could be translated readily elsewhere. A progressive company, willing to work to develop such a model was therefore a pre-requisite. Realistically it was also unlikely that a company that had not yet considered certification would be interested in the sort of partnership that ZSL was looking to develop.

ZSL's goal was sustainable wildlife management within timber production landscapes and the WWP a mechanism to provide timber companies with the capacity to achieve this goal as part of their standard operating practices. For this to succeed our industry partners had to commit to four key elements:

- To work with ZSL to develop and implement the necessary monitoring and management systems to ensure that wildlife populations are not significantly affected by their activities.

- To take suitable steps to ensure that illegal activities and in particular illegal and unsustainable hunting is not taking place within their area of intervention.
- Engage with other stakeholders, in particular local forest communities, to meet project objectives and ensure they are not adversely affected by the timber enterprise.
- And finally, and in the longer term perhaps most significantly, to commit to develop the necessary capacity in terms of human resources and logistics to sustain ongoing delivery of project objectives.

Many of these objectives are part of a company's obligations under Cameroonian forestry law and FSC certification standards; however the tools and approaches to realise these obligations are often lacking or not implemented. This represents ZSL's commitment to the WWP partnership, to develop the tools and approaches a company needs to meet these obligations and furnish them with the skills to implement them.

Following consultations with a number of companies two were identified as suitable and willing to partner on the Wildlife Wood Project: Pallisco and SFID-Rougier.

Box 3. Wildlife Policy: a public commitment

ZSL encourages partner companies to commit to a wildlife policy, which represents a publicly available declaration of their intention to manage their operations in a sustainable and responsible manner. Pallisco-CIFM has worked with ZSL to develop such a wildlife policy.

Responsible Management of Wildlife Policy

Recognizing that industrial logging operations have an impact on wildlife in production forests, noting that, because of their large surface areas, forest concessions play an important role in preserving forest ecosystems and, adhering to the principle of sustainable management of forest resources for the benefit of future generations, the societies of Pallisco and CIFM take a public commitment to responsibly manage the wildlife of the forest that has been allocated to them.

Therefore, Pallisco and CIFM will:

- 1. Implement a set of actions for wildlife upheld in a management plan for which the human, logistical and financial resources are made available. Moreover, in order to internalize the skills, a contact person is enrolled specifically for the implementation of this wildlife management plan, and partnerships with experts or with civil society are considered.*
- 2. Adopt a system of adaptive management based on comprehensive knowledge of animal populations and the risks they face. This knowledge is acquired through periodic monitoring of the effects of logging on wildlife and continuous collection of information about wildlife threats.*
- 3. Reduce the direct impact on biodiversity resulting from their presence and activities. This involves, in particular, implementing rules prohibiting the involvement of the employees of Pallisco and CIFM in the trade in bushmeat and poaching of protected species. Access to alternative sources of protein quality and in sufficient quantity for these workers is ensured through commissaries and canteens. Techniques for reduced-impact logging are applied in forest operations and particular care is given to the potential effects of these on wildlife and habitat quality in order to minimize negative impacts.*
- 4. Minimize the indirect effects of logging on wildlife. Poaching of protected animals is not tolerated in the timber concession. Pallisco and CIFM will address this by systematically exposing any illegal activities to Justice Camerounaise, and through effective implementation of laws protecting wildlife. However, the rights of local communities in the concession are fully respected. The access of motorized vehicles in the concession is limited to the vehicles of Pallisco, CIFM and their collaborators.*
- 5. Contribute to the efforts of local, national and global wildlife conservation and position themselves as stakeholders in the various initiatives to this end. Therefore, the recommendations of experts for the preservation of biodiversity are applied following approval by PALLISCO-CIFM and, in general, the requirements for management of protected areas adjacent to the concession are met.*

Moving beyond business-as-usual, this policy represents an ethical and long-term commitment between Pallisco and CIFM, to serve the environment, sustainable development, social welfare and the preservation of the forest ecosystem.

It could be argued that this policy does not of itself achieve improved conservation outcomes in the forest; however it represents a tangible commitment, a public declaration of intent above and beyond legal or certification requirements to which the company can be held accountable. This represents a replicable model of how a company can signal its commitment to wildlife conservation and sustainable development.

ZSL timber company partners in the Wildlife Wood Project

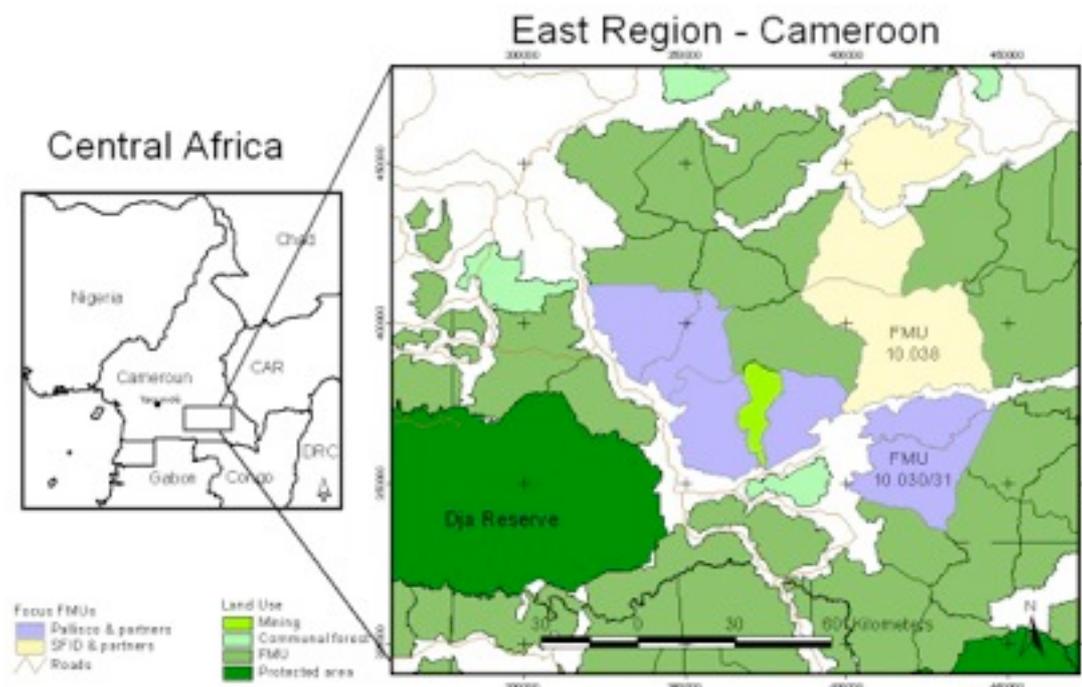
Pallisco was established in Cameroon in 1972 as an associate of a French parent company, Pasquet. The company and its partners currently manage six concessions totalling almost 350,000 hectares (FMU 10.039, the regrouped FMUs 10.041-10.042-10.044 and FMUs 10.030-10.031) and with Centre Industriel et Forestier de Mindourou (CIFM) a sawmill and processing plant in Mindourou,

employing around 480 people in total and producing almost 60,000m³ of wood per year. Responsible logging and trade in timber are highlighted as part of the Group's general management practice. They are one of the largest timber company operations in Cameroon and one of the earliest in Cameroon to achieve full FSC certification status for their concessions in 2008.

S.F.I.D. (Société Forestière et Industrielle de la Doumé) is part of the Rougier group, a French based company that has been active in Africa since 1952 and one of the larger operators in African tropical timber production. The company has subsidiaries in Gabon, Republic of Congo and Cameroon managing over 2 million hectares and produced almost 600,000m³ of wood in 2011 exported worldwide. The company's concessions in Gabon are all fully FSC certified (>600,000ha) while their remaining African sites are working to meet the standard. In Cameroon they have two main groups of concessions and associated sawmills, in Djoum to the south of the Dja Biosphere reserve and Mbang to the east (Djoum covers 262,572ha (FMU 09.006, regrouped FMUs 09.007-09.008, and FMUs 09.003-09.004a-09.005a-09.005b), and Mbang extends over 285,684ha (FMU 10-056, 10-054 and 10-038)). ZSL's work with SFID has largely focused on the Mbang concessions adjacent to Pallisco. These encompass over 285,000 hectares of forest, managed by the company since 1984 and representing their largest production site in Africa. In 2011 the Mbang concessions achieved FSC controlled wood status with the aim of securing full FSC certification soon while the Djoum concessions are at an earlier stage in the certification process.

The main initial focus for WWP activities has extended over Pallisco's and SFID's allocated FMUs in the Eastern Region of Cameroon in the landscape between Dja and Boumba bek/Nki (Figure 5). This production forest block of almost 6,500 km² is an area larger than the nearby Dja Faunal Reserve World Heritage Site. These FMUs are located in the transition zone between the mixed moist semi-evergreen Guineo-Congolian rainforests and the evergreen forests of the Congo Basin (White, 1983), a mosaic of mixed mature forests without predominant species and secondary forests at different succession stages. Three main species account for the majority of timber harvested in these concessions: the sapelli *Entandrophragma cylindricum*, the ayous *Triplochiton scleroxylon* and the tali *Erythroleum ivorense*.

Figure 5 Wildlife Wood Project area of intervention, bridging the landscape between the Dja Biosphere Reserve and Boumba Bek National Park. © ZSL



From a biodiversity perspective these concessions are located at the north-eastern border of the Dja-Minkébé-Odzala Tri-National Landscape (TRIDOM), a high priority conservation zone spanning the borders of Cameroon, the Republic of Congo and Gabon. They are home to remarkable forest wildlife including flagship charismatic mammals the western gorilla, common chimpanzee and forest elephant - populations within or bordering areas of highest priority for the conservation for all of these species. The potential exists therefore for improved management in these concessions to make a significant contribution to globally important conservation goals.

Forestry in Cameroon

Cameroon retains extensive forest cover, with around 42% of the total land area (equivalent to almost 22 million ha) still forested - 75% of which is dense moist forest. The lowland forests of South and East Cameroon contain key sites identified as being exceptional priorities for the conservation of the critically endangered western gorilla and the endangered common chimpanzee: The Dja conservation complex and Boumba-Bek/Nki each total over 6,000 km² while in the extreme south east Lobéké National Park is part of the Sangha Trinational complex, recently declared a world heritage site. People are also an intrinsic part of the forest ecosystem and the Baka, Bakola and Bagyéli groups in the region make up a substantial proportion of the 80,000 indigenous people living in Cameroon.

Despite the importance of these forests, Cameroon has a deforestation rate of around 0.14% per year and much of the remaining forest is affected by degradation, with selective logging known to be a significant contributor to this. Thus it is essential that for the preservation of the critical values and services the forest provides the management of logged forests will be crucial.

Cameroon's forests are owned almost exclusively by the state and divided into permanent forest estate (DFP) currently making up around 80% of total forest area

at around 18 million hectares and non-permanent forest estate (DFNP), almost 4.5 million ha. The DFP, which includes protected areas, should cover at least 30% of total national area, be representative of national biodiversity, remain as permanently managed forest and/or wildlife habitat and be sustainably managed according to approved management plans. Typically within the DFP, commercial operations are managed under a system of 15-year concessions (<200,000ha per concession) which are renewable once - in effect 30 years - although provision exists for local councils to allocate more extensive harvesting licences. The DFNP offers possibilities for smaller scale harvesting including community managed forests up to a maximum of 5,000ha but can also be allocated for agro forestry, crops and private forests. As of 2010 it is estimated that over 7 million ha of Cameroonian forests are managed as FMUs with an additional 600,000ha under community management.

At the same time the pressures in balancing sustainability with maximizing short term economic benefits (state revenues) can be seen in the fact that forest exploitation and related activities represented 8.9 percent of national gross domestic product (GDP) between 1992 and 2000 and have grown at a rate of 4.7 percent per year since 2000 - a significant role in the Cameroonian economy. The forestry sector is also a major export earner, accounting for 28.2 percent of total non-oil exports over the same period. The economic importance of the industry to Cameroon must be borne in mind when seeking to develop changes in industry practice.

Understanding the context of wildlife management and logging operations

To begin to mitigate the impact of logging activities on forest wildlife populations it is essential to understand the context in which the timber company operates. To manage any process effectively requires an understanding of what that process involves. In the case of the impacts of logging on wildlife there are several areas that need to be understood if effective strategies to mitigate these impacts are to be developed.

First, an understanding of the operational, legal and human context in which logging takes place is crucial. Relevant legal and certification standards, operational norms and constraints, financial and logistical issues and just as importantly human capacity all affect the ability to mitigate adverse impacts. These help define the parameters for any interventions, the areas for capacity development and may also enable the conservation partner to identify incentives to leverage action.

Second, it is essential to have sufficient knowledge of the wildlife populations within the concessions, providing a baseline and an understanding of the impact of logging activities. This information will inform a risk assessment process for how operations might affect wildlife and therefore guide management recommendations to mitigate impact. They will also provide a baseline for ongoing monitoring to assess the efficacy of interventions and provide the basis for adaptive management. This data collection process must also be realistic and economically viable; the intention is not to conduct a complete wildlife census across all taxa within the forest, but instead to provide enough scientifically defensible evidence to inform effective management action. It should be noted that the limiting factor in this process is typically not the absence of robust scientific methods to collect the data, but cost, time, capacity and feasibility of replication. Baseline data should represent a benchmark against which

future change in measured. To be comparable over time, data on wildlife should be collected using similar methods – thus expensive and time consuming methodologies that require a high level of technical expertise are unlikely to be suitable for long term monitoring and should therefore be avoided.

The context and constraints under which the partnership will work should already have been clearly explored and discussed by all parties during the partnership development phase and should guide subsequent work plans.

WWP – The Cameroonian legal context and certification

The management of all forests in Cameroon comes under the legislative framework outlined by the 1994 forestry laws, which sought to enshrine the principles of sustainable forest management in national forestry and reconcile development of the sector with social and environmental safeguards. As described above the laws detail a forest zoning system within which the forest management unit (FMU) represents the ‘concession’ allocation within the permanent forest estate in which large-scale timber production typically operates. FMUs are leased at public auction and although limited harvesting can begin immediately a forest management plan (FMP) must be submitted to MINFOF within three years. The FMP is envisaged as a document outlining how the FMU will be sustainably managed and should include an assessment of potential social and environmental impacts of harvesting and how these will be mitigated to ensure the forest resource is maintained. A major focus is ensuring sustainable harvesting based on an inventory of timber resources, outlining plans for annual allowable cuts (AACs) and cutting rotations/mean cutting diameter. These estimates are limited by lack of basic biological knowledge regarding species growth although in practice the typical 30 year term for a concession lease means that timber companies have no incentive to plan for longer, potentially more sustainable rotations that, from their perspective, might leaving valuable timber standing.

Although the FMP process for managing large-scale timber production forests represents a progressive step forward in the Congo Basin context for improved sustainable practices, the present application fails to achieve its SFM goals. The system of timber inventories and annual allowable cuts is important, however, as it should provide a spatial and temporal guide for forest disturbance as well as a potential opportunity for people on the ground in the forest to collect data on wildlife and signs of illegal activity.

Cameroon’s wildlife laws were also developed in 1994 as part of the same process that led to the development of the forestry laws. Animals are grouped into three classes, A, B and C. Class A species, which include the great apes, are fully protected except at the minister’s discretion under exemptions for designated hunting areas or human-wildlife conflict (‘battue’). Class B species are partially protected and may be hunted, captured or killed subject to the grant of a hunting permit, while the capture or killing of class C species is regulated by conditions laid down by order of the minister in charge of wildlife. Thus in principle the laws provide a detailed programme for conservation that ensures that sustainable use and subsistence consumption is catered for. However, as anywhere in the world, the key to the efficacy of any law in meeting its objectives is its enforcement, and policing wildlife laws in the vast, sparsely populated forests of south-east Cameroon is not

easy. There is great need of capacity development in this area, one that the timber sector could clearly contribute to.

In addition to the national laws, Cameroon has signed a VPA with the EU under the FLEGT process (see above). The verification system under which VPA certificates will be allocated is still being defined but it will identify standards and indicators for timber producers relating to legal assurance e.g. wildlife laws, forestry laws etc. For FSC certified companies and those seeking certification, the principles and criteria (Box 4) are amongst the strongest incentives for action in timber production forests that favour sustainable forest management, and in particular actions that favour wildlife conservation. Several of the principles and criteria agreed for the Congo Basin region are explicit regarding the impacts of logging operations on wildlife populations and the responsibilities for companies to mitigate them.

Box 4. FSC principles relating to wildlife

“Principle 1: Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.” (FSC, 2002, p. 4)

It should be noted that under this principle the forest manager is obliged to be aware of and contribute towards national biodiversity strategies. The manager is also obliged to ensure that no illegal or unauthorised activities take place within the concession and to liaise with the national authorities to achieve this.

“Principle 2: Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established.” (FSC, 2002, p. 4)

“Principle 3: The legal and customary rights of indigenous peoples to own, use and manage their lands, territories, and resources shall be recognized and respected.” (FSC, 2002, p. 5)

A key element of these principles to note in relation to forest conservation is the obligation to engage with local forest-dependent communities and ensure that they maintain their customary rights and resource access and that those resources are maintained.

“Principle 6: Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest.” (FSC, 2002, p. 6)

Under this principle are criteria that oblige the organization to identify potential impacts and take steps to preserve ecosystems and threatened species. This includes controlling hunting and ensuring company staff are not involved in production, consumption or trade of wild meat.

“Principle 7: A management plan – appropriate to the scale and intensity of the operations, shall be written, implemented, and kept up to date. The long-term objectives of management, and the means of achieving them, shall be clearly stated.” (FSC, 2002, p. 7)

The management plan referred to under this principle should detail objectives relating to, amongst other things, identifying and protecting rare, threatened or endangered species, and including explicit reference to the HCV framework (see section below for detail on Principle 9 that relates to HCV). The HCV concept is of particular importance to wildlife conservation as it obliges the concession manager, in consultation with relevant stakeholders to identify, monitor and manage areas of HCV to maintain and/or enhance them.

When viewed together, the FSC principles and criteria, forestry laws and other guidelines appear to comprehensively address the issues relating to SFM and ensuring good outcomes for wildlife. They explicitly state the criteria a forestry operation must meet and, in the case of FSC, should suggest indicators and means of verification for demonstrating them. But to meet the goals of certification and the legislation forest managers needs to know how to what action they need to take. What information do they need to inform wildlife monitoring? And how do they take steps to adapt their operations to ensure best management practice that meets their obligations?

Establishing baselines and assessing the impacts of logging operations on wildlife.

Clear obligations exist for the forest manager to assess the impact of forestry operations on wildlife populations and local communities' use of resources. As outlined above, logging operations' impacts on wildlife are both direct, as a consequence of the wood harvesting, and indirect, as a consequence of associated effects of the timber operation. Information-gathering directed towards a better understanding of the impacts of logging on wildlife could address two important issues:

1. Identifying causation for any adverse impacts on wildlife to steer targeted and effective mitigation activities.
2. Identifying indicators that are sensitive to the impacts of logging activities would facilitate the development of wildlife monitoring systems for concessions. Monitoring is essential to guide management decisions and an obligation under FSC standards. Ideally a compact suite of indicators could be developed that would act as markers of the impacts of logging activities on wildlife populations.

Two case studies from the WWP study sites explore the effects of logging on wildlife and the relationship between local communities and the forest as a source of wild meat. They also serve to illustrate some of the difficulties in understanding these issues.

The effects of logging on mammals.

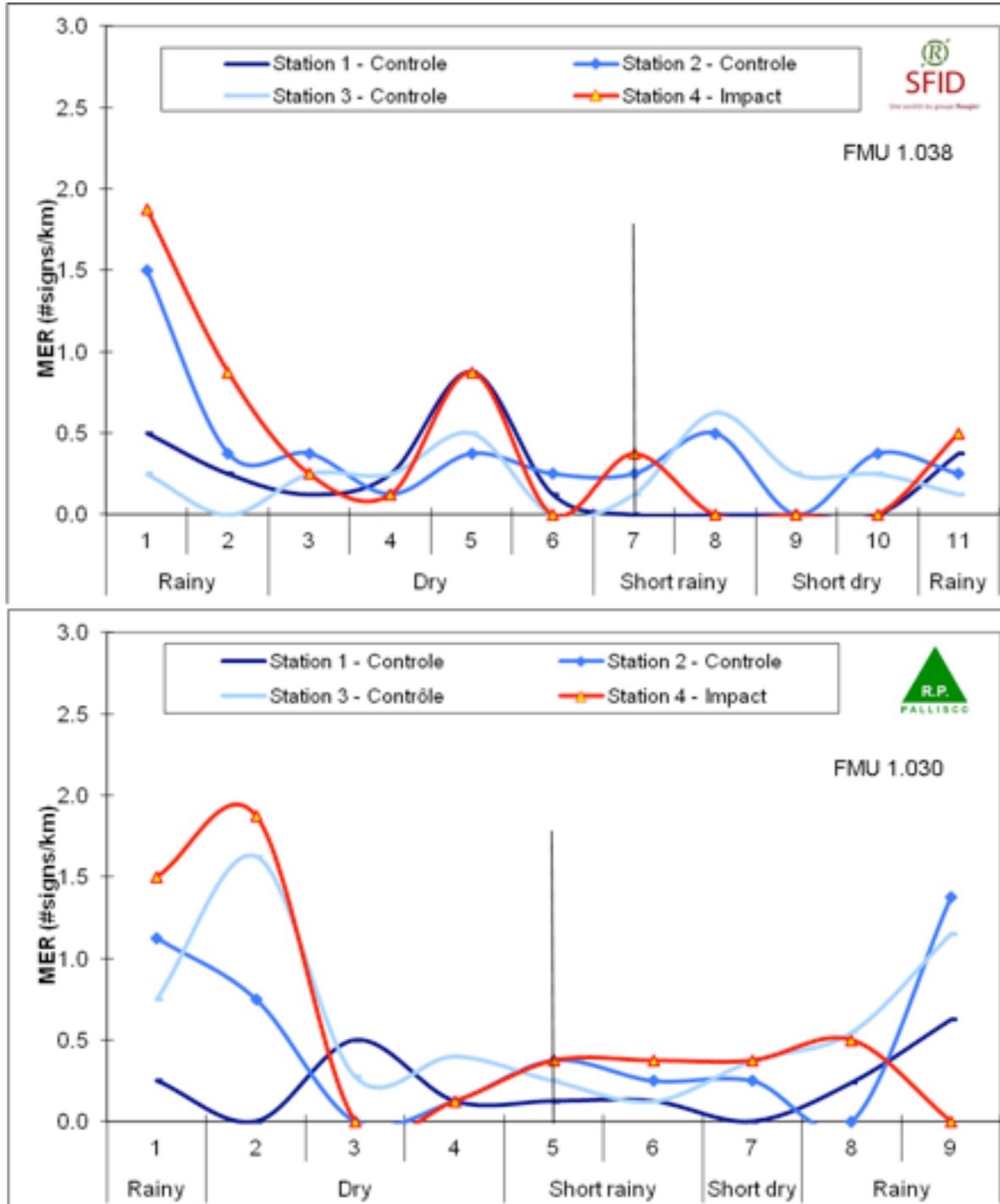
To assess the response of wildlife populations to logging activities, wildlife monitoring programmes were designed and implemented in two concessions managed by WWP partners Pallisco and SFID: FMU 10.030 (118,000ha) and FMU 10.038 (152,000ha). An *Asymmetrical Multi Control* sampling design was used allowing *Before-After Control Impact* analysis (Underwood, 1994). This methodology attempts to address the problem of how best to ascribe causation to the 'treatment', which a simple before and after study of the same site could miss. This in effect compares your 'treatment' site with a matched untreated 'control', in this case a logged site with an undisturbed, similar site nearby (>2km). Data are collected at two time periods, before and after logging, at all sites.

Four permanent bio-monitoring stations were established in each concession, including one *impact station* where logging operations occurred during the time of the study and three *control stations* where no logging took place in their immediate surroundings (>2km). Data were collected by the timber companies' wildlife monitoring teams using handheld devices programmed with cybertracker software, recording indirect signs of species presence e.g. tracks, dung, nests etc. Monthly surveys were carried out over a year at permanent bio-monitoring stations in both concessions. Each bio-monitoring station was composed of a total of 8 km (4 x 2 km) of line transects with a total of 355 km and 352 km of transects surveyed in the two concessions. The selected study species were all large or medium-sized mammals either legally protected - such as the forest elephant (*Loxodonta a. cyclotis*), the western lowland gorilla (*G. g. gorilla*), the common chimpanzee (*Pan t. troglodytes*), the sitatunga (*Tragelaphus spekei*) and the yellow-backed duiker (*Cephalophus sylvicultor*) - or considered socio-economically important species as in the case of the red river hog (*Potamochoerus porcus*), the "red" duiker (*Cephalophus dorsalis*, *C. callipygus*, *C. will nigrifrons*) and the blue duiker (*C. monticola*). The results of this

study provide a baseline for future monitoring and allowed the exploration of the immediate effects of logging on the study species.

The results obtained for chimpanzees highlight the difficulties of these studies and illustrate some of the findings reported above from the literature. Trends in chimp abundance showed a different pattern in each of the two logging concessions. In FMU 10.030, logging activities were observed to have no impact on this species as no significant changes in abundance were detected before and after logging. Nor was there a difference observed in abundance between the impact station and control stations. This seems to indicate that chimpanzees in this FMU did not move away from the impact station during logging operations and one might conclude on this basis that the species is tolerant of the logging practices at the site. In FMU 10.038, however, a significant drop in relative abundance was detected at the impact station after logging, evidenced in a lower encounter rate for chimpanzee signs than those found in the two control stations. On the basis of the data from this concession one might draw the opposite conclusion; that chimpanzees are adversely affected by logging activities and move away from the associated disturbance.

Figure 6 Change in relative abundance of chimpanzees at two sites (FMU 1.038 and FMU 1.030) during a before-after-control-impact study. Impact stations, sited at locations where logging will take place (commencement of logging represented by the solid vertical line), are compared with 3 control sites. After onset of logging, a statistically significant difference was noted in chimp abundance between impact and control sites at FMU 1.038 whilst none was observed at site 1.030. © ZSL



The study did not identify any significant changes in populations of chimpanzee or for the sympatric western lowland gorilla as a consequence of logging operations consistently across all sites. It is possible that in subsequent years different trends might become apparent, although the literature suggests the immediate post-

disturbance phase to be the time of greatest impact on wildlife (White & Tutin, 2001; Arnhem *et al.*, 2008). Thus the target species assessed in this study seem to have been mostly able to cope with the direct impacts of selective logging as it occurs in Pallisco's and SFID's FMUs. This may be partly attributable to the low extraction rates of 1 stump per hectare and consequent low disturbance levels in these concessions, and suggests that the reduced impact logging associated with SFM is consistent with maintaining populations of large mammals.

This is consistent with reports in the literature, that the indirect impacts of timber activities - chiefly increased hunting - are likely to have more of an impact on medium to large mammal species like great apes in forests where extraction rates are low, and therefore management should focus on controlling illegal hunting.

Understanding the role that wildlife plays as a resource for communities around timber concessions.

Unsustainable and illegal hunting has been repeatedly highlighted as possibly the key factor threatening wildlife populations in tropical forests (Fa *et al.*, 2005). This is particularly true for large mammals like the great apes and clear linkages have been made between the timber industry and an increase in hunting pressure (Milner-Gulland & Bennett, 2003). This can be due to logging company workers themselves or commercial hunters exploiting the opportunity of increased access to the forest. At the same time forest peoples have been relying on wild meat as a vital resource in the forests of Africa for millennia. Thus, although it is clear that unsustainable and illegal hunting must be addressed, it is also vital that this is grounded in a good understanding of local forest-dependent communities' reliance on wild meat to ensure they are not adversely affected. ZSL conducted socio-economic surveys to explore wild meat consumption patterns in communities around two of the larger concessions.

Surveys were carried out in communities around concessions 10.030 and 10.038 and among timber company workers and their families. Six villages along the road running between the concessions perceived to be a high risk zone for hunting and wild meat supply were surveyed. The studies were conducted using household and user-group surveys, with the use of structured questionnaires and informal interviews. Results estimated 20,000 animals to be captured per year by all the hunters interviewed. The majority of these were smaller mammals and no-one reported hunting protected species, though it is likely this reflected reluctance to 'own up' to illegal activity. These levels of offtake represent a major resource for local communities.

The study also explored the role hunted wild meat plays in the livelihoods of the community. A substantial amount was sold, representing a significant portion of income for hunter families. Irrespective of the ethnic background of the hunters, the incentives for hunting were both economic and nutritional.

This study illustrates what can be achieved in a rapid assessment as well as providing baseline data against which to measure the impact of subsequent activities. It highlighted the importance of hunting for local communities and of the consequent need to take that into account in developing strategies for reducing hunting pressure. It is absolutely critical that any strategies to reduce hunting pressure must consider the needs and aspirations of local forest-dependent people if they are to be fair and successful.

Developing and implementing tools and approaches to reduce the impact of timber production on wildlife

A prime motivation for conservation NGOs to engage with the tropical timber sector is to facilitate implementation of activities that favour wildlife conservation in production forests. To make a significant contribution to wildlife conservation at the landscape level there are two main focal areas to address: support to companies to build their capacity to mitigate the direct impacts of their activities, and working with all stakeholders to reduce illegal and unsustainable wildlife hunting.

A major component of the WWP model to date has been the development of effective tools and approaches that companies and other stakeholders can implement to mitigate the impacts of logging. In this model the NGO does not take on responsibility for implementing activities on the ground (although in other models they do), rather they provide technical support and help other stakeholders develop the capacity to do so. Thus the goal is that improved wildlife management becomes another element of everyday practice within timber companies' concession operations and not seen as an 'optional luxury'. This is an important element for the model's sustainability. A model that is wholly dependent on a high level of support from an NGO partner is hard to sustain in the medium to longer term and vulnerable to falling by the wayside if funding runs out. Once shown to be achievable and cost-effective, the goal is for the responsible wildlife management model to become the norm.

This means, however, that tools and approaches must meet a number of key criteria: first they must be effective in achieving their objectives, contributing to wildlife conservation, supporting national sustainable development goals and meeting companies legal obligations and certification requirements; they must also be financially, logistically and technically feasible for a timber company to implement and, finally, they should be monitored and adaptable.

Adapting logging practices to mitigate impacts on great apes

The identification and management of HCV is a key concept in the FSC certification standard (Box 5). This is a potentially invaluable tool for wildlife conservation in the timber production landscape and has also been adopted as an industry standard in other sectors such as by the Roundtable on Sustainable Palm Oil (RSPO).

Box 5. The High Conservation Value Forest concept (HCVF)

“Principle 9: Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.” (FSC, 2002, p. 9)

Six classes of social and environmental HCVF values (FSC, 2008, p. 1) have been established that forest managers are obliged to take account of:

- “1. Forest areas containing globally, regionally, or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia).
2. Forest areas containing globally, regionally, or nationally significant large landscape-level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.
3. Forest areas that are in or contain rare, threatened, or endangered ecosystems.
4. Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control).
5. Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health).
6. Forest areas critical to local communities’ traditional cultural identity (areas of cultural, ecological, economic, or religious significance identified in cooperation with such local communities).”

Before logging can begin, forest managers are obliged to engage with other stakeholders in a participatory process to assess, identify and map areas of HCV within their concession. These assessments must then be made publically available. Once identified, the concessionaire must work with these stakeholder groups to agree a monitoring and management system to maintain and/or enhance these values. It is noteworthy that under this principle, criteria 9.4 requires development of a specific data collection protocol and annual monitoring to verify the status of the HCV that feeds into adaptation of the forest management plan.

HCVs are perhaps more easily understood when they represent spatially discrete areas such as cultural sites for local people or riverine forest that maintains ecosystem functions. Identifying areas vital for threatened species, particularly more mobile larger mammals can prove more challenging. ZSL has worked with partners to try and develop toolkits for identifying areas of HCV for great apes and other focal species.

Chimpanzees can be adversely impacted by logging activities. ZSL and its partners believe that the core territories of chimpanzee communities that represent refuges for the species should be viewed as HCV. These should be identified, mapped and logging practices adapted in these areas to minimise their impacts.

To identify the core areas, timber company wildlife teams use an adaptive sampling method, developed by ZSL, to survey large blocks of production forests more efficiently by concentrating survey effort in areas where apes are more abundant. This *Adaptive Recce Transect Sampling* (ARTS) involves walking ‘recce’ transects, taking the easiest path along a pre-planned route and, whenever a chimpanzee nest is encountered, cutting a cross of more rigorous straight line transects to identify additional nests and inform the core territory mapping process. To conduct comprehensive surveys across large forest areas is logistically difficult and costly; our efforts focused on the active five-year logging blocks. These are a management

unit containing five 'Annual Allowable Cuts (AAC)' and represent the area of maximal forest disturbance over a five-year period. In the example below, in SFID's FMU 10.056 (76,660ha), two areas with a high concentration of nest sites were identified using the ARTS method suggesting the presence of at least two chimpanzee communities in the logging block (Figure 7a and 7b).

Figure 7a Density of chimpanzee signs observed within one active five-year logging block, collected using ARTS methodology. © ZSL

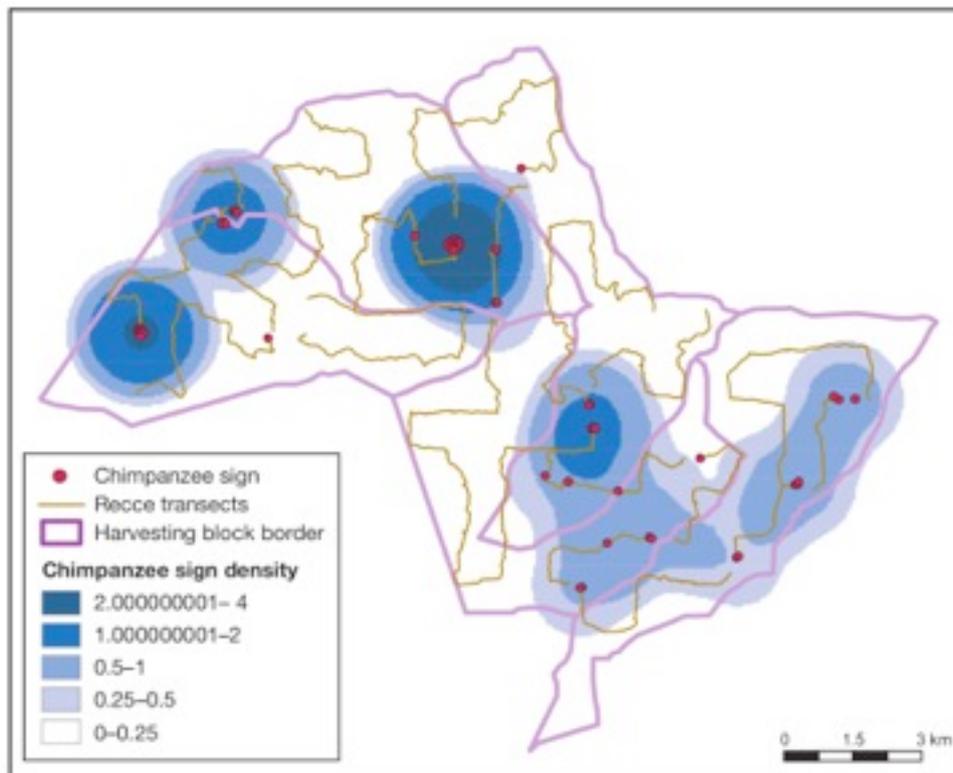
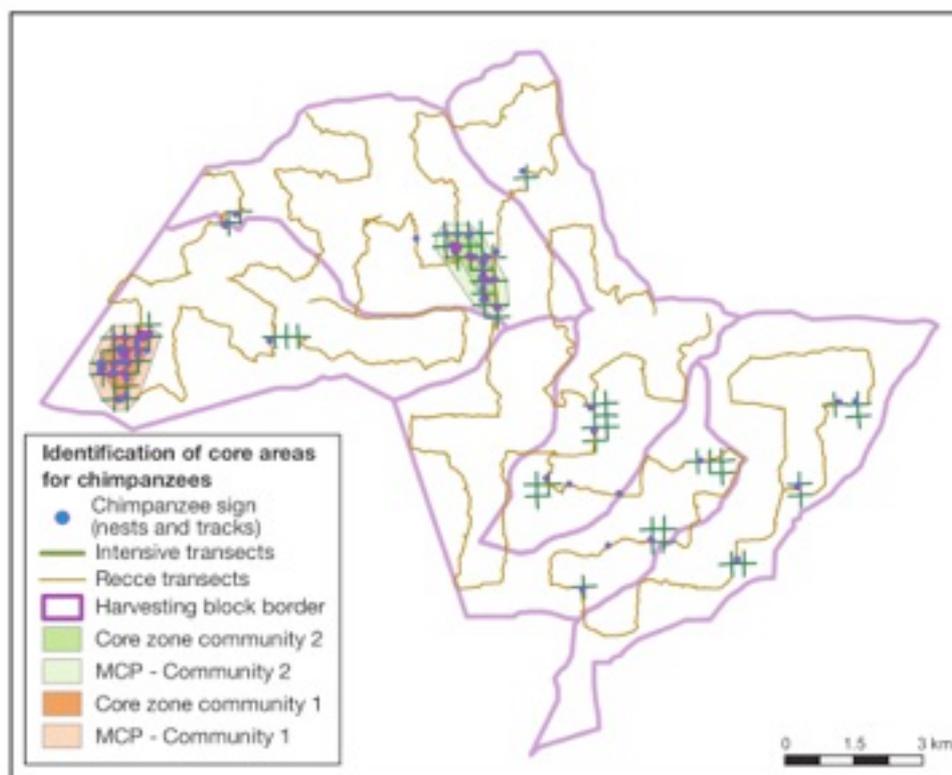


Figure 7b Data from (a) enable core areas of use for chimpanzees to be identified and mapped and for logging regimes to be adapted to mitigate their impacts. © ZSL



On this basis a number of recommendations were made for the management of the forest block:

- To organize tree cuts to enable chimps to retreat to these core areas i.e. to cut towards the core area, to alternate the cutting blocks in such a way as to avoid splitting the community, avoid erecting barriers that the chimps will not cross as the harvesting approaches the core area.
- To establish annual monitoring of the HCV areas and to carry out surveys to identify core chimpanzee areas during the annual tree inventory prior to each AAC.
- To complement this with strategies to reduce poaching in the concession and in particular in the vulnerable areas when harvesting approaches the chimp HVC
- To incorporate these recommendations into the overall forest management plans.

These recommendations have already begun to be implemented, although proof of the effectiveness of management of these chimp HCVs will be seen in the monitoring programme over the coming years.

Figure 8 WWP leaflet explaining the “10 Basic Rules to Avoid Zoonotic Disease Transmissions in Forest Camps. © ZSL

Reducing the risk of anthrozoonotic disease for great apes and people

Great apes are particularly susceptible to many human pathogens, so increased human presence and disturbance in ape habitat is a threat to them. Outbreaks of human disease can have a devastating impact on ape populations. At the same time zoonotic disease poses a threat to people who live and work in the forest. As a consequence a key recommendation of the IUCN guidelines for reducing the impact of logging on great apes is therefore to implement sanitation and health measures in logging camps and amongst logging company employees.

It is essential therefore that part of the timber company concession operation policy and practice is to ensure employees are aware of and implement safe hygiene measures. These are often simple and easily carried out measures related to washing, disposal of waste and avoiding contact with dead animals.

This is another example of where an NGO partner can provide support to implement improved management on the ground. The WWP worked with its partners to produce protocols for 'best forest practice' containing information regarding potential risks of disease transmission between wildlife and humans and the importance of sanitation and good hygiene for those who spend long periods of time in forest camps. The protocol *10 Basic Rules to Avoid Zoonotic Disease Transmissions in Forest Camps* was produced in the form of leaflets distributed to logging staff and local communities as part of an outreach campaign (Figure 8).

Reducing illegal and unsustainable hunting

Illegal and unsustainable hunting is widely recognized as one of the major threats to wildlife in tropical forests. Unchecked it can lead to 'empty forest

syndrome' (Redford, 1992) whereby forests are defaunated, stripped of their medium and large-bodied wildlife and left standing but empty. Expanding human activities such as logging in previously undeveloped forests areas is known to be a key risk factor exacerbating this process. The inevitable infrastructure development - such as new roads - associated with industries like logging opens up the forests to commercial wild meat hunting, while the prospect of employment and other opportunities attracts large numbers of inward migrants, further increasing hunting pressures. The importance of addressing these threats is recognized in national laws, legality assurance schemes, certification standards (Box 6) and other guidelines and best practice recommendations for the sector which oblige or provide incentive for the concession manager to take action:

Box 6. FSC Criteria and Hunting

"FSC Criterion 1.5 Forest management areas should be protected from illegal harvesting, settlement and other unauthorized activities." (FSC, 2002, p. 4)

Obliging the forest manager to take measures to control illegal activities as well as establish systems to detect, document and report them to the national authorities.

"FSC Criterion 6.2 Safeguards shall exist which protect rare, threatened and endangered species and their habitats (e.g. nesting and feeding areas). Conservation zones and protection areas shall be established, appropriate to the scale and intensity of forest management and the uniqueness of the affected resources. Inappropriate hunting, fishing, trapping and collecting shall be controlled." (FSC, 2002, p. 6)

Illegal hunting in the concession is forbidden as is the transport and trade of wild meat in company vehicles. The concessionaire is obliged to develop and demonstrably enforce a hunting policy on site and to take action to protect rare or threatened species. The company is also obliged to provide adequate supplies of alternative sources of protein for employees at a price equal to or less than that of wild meat.

This a complex problem with impacts from site level up to the broader forest landscape, while for species such as the forest elephant, the issue is linked to global criminal trade. Thus strategies to address it must also act at this range of scales and link to a wide group of actors and stakeholders. This is also a controversial problem relating to jurisdiction, responsibility and capacity as well as being a livelihood and rights issue for those forest communities who depend on wild meat. There is no straightforward or 'one size fits all' solution to these issues but a number of potential approaches exist for the timber sector to contribute to reducing illegal and unsustainable hunting of wildlife as a consequence of its activities.

The Wildlife Wood Project - engaging with local communities to reduce illegal and unsustainable hunting in the timber production landscape

Forest dependent peoples are sometimes stereotyped as a 'problem' with regard to the threat of hunting of wildlife populations. The WWP model sees people as an essential component of the forest ecosystem and sustainable hunting as an element of that system – they need to be part of the solution. Engaging with communities is essential to ensure they are able to play a role in managing their natural resources. The studies outlined above highlighted the important role that wild meat plays in the livelihoods of people from communities living around the forest concessions of the WWP partner companies. The next step was a community consultation to see what issues, if any, they identified regarding wildlife and hunting with a view to working with the WWP to develop suitable approaches to reduce pressure on wildlife.

This consultation also highlighted a potential pitfall of community engagement processes – that of an outside agency presenting solutions that communities themselves do not feel are appropriate. In Cameroon the forest law provides a mechanism for community-managed hunting forests. ZSL had identified the establishment of community managed hunting zones as a possible strategy to contribute to sustainable wildlife management. During the consultation the communities reported a decline in the availability of wild meat and a reduction in threatened species such as the great apes within the forests in which they hunt. They associated these observations with hunting by outsiders and the activities of logging companies. When questioned regarding possible solutions to this decline, communities identified the need for more co-ordination of existing community-led anti-poaching initiatives as well as the promotion of alternative livelihood and microfinance schemes. However, the idea of local ownership of wildlife and by inference its ‘management’ was not seen as culturally appropriate – wildlife is viewed as a communal resource and therefore not owned by anyone. Community hunting zones were therefore not a suitable approach for wildlife conservation for these villagers.

Although this may seem to be a failure of the planned consultation it in fact illustrates the strength of the approach – at an early stage an unsuitable option was identified and an alternative highlighted by the communities themselves. Efforts should focus on integrating communities into anti-poaching monitoring and developing a mechanism for engaging with the Government forest ministry (MINFOF) and other enforcement agencies. Communities have existing local governance structures established through previous engagement with timber companies and civil society, through which initiatives could be developed and managed. At the same time this approach should be coupled with exploration of complementary sustainable livelihood options and microfinance initiatives to ensure additional benefits for people. Having identified an approach, how can communities be helped to make it work?

[The *Fondation Camerounaise de la Terre Vivante* \(FCTV\) model for community game-guard involvement in anti-poaching activities.](#)

A possible model for community engagement in anti-poaching activities is that piloted by the *Fondation Camerounaise de la Terre Vivante*, a Cameroonian NGO, with communities in the south-east of the country. This project worked to link communities with eco-guards on the periphery of the Dja Biosphere Reserve to help protect their natural resources.

This project focused on engaging with villages at critical risk points for poachers accessing the reserve. A participatory approach led to the development of ‘co-management platforms’ managed jointly by game guards and community representatives. Each committee then received training on poaching and wildlife laws in Cameroon, raising awareness within their own communities about the initiative, techniques to monitor poaching activities and manage conflict, and constructive dialogue. These committees and an additional mobile phone link provided a mechanism linking the communities as ‘eyes-on-the-ground’ with the game guards, and established a dialogue between the two groups. As a consequence, seizures of illegally-hunted wildlife including chimpanzees increased, making this a potential template for replication elsewhere. The project also highlighted the importance of taking time to build relations between communities and

government agents and the importance of exploring mechanisms for sustaining the project. ZSL are now working with FCTV to develop a model east of the Dja.

Engaging timber companies in reducing illegal activities in their concessions

Timber companies are obliged to reduce illegal activities, including hunting, within their own concessions but should also contribute to wider efforts across the landscape and at the national level to reduce illegal and unsustainable hunting. This involves the implementation of a suite of activities at site level, and working with other stakeholder groups such as local communities, national authorities and other timber companies.

Action to control illegal activities within concessions can be viewed as contributing to meeting two main objectives; first to prevent incidents taking place, and second, to identify incidents of illegal activities and enforce sanctions in response (Figure 9).

Direct company actions:

- Companies should ensure their own employees are not implicated in the wild meat trade through developing and enforcing policies that ban them from hunting and trading wild meat. Certification standards also oblige the company to ensure that firearms are not carried on company vehicles (Figure 10). At the same time companies should provide alternative supplies of reasonably priced alternative sources of meat for these employees. This should be achieved through establishing and stocking a store on site that staff and their families can access.

Figure 9 Control of illegal activities on the concession is a core aspect of management and an obligation under many national legal frameworks and certification standards. Here a hunters' camp located deep within the forest is destroyed. © ZSL/Pallisco



- Control of entry points to the concession is essential to prevent poachers gaining access. A key activity is erecting and manning barriers at active logging roads and carrying out searches of vehicles for wild meat and firearms. Alongside this, roads that are no longer used should be rendered permanently impassable to vehicles.

- Companies should initiate a programme to monitor illegal activity within their concessions. Under the WWP model this has been conducted by a patrol-based company team trained in identifying and reporting signs of illegal activities. An important aspect of this is that patrol plans should be informed by a risk assessment as part of an adaptive approach; responding to findings, intelligence or simply ensuring that patrol effort isn't predictable.

Figure 10 Timber companies should ensure no company vehicles are being used to transport wild meat or arms that could be used for hunting. Here a company security team carries out a spot check on a truck. © ZSL/Pallisco



Collaborative actions:

- Timber companies are typically not mandated to arrest or prosecute and so must work with national authorities to ensure this happens. The bare minimum for a certified company is to merely inform the responsible government agency. However we would argue that this is not sufficient to discharge their duties.
- In the Congo Basin forestry agencies often lack the capacity and resources to respond efficiently, at the same time the judicial process can be subject to influence and inefficiencies which all serve to hinder effective enforcement of national laws.
- Timber companies can work with other stakeholders to assist this process. By co-ordinating with forestry agents, local communities and NGOs such as the Last Great Ape Organization (LAGA) in Cameroon, an effective model for enforcement can be implemented. Well organized timber company monitoring systems complemented by co-managed patrols such as the FCTV model can engender wide support as well as improve detection of illegal activities. Logistical support can be provided to forestry agents to enable them to respond effectively to incidents while the understanding of legal procedure that LAGA provides can ensure that cases are properly pursued. Timber companies must use their influence to press for proper process to be followed.

- Failure to co-ordinate efforts between neighbouring companies in controlling illegal activities risks losing the potential for efficiencies and improved effectiveness of actions such as road barriers and patrolling, and sharing information on poaching. Efforts to co-ordinate these activities should be a priority and could be an area of opportunity for NGO facilitation.

A role that an outside NGO such as ZSL can play and which forms part of the WWP model is to facilitate the development of these systems, linking the various stakeholders and associated protocols for identifying and responding to illegal activities.

Monitoring for sound forest management and conservation

Effective monitoring is essential for achieving sound forest management and securing conservation goals and as such is a key element of the Wildlife Wood Project Model. Monitoring is not an end in itself, although it is an obligation under FSC (Box 7). Rather it goes hand in hand with management.

Box 7. FSC Criteria and monitoring

“FSC Principle 8: Monitoring shall be conducted -- appropriate to the scale and intensity of forest management -- to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.” (FSC, 2002, p. 8)

“FSC Criterion 8.2: Forest management should include the research and data collection needed to monitor, at a minimum, the following indicators:

- a) Yield of all forest products harvested.**
- b) Growth rates, regeneration and condition of the forest.**
- c) Composition and observed changes in the flora and fauna.**
- d) Environmental and social impacts of harvesting and other operations.**
- e) Costs, productivity, and efficiency of forest management.” (FSC, 2002, p.8)**

And specific reference is made to not just documenting but evaluating the impact of the forestry activities on species, with trends over time clearly elucidated as well as the use of monitoring to improve management,

Indicator 8.2.14: The forest manager shall have a documented system for the collection of data on the presence of major species of flora and fauna within the FMU, permitting the identification and description of any changes within the populations over time.

Indicator 8.2.6: The impact of forest management activities on key and/or sensitive species shall be evaluated and documented.

Indicator 8.2.8L: Results from the monitoring mechanism and new scientific or technical data shall be taken into account for the improvement of forest management practices.

In fact it is essential that the development of an effective monitoring programme is a core element of management operations, linked to a documented management plan and is not seen as an optional 'add-on' or luxury. At the same time, monitoring serves little purpose if it is not linked to management actions; similarly it has been said that one cannot effectively manage any system that is not monitored. Despite this, the track record of the use of monitoring for conserving forest biodiversity to date has not been good. Lindenmayer described it in the forward to Gardner (2010), as 'truly appalling' while at the same time recognizing its importance as 'absolutely critical' if conservation goals are to be secured through improved forest management.

What purpose should monitoring serve? Why has its track record to date been so bad and, more importantly, how can it be carried out to enable effective SFM?

In general terms monitoring can be carried out for a number of reasons. For companies certified or aiming for certification, monitoring of management activities and their impacts is obligatory. Monitoring can also act as a form of surveillance to track changes in biodiversity or illegal activities over time as a measure of progress but for forest managers, monitoring should represent a tool to aid understanding of operational impact on biodiversity and to guide the adaptation of management practices to lessen these impacts.

Many authors, including Nichols & Williams (2006), Lindenmayer & Likens (2009) and Gardner (2010) amongst others, have been critical of the commonly practiced surveillance style approach to monitoring, collecting data on trends in biodiversity (typically data on species) without directly linking these to the management processes under consideration. They argue that this uses valuable funds without providing any understanding of the causes underlying observed changes and therefore fails to inform or improve management. Another criticism that can be levelled at this sort of monitoring is that it can lead to frustration or even breakdown in trust between researchers and managers who see funds being spent and monitoring being carried out but a lack of useful information and advice feeding back to refine their operations. From a management perspective it can lead to the question, 'what is the point?'

At best the information gained from such a monitoring programme can trigger a reactive management response to a detected change, presuming a suitable response plan is already in place. Monitoring and management should be closely interlinked: to properly understand the observed changes in biodiversity, it is necessary to monitor not only changes in species but also changes in management activities themselves, as well as the changes to forest structure and function that are a direct result of management. While surveillance style monitoring is not without merit (for example linked to illegal activity monitoring it provides a vital detection/enforcement tool and can feed into wider national reporting mechanisms) more care should be taken in designing monitoring programmes such that they deliver the maximum returns, yielding useful information to directly advise, assess and adapt management interventions at minimum cost.

Monitoring should be part of a process of adaptive management; again this is an obligation under certification standards, a process that can be succinctly summarised as a systematic and purposeful approach to management involving learning by doing (Stem, Margoluis, Salafsky *et al.*, 2005). Adaptive management is a widely used term but often misapplied, it means more than simply a flexible approach to management

i.e. being prepared to try something new if a system isn't working. It should rather include a suite of managerial approaches adapted through a 'learning system' (an information gathering process or more succinctly, monitoring). In its purest form this involves a structured hypothesis-testing approach built into day-to-day management operations. In ecological systems such as a tropical forest concession, however, this can be challenging, and sometimes compounded by logistical and political constraints to the point of being unrealistic. A more passive adaptive management system in which operations are assessed in terms of their impact in meeting clear goals and objectives and adapted accordingly is, however, more achievable and should form the basis of standard practice.

A potential framework for adaptive wildlife monitoring and management is outlined below followed by an example taken from the WWP, the ZSL/Pallisco wildlife management plan for their concessions in Cameroon.

Scale and scope of managerial operations:

As outlined above, understanding the context of operations is the first step in designing a management plan. How large are the concessions? Where are they located in terms of both physical and human geography? What people, wildlife and other natural resources are found there? How are these likely to be affected by the intended operations? Similarly it is essential to understand the legal and regulatory framework and the capacity of the forestry company in terms of people, skills and finances. These provide the baselines, the understanding of the current state and will inform the core foundation of the management plan – the setting of goals and objectives.

Goals and objectives:

Clear goals and objectives are essential to guide any purposeful management programme. Goals represent a vision to aim for while objectives are shorter-term steps towards meeting the goal. Objectives should have quantifiable verifiers to enable progress to be readily measured. Conservation and ecological systems generally have a poor record of establishing these verifiers (Wintle & Lindenmayer, 2008) and the FSC Congo Basin standards have yet to define the verifiers that accompany their P+C. In their absence managers are left with a difficult task and must look to establish their own quantifiable verifiers: without targets performance cannot be measured.

A key problem is defining the aimed for state – what are managers aiming to achieve? Should they be looking to maintain a baseline state as measured at the start of the management programme? Or perhaps restoring or maintaining a concept of a natural system? This to some extent cuts to the core of SFM and sustainability more generally. The standard that Gardner (2010) adopts is that of (Stoddard, Larsen, Hawkins *et al.*, 2006), namely the 'best attainable state' which represents the expected condition if the best managerial practice is applied. Forest managers should aim for this outcome.

Develop monitoring programme indicators:

Indicators provide the practical tool by which changes in management practices and biodiversity responses can be measured and evaluated against standards, goals and objectives. Much effort has been expended over the years to identify suitable indicators and virtually every taxonomic group has been proposed as representing a

surrogate for wider biodiversity or ecosystem function (Lindenmayer, 2009). The evidence for these claims is typically patchy or only locally relevant and rather than looking for a one size fits all indicator species/taxon a more suitable approach involves identifying a panel of indicators that are well understood, readily measurable, cost effective and provide insight into the processes involved (see Box 8, adapted from (Gardner, 2010)).

Box 8. Indicators for forestry management

Implementation monitoring assesses whether certain management practices are being carried out or policies in place. These are crucial and can be done through monitoring policy/management practice indicators e.g. the existence of a management plan, length of logging cycle etc. However, they yield no information on management performance, and conceivably full implementation can be achieved with no conservation goals met.

Effectiveness or performance monitoring assesses whether a particular target has been met, but does not assess the underlying reason for success or failure. These are assessed through the use of performance indicators;

- Direct or biological indicators such as species that indicate ecological disturbance, presence of hunting etc. These can be complemented by additional target species e.g. protected or flagship species;

- Indirect indicators that relate to forest structure such as stand complexity or dead wood. These are presumed to give a good indication of ecosystem integrity and also are more closely linked to management actions.

Validation or adaptive monitoring seeks to link management performance with change in a set of values. In effect it seeks to attribute cause to management actions (Stem *et al.*, 2005) and uses the management practice and performance indicators within more carefully designed sampling systems to test hypotheses within a learning framework of adaptive management.

Sampling design:

For certain indicators verification involves simply confirming the existence of documents, protocols or designated staff members. For others dedicated sampling programmes must be established and reported on. The sampling design needs to be sufficient to measure the indicators and thereby assess progress in meeting objectives. Thus it needs to be scientifically robust, achievable by the personnel carrying out the work and cost-effective. Typically this is outside the existing skill set of forestry managers and staff and the technical support to establish these programmes and equip personnel with the requisite skills is a role that outside experts can play, and as such is a key element of the WWP.

Figure 11 Bio-monitoring teams should be established within companies to collect data on wildlife and inform management of progress in meeting environmental objectives. This a key element of effective adaptive management. © ZSL/Pallisco



As part of the WWP the company commits to establishing bio-monitoring teams and illegal-activity patrol teams, specifically dedicated to monitoring roles; made up of trackers, field officers and team leaders (Figure 11). These teams must be provided with the necessary skills and adequately supported in terms of equipment, time, logistical and also cultural/political support within the company. ZSL provides training in a suite of field skills; planning surveys, use of technologies such as camera traps, identifying and recording signs of wildlife and illegal activity, use of GPS, and use of cybertracker software on handheld PDA devices. ZSL also develops field protocols and training materials for ongoing use within the company, again the emphasis is on developing internal capacity to sustain improved management. A discussion of survey methodology is outside the scope of this paper but suffice to say that they should follow repeatable and scientifically robust standards while being financially and logistically achievable. Procedures for the analysis and management of data are another crucial element for which technical support is provided. This is a rapidly developing area in which decision support software will have an increasing role to play. This can vary from the automatic upload of recorded field data from PDAs to databases via cybertracker software, through to more powerful tools such as MIST/SMART that can upload, store and analyse data collected on surveys or patrols, producing map based reports for managers to easily assess monitoring. The use of such decision support software should greatly facilitate the implementation of adaptive monitoring and management.

[Wildlife management plans – an adaptive approach to monitoring and management](#)

Management plans are the cornerstone of forestry operations and also key requirements under FSC (Box 9) and in most countries, national forestry planning. To date these have largely focused on tree harvesting with social and environmental standards being less well developed.

Box 9. FSC criteria and adaptive management

“FSC Principle 7: A management plan - appropriate to the scale and intensity of the operations - shall be written, implemented, and kept up to date. The long term objectives of management, and the means of achieving them, shall be clearly stated.” (FSC, 2002, p. 7)

“FSC Criterion 7.2: The management plan shall be periodically revised to incorporate the results of monitoring or new scientific and technical information, as well as to respond to changing environmental, social and economic circumstances.” (FSC, 2002, p. 8)

Obliging forest management to be carried out following an objective led plan and crucially that this plan should be kept up to date. This is clarified in Criterion 7.2 and explicit reference is made to social and environmental monitoring to guide revision of the plan.

ZSL is working with companies to change this and provide the adaptive management framework to enable wildlife to become an ongoing aspect of day-to-day management. Working together, ZSL and Pallisco have developed a five-year management plan that details an objective-led adaptive approach to management and monitoring of wildlife within their concessions (Box 10) It follows the steps outlined above; detailing management activities, and establishing a monitoring programme that matches objectives to measurable indicators and quantitative verifiers, linked to management performance and contributing to the wider goal of ‘ensuring their forestry operations conserve biological diversity and its associated values, in line with FSC principles’.

Box 10. The WWP model of an adaptive wildlife management plan

Goal: To ensure that Pallisco's forestry operations conserve biological diversity and its associated values, in line with FSC principles

Based on an analysis of the context of Pallisco's forestry operations and baseline data, objectives to help meet the goal are agreed. An example of how the plan links monitoring and management to these objectives is given below.

Objective 4. A significant decrease evidenced in commercial hunting and poaching of elephants, great apes and other Class 'A' protected species within the concessions.

Management activities are detailed in the plan (with methodologies where appropriate) that contribute to meet this objective including: preventive action (controlling access to the concessions, closing secondary roads, education, etc...); affirmative action (providing cheap, good quality sources of alternative protein for workers, providing employment for local community members, etc...); and enforcement (patrols, joint operations with MINFOF, supporting prosecutions etc...).

A suite of complementary *indicators* are established to measure progress towards meeting the objective and assess the efficacy of management actions. Implementation indicators such as verifying the establishment and maintenance of roadblocks confirm that actions have been taken as planned, while performance indicators link management performance to outcomes, e.g.:

| Indicator | Not achieved | Part achieved | Achieved | Means of verification |
|---|---------------------------|----------------|---------------|--|
| At least 4 cases of poaching of Class A species reported to the authorities and lead to a prosecution annually. | No cases reported | 1-3 cases | 4+ cases | Database records, reports and legal record |
| A 6% decrease from baseline in the number of commercial hunting signs, (relative to patrol effort) found during patrols year on year. | No reduction or increased | 1-5% reduction | 6%+ reduction | Database records and reports |

These management performance indicators are matched with biological indicators tracking population trends in the suite of ten Class 'A' protected species found within the concessions. Together these provide a quantitative measure of the levels of illegal activity and status of the target species linked to management performance in meeting the objective.

In essence the wildlife management plan is envisaged as forming the complete package for concession management, meeting conservation and sustainable development goals while also enabling the company to meet its obligations under FSC. Although still being established it is hoped to provide a working and cost-effective example that should become an industry standard approach.

Opportunities and challenges – lessons learned and a way forward

Aside from the WWP, there are few models for partnership between the conservation sector and the timber industry, particularly in the context of tropical forestry. The WWP model has existed since 2007 and continues to evolve and develop. In fact it could be argued that the project itself represents an example of adaptive management, learning from experience and shaping objectives and activities accordingly to better meet the wider goal. It is potentially illustrative to explore some of the lessons learnt from the experiences of the WWP to date in terms of their implications for engaging the timber sector in conservation.

Of prime importance to the success of the WWP model and the foundation for any successful enterprise is the strength of the relationship between partners. Closely linked to that are issues of trust and communication. The relationship between a conservation NGO and private sector partner can be difficult: partners typically come from different backgrounds, with different experiences and different goals. The WWP has maintained a good, effective working relationship with its timber company

partners throughout this period and endured, despite a challenging global financial climate. The course of these relationships has not always run smoothly, however, and on both sides communication failures have hindered progress. A key lesson would be of the need to ensure effective and ongoing channels of communication between relevant staff; progress reports, new challenges or problems, staff changes, evolving objectives and needs are all crucial to building trust and harnessing the benefits of the partnership for both parties to help meet their goals.

The focus the WWP has maintained on the timber company partnerships and resulting successes in building their technical capacity for effective wildlife management has meant that relationships with the wider community of forest stakeholders are not as well developed. To achieve the wider goal of having production forests play a strong role in conserving the Congo Basin forests requires all stakeholders to be actively engaged, particularly with regard to controlling illegal and unsustainable hunting. This group includes but is not limited to; the timber industry from individual companies to trade bodies, forest peoples, national administrations, certification bodies, auditors, policy makers in consumer countries as well as consumers themselves. This is of course challenging and another important lesson is that it is unrealistic to expect all aspects of a strategy for engagement to progress in parallel at the same time or be delivered by one organization with such a diverse array of stakeholders and needs. Exploring additional partnerships to complement existing skill sets and capacities is a way to help meet these challenges. A range of potential partners should be involved here, including development organizations, rights and governance groups, legal and policy specialists, consumer groups etc., who can all contribute to addressing, what is a multifaceted problem, relating to management of forest resources.

It is clear that for the WWP model, in common with many project-led initiatives, sustainability is a serious challenge and should be a key objective. It is beyond the capacity of ZSL to provide an ongoing intensive level of support to company partners in terms of human resources and funds in a replicable way that enables the model to be scaled up. Similarly, despite the project being fortunate in the support it has received to date, donors are unlikely to wish to provide ongoing financial support to maintain the same suite of activities. Nor from the perspective of the WWP would this level of engagement be desirable. The model is envisaged as building the capacity of stakeholders such that they have the ability to take ownership and responsibility for improved wildlife management. At the same time the conservation NGO disengages and provides a role more consistent with technical oversight or higher-level support, probably in a more financially sustainable, consultative role. It should be noted that this phase is only now being reached with existing company partners and it remains to be seen whether or not this provides the hoped-for sustained outcomes. At the same time the project is committed to support ways that make effective sustainable forest management economically as well as technically viable. This can range from building support amongst consumers for SFM products to exploring innovative financial mechanisms such as revenue from climate change mitigation activities under the REDD+ framework.

To date the WWP model successes are centred on building the technical capacity for effective wildlife management in production forests, by developing tools and passing on skills to partner companies. The next step is to scale up these successes and

create an enabling environment so that what is technically achievable can become the norm. This will progress alongside developing incentives and capacity for controlling illegal and unsustainable hunting – essential for conserving larger fauna. A bigger focus, therefore, will be on engaging wider stakeholder groups such as national governments, local communities and certification bodies and auditors, to better understand their needs and develop their ability and desire to insist on and monitor effective SFM practice as the industry standard to ensure that production forests contribute to broader sustainable development goals.

Conclusion

The pressures on tropical forest ecosystems are unlikely to diminish for the foreseeable future. Local and global demand for resources the forest can provide, and competition for the forest itself from agriculture, agro-forestry and mining are ongoing. At the same time, increasing recognition of the vital role that forests play in providing ecosystem services, on which all of us rely in some form, has the potential to act as a counterbalance. The key lies in getting the incentives right; for local people to harvest their forest resources sustainably, for forest managers to implement effectively sustainable practices, for land use planners to make decisions that favour conservation of forest ecosystems and for the global consumer to demand sustainably produced products.

At the present time, interest in the value of well-managed forest landscapes for carbon sequestration coupled with efforts in the developed world to combat illegal logging and timber trade, mean the potential for improvements in the global outlook for tropical forest conservation exists. At the same time rapidly increasing threats from agro-forestry and other agricultural commodities mean that we must seek to reinforce economic incentives for those forms of forestry management such as SFM that contribute to more sustainable conservation and development goals. The myth of the 'pristine' rainforest remains largely that: forested lands are increasingly under human influence to a greater or lesser extent. To meet this challenge we must embrace a landscape approach to tropical forest conservation. Primary forests associated with protected areas remain the cornerstone of these efforts but, to ensure the persistence of species and healthy ecosystems, biodiversity values must be maintained in the matrix production landscapes in which sustainably managed forestry operations can play a significant role. We need only look to Europe and North America to see examples of persistence and recovery of biodiversity in the face of deforestation and the value of modified forest landscapes. This is not to say that the widespread deforestation seen in many developed regions is a model we would wish to promote, merely to highlight that maintaining biodiversity values can be reconciled with development needs.

So, does timber production have a role to play in securing a future for the threatened great apes of Africa and Asia? This question could perhaps be turned around; can we secure a future for great apes without working with the timber industry? This paper clearly shows that in Central Africa at least, the future of the western gorilla and the central chimpanzee are intertwined with the management of production forests in the region. The experience of the WWP and other examples from the literature illustrate how, responsibly implemented, tropical forestry is compatible with achieving conservation goals for great apes and other wildlife. For this to happen a

number of things have to be in place; an enabling environment in terms of policies, tenure, rights reform and good governance, pressure from consumers and governments both locally and internationally in favour of genuinely legal and sustainable timber, a concerted effort amongst stakeholders to control illegal and unsustainable use of natural resources including wildlife, and the political and institutional will to ensure this is enforced as the norm. This may seem a forbidding list and it would be foolish not to acknowledge the magnitude of the challenge but, when we contrast the situation today with the context for tropical forestry 20 years ago, there are grounds for guarded optimism. Genuinely socially and environmentally sustainable forest management is achievable and, as a consequence, tropical production forests can be both an effective and necessary partner for conservation.

Acronyms

AAC – Annual Allowable Cut
ATIBT - Association Technique de Bois Tropicaux
CBD – Convention on Biological Diversity
CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora
COMIFAC - Central African Forest Commission
DFP – Permanent Forest Estate
DFNP – Non-Permanent Forest Estate
EU – European Union
FAO – Food and Agriculture Organisation (UN)
FCTV - Fondation Camerounaise de la Terre Vivante
FIP – Forest Investment Programme
FLEGT – Forest Law Enforcement Governance and Trade
FMP – Forest Management Plan
FMU – Forest Management Unit
FSC - Forest Stewardship Council
HCV – High Conservation Value
IFIA - Association Inter africaine des Industries Forestières
ITTO - International Tropical Timber Organization
IUCN - International Union for Conservation of Nature
LAGA – Last Great Ape Association
MINFOF – Ministry of Forestry and Wildlife (Cameroon)
MIST – Management Information SysTEM (decision support software for anti-poaching monitoring)
NGO – Non-Governmental Organisation
REDD – Reduced Emissions from Deforestation and Degradation
RIL – Reduced Impact Logging
SFID - Société Forestière et Industrielle de la Doumé
SFM – Sustainable Forest Management
SMART – Spatial Monitoring and Reporting Tool
UNEP - United nations environment programme
VPA – Voluntary Partnership Agreement

WRI – World Resources Institute
WWP – Wildlife Wood Project
WWF – World Wildlife Fund
ZSL – Zoological Society of London

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