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Management of High Conservation Value in Forest Management Units of Cameroon: Case of 1025 Forest Concession

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Abstract

The forests of South-Cameroon are known for the mass of products and services they offer directly (wood, non-timber forest products, etc.) or indirectly (climate regulation, cultural services, etc.) and appear to be among the most threatened in the Congo Basin. Fortunately, the management process for High Conservation Value (HCV) constitutes an alternative for the preservation of this biodiversity. The study was inspired by the ProForest guide and Brown's common directives to help optimize the integration of ecological and social values within the forest concession 1025. To do this, participatory mapping, focus groups and field observations were used to identify the high social values contained in the forest concession. Consultation of forest management plan, land use plan and inventory documents as well as field observations led to the identification of high ecological values. After evaluation of the potential threats on the attributes of high conservation values, management measures were proposed to improve and/or maintain the high conservation values identified. As results, the forest concession 1025 contains the six categories of high conservation values with a variety of attributes. Of the four categories of high ecological conservation values identified, only category 2 relative to the large intact forests of global/regional importance seems not to be unanimous because of the typology of the Congo Basin forests. On the other hand, the high values of social conservation, with few exceptions, are similar from one study to another. This similarity is related to almost homogeneous socio-cultural practices in the sub-region.

The potential threats are (1) the reduction of protected animals density, exploited of trees and endemic species due to road network favouring hunting and forest exploitation respectively ; (2) The degradation of actual temporal habitats due forest exploitation and other anthropic activities ; (3) Scarcity of NTFP due to forest exploitation activities (notable competitive species), and the over exploitation by different actors ; and (4) The distruction of important cultural sites of the communities through forest exploitation.

The management measures are linked to activities. The overlapping of incompatible activities in the massive forest offers an uncertain outcome to the implementation of the management process of forest with high conservation values. A revision of the land-use plan would be a primer to the ownership of the concept of forests at high conservation values in the Forest Management Unit (FMU) 1025.

Keywords: Cameroon, FMU, Forest Concession 1025, High Conservation Values Process, Participatory Mapping.

1. Introduction

Deforestation sweeps over 13 million hectares of forest annually and produces 25% global emissions of greenhouse gases with direct consequence of biodiversity loss and global warming (WWF[World wildlife funds], 2007). Local communities pay a high price for this deforestation; 1.6 billion people depend on forests to meet their basic needs (WWF, 2007). To better take into account the social and ecological values in the management plans, the Forest Stewardship

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Council (FSC) has developed the concept of Forest High Conservation Value (FHCV) through Principle 9 of its standard (Daïnou & al.,2016).

By definition, Forests of High Conservation Value are those revealing a crucial or exceptional importance thanks to the social and ecological values that they contain (Jennings & al., 2003a) The new FSC principle stipulates that: « Management activities in high conservation value forests shall maintain or enhance the attributes that characterize them. », (FSC, 2012). This principle has been broken down into four criteria:

- Assessment to determine the presence of the attributes consistent with High Conservation Value Forest will be completed, appropriate to scale and intensity of forest management;

- Consultative portion of the certification process must place emphasis on the identified conservation attributes, and options for the maintenance thereof;

- The management plan shall include and implement specific measures that ensure the maintenance and/or enhancement of the applicable conservation attributes consistent with the precautionary approach. These measures shall be specifically included in the publicly available management plan summary;

- Annual monitoring shall conducted to assess the effectiveness of the measures employed to maintain or enhance the applicable conservation attributes.

The principle of precaution (FSC, 2015) must inspire or guide all decisions relative to forest of high conservation value. The ProForest (2003) generic toolbox recommends the organization of HCV into six distinct categories that can be locally adapted:

- **Category 1**: Zones containing significant concentrations of biological values at the global, regional and national level.

- **Category 2**: Vast intact forests of global, regional or national importance at the level of a landscape.

- **Category 3**: Forest zones containing or being in rare, threatened or endangered ecosystems.

- **Category 4**: Forest Regions providing basic natural services in critical situations.

- **Category 5**: Forest areas fundamentally necessary for the satisfaction of local communities' basic needs.

- **Category 6**: Forest areas fundamentally necessary for the traditional cultural identity.

The management process of HCV proceeds in three steps: identification; management and monitoring. To propose management strategies of an attribute of HCV, this attribute must first be identified. For the elaborated strategies being implemented, it is important to ensure their effectiveness through monitoring (Jennings et al., 2003b).

The third massive forest of Africa with an area of 19 500 000 ha, the tropical rainforests of southern Cameroon are described as part of the forests that, both, have the greatest biological and cultural diversity and most endangered than elsewhere in the Congo Basin (Topa & al., 2010). Indeed, the forests of Cameroon, at the extreme of the massive forest of Southeast Cameroon, are unfortunately under significant pressures: mining, illegal forest exploitation, demographic pressure and structural projects (Anonymous, 2002a). Insufficient management measures also add to the generic problematic in this massive forest of southern Cameroon during the implementation of the management plan. Production objectives are the advantages taken into account to the detriment of preservation of social and ecological values. In order to respond to this concern, this study was initiated to optimize management of the ecological and social values. In the framework of this study, we will limit ourselves to the identification and proposition of management measures.

1.1 Study Objectives

The general objective of this study is to propose a management strategy for high conservation values in order to optimize integration of social and ecological values within Forest Management Units 10 001, 10 002, 10 003 and 10 004.

Specifically, it includes:

- To identify high conservation values in the forest concession 1025;

- Map out identified attributes of high conservation values;

- Propose management measures for the high conservation values identified.

2. Materials and Methods

2.1 Study site

The forest concession 1025 and its 36 surrounding villages were chosen as the study site. This massive forest exploited by the Forestry Company of Cameroon (FCC) is located in the Eastern Region Cameroon — Central Africa — specifically in the operational technical unit (UTO) of South East (Figure 1). The forest concession 1025 is consisted of four contiguous FMU: 10 001, 10 002, 10 003 and 10 004, with a total area of 193 664 ha all subjected to the same management plan.
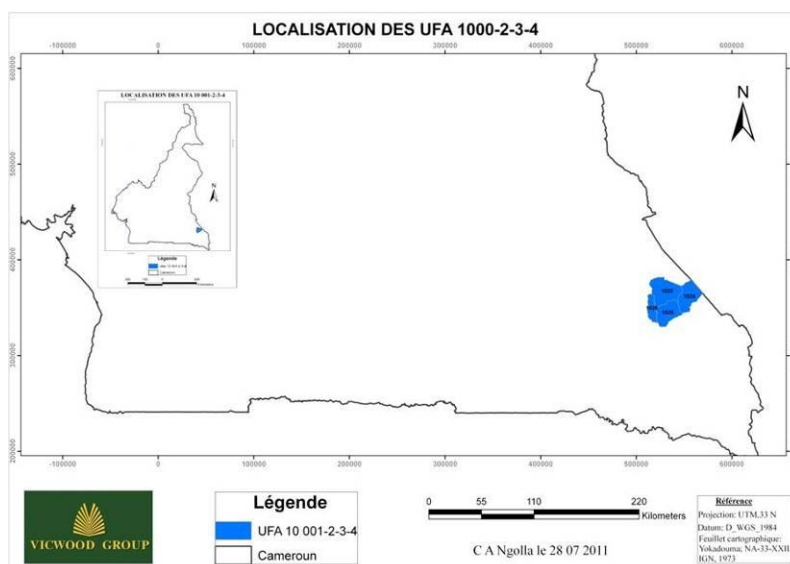

Figure 1. Location of the forest concession 1025 (source: field work)

Other materials used:

- Management plan (Anonymous, 2002a);

- An environmental impact study report (Anonymous, 2009b);

- A wildlife inventory report (Anonymous, 2008);

- Socio-economic study report (Anonymous, 2002b);

- Identification and FHCV management guides (Jennings & al. [2003a, 2003b, 2003c]);

- ArcView mapping software;

- Documents of national and international organizations (IUCN Red List, CITES Appendices, Southeast-Cameroon operational Technical unit, protected species lists, the 1994 Cameroon forestry, FSC standards, etc.).

2.2 Data collection method

The identification of high conservation values is performed following two approaches. The first approach is exclusively based on the exploitation of primary data used to identify high conservation values of a social nature and the second, based on secondary data, allow identification of high conservation values of ecological nature (Steward & Rayden, 2008).

- Social high conservation values

The tools used to identify social HCV were borrowed from the RRA (Rapid Rural Appraisal) [Wanders, 2008].

- Participatory mapping: In each of the 36 surrounding villages of the Forest Management Unit (FMU) 10 001, 10 002, 10 003 and 10 004, a participatory map (with a group of informants) was realized in order to circumscribe different activities zones of these populations;

- Focus groups: As recommended by Mbolo and Mimbimi (2009), open chats sessions enabled to gather information on the social and cultural aspects. The themes focused primarily on the potential attributes of the 5 and 6 HCV (vital resources from the forest, related worship and cultural values to the forest);

- Semi structural interviews: This tool helped refine the information from the focus groups especially on the themes on worship and cultural values that were addressed with extra care for various reasons;

- Field observations: The different points and attributes identified during the activities listed were geo-located.

- Ecological high conservation values

The documents of species categorization (IUCN Red List, CITES Appendices, Southeast-Cameroon TOU protected species lists, etc.) and the ProForest tool box served as the identification key for high ecological conservation values (Steward & Rayden, 2008). On the basis of internal reports and studies relating to the massive forest 1025, it was a question to highlight the presence of the attributes of high conservation values.

- The management inventory report and the study report on large and medium mammals permitted to evaluate the presence of rare and threatened biological values;

- Topographic funds allowed to assess the presence of watersheds;

- The land-use map of the massive forest and forest landscape repartition of the sub-region allowed to assess the presence of forests of particular interest.

2.3 Data processing

The data processing was necessary for the identification of social HCV. Indeed, the information contained in inquiry sheets, focus group reports were manually counted and stored in Excel sheets. A summary of data allow to identify social HCV present in 36 villages surrounding the forest concession For what concerns the geolocation of these HCV, thematic maps were developed. Indeed, it was possible to delimit the village land (hunting area, fishing area, NTFP collection zone, etc.) through ArcView mapping software by using:

- GPS coordinates identified during the ground phase;

- ING maps of the area;

- And finally the information in the participatory maps.

The identification and geolocation of ecological HCV did not need the phase of data processing because the study was limited to the use of secondary data (environmental impact study report, management plan, inventory of flora and fauna report, etc.)

In order to propose management measures for each attribute of high conservation values, the cause and effect links between threat and activity were established. Subsequently, measures intended to eliminate or mitigate threats were proposed in a strict compliance with the norms and forest management policies in force, nationally and internationally.

3. Results

3.1 Identification

HCV 1.1: Zones containing important concentrations of biological values at the global, regional and national level.

HCV 1.1: Presence of a protected area

The forest concession 1025 is overlapped by hunting zones (Figure 2). There are two types of hunting zones, hunting zone owned by communities (ZICGC) and hunting zone owned by State (ZIC):

- 02 hunting zones owned by State (ZIC 35, ZIC 36);

- 03 hunting zones owned by communities (ZICGC 04, ZICGC 05 and ZICGC 06).

Decree No 95/466 / PM / of 20 July 1995 laying down application modalities for implementing wildlife regime in Cameroon, article 3 paragraph 1, defines a hunting zone as « all protected area reserved for hunting ... ».
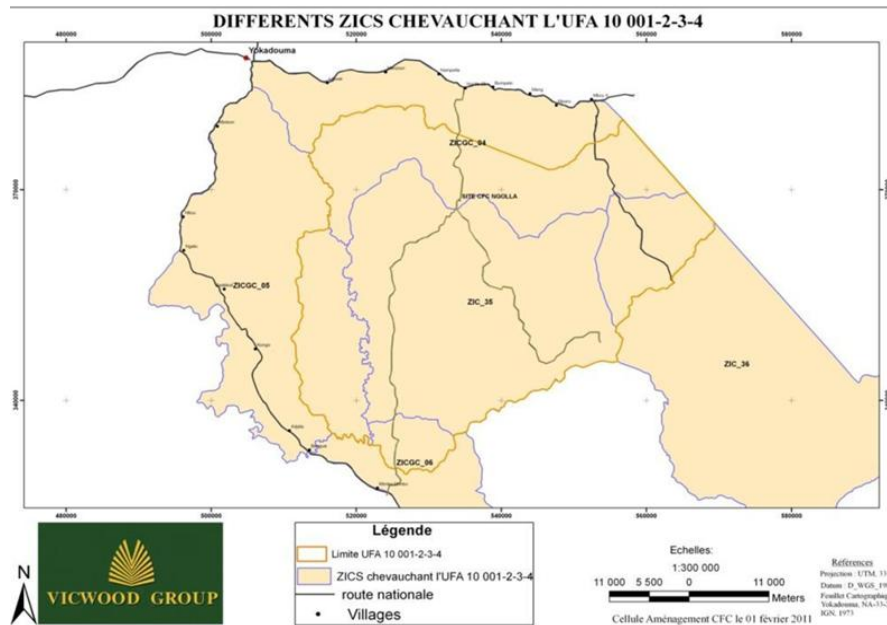
Figure 2: hunting zones overlapping the forest concession 1025 (source: field work)

In view of what precedes, the above hunting zones overlapping the FMU of the massive forest 1025 are considered as high conservation value of type 1.1 (protected area).

HCV 1.2: Threatened or endangered rare species

According to the IUCN (2015) evaluation criteria, on 21 species of large and medium mammals identified in the forest concession (Anonymous, 2008), 06 species are considered as threatened or endangered. These includes: bongo (Tragelaphus euryceros), elephant (Loxodonta africana), gray mangabey (Cercocebus albigena), gorilla (Gorilla gorilla), chimpanzees (Pan troglodytes), giant pangolin (Manis gigantea). Some plant species were also identified as threatened as the assamela (Pericopsis elata) in Annex II of CITES. In addition, out of 26 species assessed by the IUCN criteria, 25 were classified as threatened like: wenge (Millettia laurentii), big leaflets mahogany (Khaya grandifolia), ebony (Diospyros crassiflora), light worked (Guarea cedrata) and Sipo (Entandrophragma utile).

HCV 1.2 are present in the massive forest 1025.

HCV 1.3: Endemic species concentration at the sub-regional level

The list of endemic vascular plants of Cameroon (Onana, 2013) reveals that Mansonia altissima var. kamerunica is an endemic species to Cameroon. Unfortunately, the distinction of the varieties was not made during the management inventories.

In the absence of data excluding the presence of Mansonia altissima var. kamerunica in the massive forest, also associated with that, the lack of sufficient inventory data, the lack of inventory data, by precaution principle, the HCV 1.3 are considered as present in the massive forest 1025.

HCV 1.4 Seasonal species concentration zones

Swampy forests (protection standard) were formally identified and located in the massive forest during its micro-zoning. Seasonal migration corridors of some large mammals like elephants were identified by surrounding populations.

HCV 1.4 are present in the massive forest 1025

HCV 2: Vast intact forests of global, regional or national importance on a landscape scale.

It is certain that, the forest concession 1025 belongs to a vast forest area of global or more or less regional importance because, it is part of:

- The massive forest of South Cameroon (12% of the second largest forest in the world);

- The Sangha Tri-National (Cameroon, Central African Republic, Congo) which is among the 12 forest landscapes identified by the Congo Basin Forest Partnership (CBFP).

However, the human impacts of this milieu induce touchy changes likely to influence the distribution of biodiversity (Usongho & Nsooh, 2010). Fortunately, the diametric structure of marketable species represents a natural distribution (Figure 3).
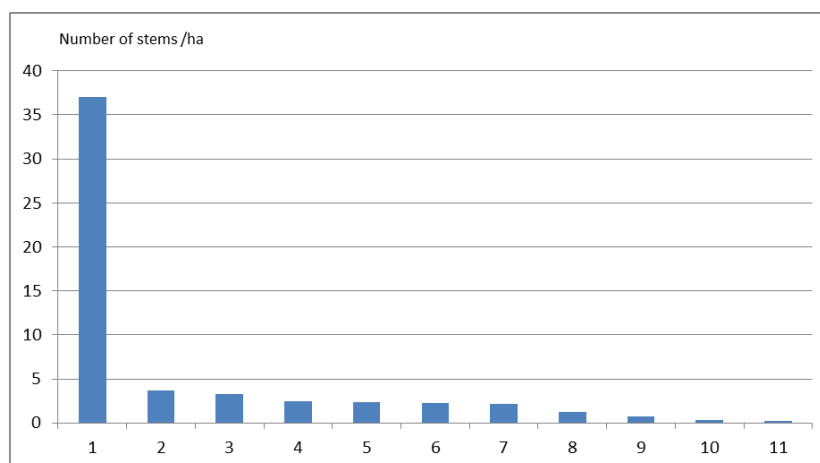

Figure 3. Distribution of the diametric structure of 63 species in the forest concession 1025

(Source: Anonymous, 2002a)

While waiting for studies allowing the assessment of total forest disturbance rates of the massive forest, by precaution principle, the HCV 2 is considered as present in the massive forest 1025.

HVC 3: Forest zones containing or found in rare, threatened or endangered ecosystems

The massive forest contains a series of protection essentially constituted of permanent swampy forests covering an area of 5406 ha or 2.79% of forest concession (Anonymous, 2002a). This low representation is comparable to an index of scarcity.
HCV 3 is present in the massive forest 1025.

HVC 4: Forest Regions providing basic natural services in critical situations

HVC 4.1 Hydrographic network

The forest concession presents a very dense river network dominated by Bangué that collects the waters from almost all the small rivers to deposit in the Boumba. The rivers originate in the rugged areas exposed to the phenomenon of erosion in case of destruction of vegetation cover. These rivers are exclusive sources of water supply and fish products in some villages.

HCV 4.1 is present in the massive forest 1025.

HCV 4.2 Watershed

The North, Northeast and East limits are bordered by a chain of hills which go up to 680 m (Figure 4). This part of the massive, origination point of some rivers, constitutes an erosion zone by an outstanding lack of vegetation cover. Such a scenario would have a serious impact on farming activities in surrounding villages, on the water quality and on the ecosystem of the zone.
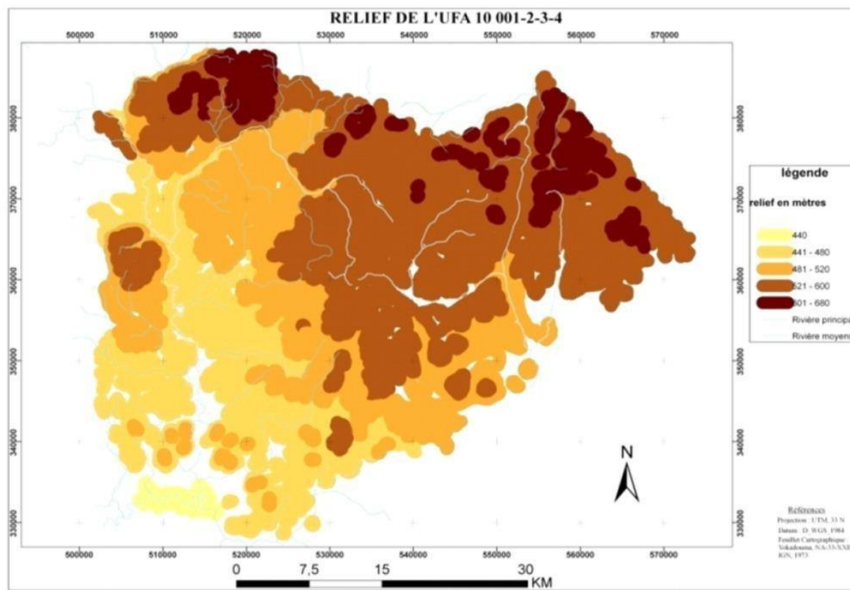
HCV 4.2 is present in the massive forest 1025.

Figure 4. Relief of the forest concession 1025 (source: field work)

HCV 4.3 Protection against air masses and bushfires

The humid dense tropical forests are not under threat from bushfires. On the contrary, the massive forest serves as a shield against violent air masses that could befall the surrounding villages.

HCV 4.3 is present in the massive forest 1025.

HVC 5. Forest areas fundamentally necessary for meeting the basic needs of local communities

The data collected in the field reveal that the surrounding population constituted of the BAKA and the BANTOU have an excellent economy dependent on the forest. Their principal activities include: agriculture, hunting, fishing, gathering, artisanal gold mining and crafts.

Almost all of the forest concession is constantly frequented by local residents in search of non-timber forest products (Figure 5). These products are sources of permanent income. Beyond the financial aspect, it is also essential as food products and for traditional medicines.

Figure 5. Two Non-Timber Forest Products (NTFPs) commonly consumed by the surrounding population of the forest concession 1025; a: almonds of Ndjansan (Ricinodendron heudelotii); b: caterpillars (source: field work)

At the conclusion of field investigations, a list of NTFP commonly collected by surrounding population was drafted (Table 1).

Table 1. Some NTFP collected in the forest concession 1025.

N°	Local name	Trade name	Scientific name	Parts used	Importance
	NTFP of plant origin				
1	Assom	Bubinga	Guibourtia sp.	Bark, tree	fetish, ritual site
2	Djilé	Ebony	Diospyros crassiflora	Bark	Healing
3	oguio'o	Moabi	Baillonella toxisperma	Fruit	(food)
4	Okack	Bossé	Guarea sp.	Bark	healing (manhood)
5	Oléré	Fraké	Terminalia superba	Bark	Healing
6	Ossié	sapelli	Entandrophragma cylindricum	Leave	Nests of caterpillars
7	Plêure	tali	Erythropleum ivorense	Leave	Nests of caterpillars
8	bo'oh	iroko	Milicia excels	Bark	Healing
9	Guiep	assamela	Pericopsis elata	Bark	Fetish
10	ogniock	Andok	Irvingia gabonensis	Fruit	Food
11	okwesse	Ayous	Triplochiton scleroxylon	Bark , leave	Healing, diet
12	--	emien	Alstonia boonei	Bark	Healing (malaria)
13	ka'ah	padouk rouge	Pterocarpus soyauxii	Bark	Rite (twin)
14	osack	Aningré	Aningeria sp.	Fruit	Diet
15	dipah	Ilomba	Pycnanthus angolensis	Bark	Healing
16	éteuh	Dabéma	Piptadeniastrum africanum	Bark	Healing
17	sa'ap	aiélé	Canarium schweinfurthii	Bark	Healing
18	ndjansan	Ezezang	Ricinodendron heudelotii	Fruit	Diet
19	bouola-boula	mukulungu	Autranella congolensis	Bark	Healing (antibiotic)
20	possa	sipo	Entandrophragma utile	Bark	Healing (hemorrhoid)
21	Lire	Bilinga	Nauclea diderrichii	Bark , fruit	Antibiotic
22	Kokoh	Okok	Gnetum africanum	Leave	Diet
	NTFPs of animal origin				
23	--	Escargot	Helix sp.	Chair	Diet
24	ko'ong	Chenille	Imbrasia sp.	Chair	Diet

The juxtaposition of participatory maps (Figure 6) helped rebuild the village land are consisted of farming, fishing,
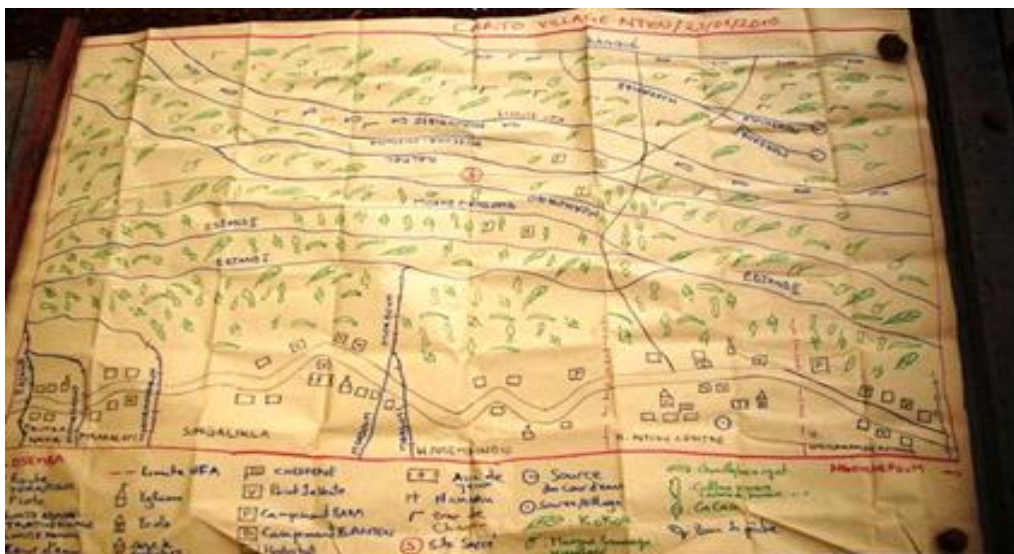

Figure 6. Participatory mapping of Ntiou village (source: field work).

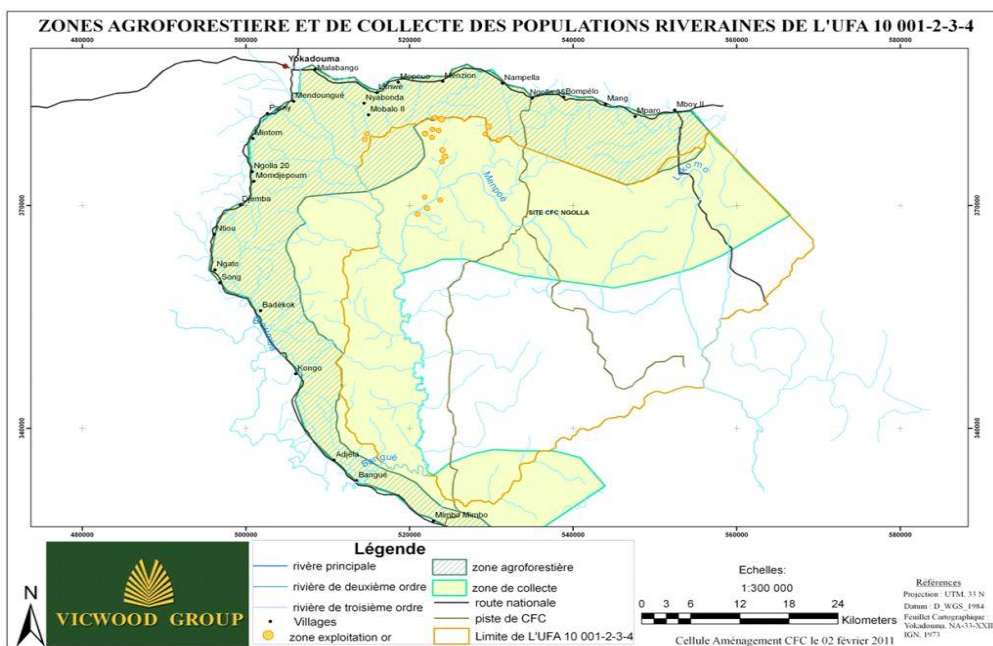Hunting, mining and collection zones (Figure 7).

Figure 7. Agroforestry and gathering zones of the surrounding population (source: field work)

The essential from craft activity comes down to making some domestic furniture and kitchen utensils with the use of forest products (china bamboo, raffia and rattan). House construction is entirely dependent on materials from the forest (Figure 8).

Figure 8. Koter: Baka village located within the forest concession and constructed with the use of plant materials (Source: fieldwork)

Agriculture is the primary source of income of the Forest Company of Cameroon (FCC) surrounding villages despite the weak involvement of the BAKA in this activity. The spatial occupation of farming activities extends from villages to the forest concession limits. However, it is common to identify farming enclaves within the forest concession - areas exclusively devoted for the production of timber (Figure 9). These enclaves are in the many cases of the old plantations that were incorporated in the permanent forest domain following the classification procedure (Decree No. 96/076 / PM of March 1, 1996 carrying allocation of a forest concession to the company "Forest Company of Cameroon").

Figure 9. Delimitation marks of the forest concession 1025 (in red) inside a cocoa field

(source: field work)

HCV 5 are present in the massive forest 1025.

HCV 6. Forest areas basically necessary for traditional cultural identity

The local and indigenous communities by their customs are trying sometimes and somehow to conduct cultural rites despite the penetration of Western religions. Numerous rituals are practiced in the forest area, one that is built to provide care and other to prepare hunting and fishing campaigns (Table 2). Moreover, the forest milieu is excellent living environment of the indigenous Baka populations.

Table 2. Summary of cultural values in and around the forest concession.

Cultural identifier	Localization	Ethnic group	Village
Assom	Outside FMU	Kounabembe, Mbimo-bidjouki	Ngatto nouveau ; Mboy II ; Biwala.
Zanga	Outside FMU	Kounabembe	Mimbo-mimbo
Odji	Outside FMU	Mvong-mvong	Mendougue
Boma	Within FMU	Baka	Mboy et Limoé
Béka	Within FMU	Baka	Mboy et Limoé
sendo'o	Within FMU	Baka	Mboy et Limoé
Tombe	Within FMU	Mvong-mvong	Parny
Big baka camp	Within FMU	Baka	Limoé (Koter) et Mboy II (Ampaya)

HCV 6 is present in the massive forest 1025.

3.2 Management of high conservation values attributes

According to principle 9 of FSC, management activities in high conservation values forests must maintain and enhance the attributes that characterized them (Anonymous, 2009a). In other words, the proposed management measures must ensure the amelioration of high conservation values attributes or at least ensure their maintenance. Once again, the precautionary principle must guide all decisions relative to forests of high conservation values (Jennings et al., 2003a). To propose adequate management measures, it is essential to determine the potential threats on the attributes of high conservation values and define objectives in order to preserve the HCV (Daïnou & al., 2016).

The threats that can affect the attributes of high conservation values are related to activities within the massive forest. The forest concession 1025 is a space where activities, other than forest exploitation, occur. These include mining exploitation, sport hunting, subsistence hunting, gathering, fishing and crafts. The viability of these activities influences a set of practices that could threaten the attributes of high conservation values identified. In all of these activities, only the open pit mining is incompatible with sustainable forest management. It makes use of techniques (clear cutting and excavation) irreversibly affecting the ecosystem of the milieu (total destruction of vegetation cover). In the framework of developing its resources, the Cameroonian government has issued two industrial mining permits (Mempoé and Mobilong) representing 51% of the same space allocated to the forest concession 1025 (Figure 10).

The potential threats are (1) the reduction of protected animals density, exploited of trees and endemic species due to road network favouring hunting and forest exploitation respectively(HVC 1.2 et 1.3) ;

(2) The degradation of actual temporal habitats due forest exploitation and other anthropic activities (HVC 1.4) ;

(3) Scarcity of NTFP due to forest exploitation activities (notable competitive species), and the over exploitation by different actors; (HVC 5) ;

And (4) the distruction of important cultural sites of the communities through forest exploitation (HVC 6).

For each identified threat are corresponding management measures to improve or maintain the identified high conservation value attribute (Table 3). In the framework of the implementation of the forest concession 1025 management plan, the Forest Company of Cameroon (FCC) has adopted management measures. These measures constitute a partial solution that should be taken into account.
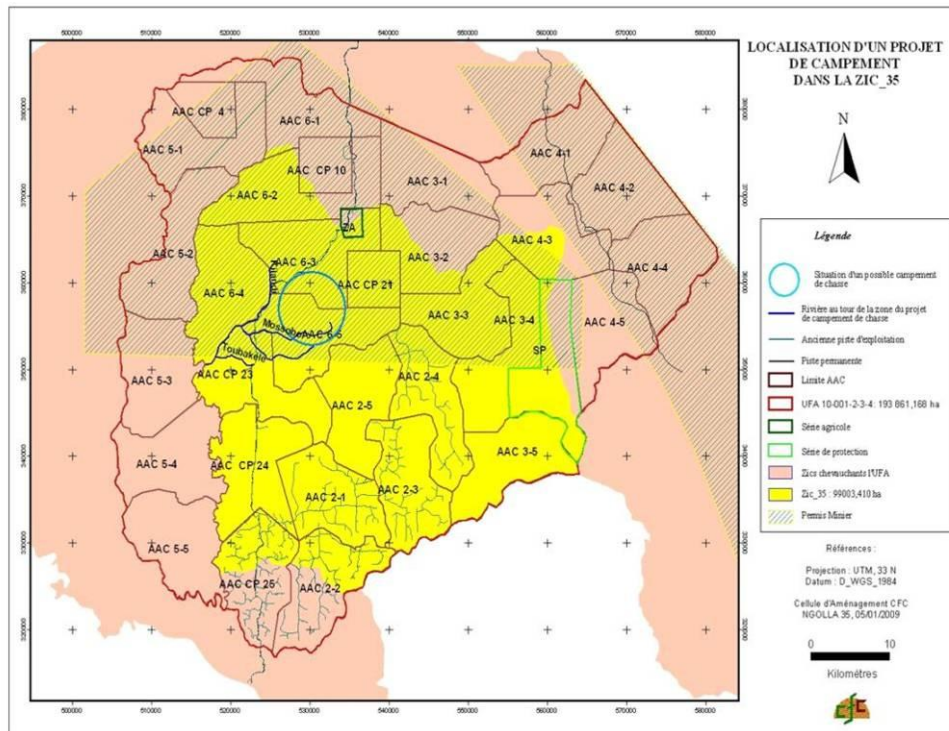
Figure 10. Location of mining permits in the forest concession 1025 (source: management unit, FCC)

Table 3. Analytical Grid of HCV identified in the forest concession 1025.

	Identification of HCV		Management of HCV	
	Description of the value/Attribute	Result	Threats	Management Measures
1	Zones containing significant concentrations of biological values at global, regional and national level			
1-1	Protected areas/ZIC 35; ZIC 36; ZICGC 04; ZICGC 05; ZICGC 06.	Present	Agriculture (encroachment, land clearing)	- Refreshing and monitoring of limits of FMU; - Establishment of a surveillance team of unauthorized activities
			Poaching (destruction of wildlife potential)	- Intensify the fight against poaching; - Proposal of alternative sources of protein, - Opening of stewardship; - sensitization on endangered, rare species;
1-2	Threatened species: Animal (elephant, gorilla, chimpanzee, giant pangolin) Flora (ebony; wenge; assamela…)	Present	Collection of NTFP (intensity of taking away) ;	Limit the take away in zones of wildlife concentration
			Illegal logging (felling of rare and threatened species).	Involvement of peasant-forest commitees (PFC) in the fight against illegal logging.
1-3	Sub-regional endemic species Flora (Millettia laurentii, Mansonia altissima,).	present	Logging (nuisance sound, forest fragmentation, habitat destruction)	Logging at reduced impact;

	Fauna (elephant African bufallo)			
1-4	Seasonal concentration zone of wildlife/swampy forest species : series of protection		NTFP collection (intensity of take away)	- Favor local recruitment - Support with micro-project, - Limit take away in wildlife concentration zones
		Present	Poaching (destruction of wildlife potential)	- Proposal for alternative sources of protein; - Opening of stewardship ; - Intensify the fight against poaching; - Favor local recruitment.
2	Vast intact forest of global, regional and national importance at a landscape scale			
	Massive forest 1025	Present	Collection of PFNL (intensity of take away)	- Favor local recruitment, - Support with micro-projects, - Limit take away in wildlife concentration zones.
			Poaching (destruction of wildlife potential)	- intensify the fight against poaching - Proposal of alternative sources of protein; - Opening of stewardship.
			Logging (forest fragmentation)	Logging at reduced impact;
			Agriculture (encroachment , land clearing) ;	- Refreshing and monitoring of limits of FMUs ; - Establishment of a surveillance team of unauthorized activities.
			Illegal logging (felling of rare and threatened species).	Involvement of peasant-forest committees (PFC) in the fight against illegal logging.
			Forest fragmentation related to its overexploitation (superposition of activities).	- Contribute to the update of the land use plan data of the Sangha Tri-national; - Creation of a dialogue platform of different actors.
3	Forest zones containing or found in rare, threatened or endangered ecosystems			
	Rare/swampy forest ecosystem: series of protection	Present	Cf. 1.4	Cf.1.4
4	Forest regions providing natural basic services in critical situation			
4-1	Protection of water network/drainage network of the 1025	Present	- Road network, crossing work (silting) ; pollution (oil spills and pesticide) ; felling (obstruction of river course) Soil excavation (deviation of river course).	Strengthen the implemention of forest-based intervention standard (NIMF).

4-2	Watershed protection/North side and North east watershed of the 1025	Present	Road network; water drainage, felling; clearing; soil excavation.	Strengthen the implementation of forest-based intervention standard (NIMF).
4-3	Protection against air masses and bushfire /massive forest	Present	Felling;	- Forest logging at reduced impact
			Agriculture: encroachment; clearing.	- Refreshing and surveillance of the limits of FMUs;
				- Establishment of a surveillance team of unauthorized activities.

5	Forest areas fundamentally necessary for meeting the basic needs of the local communities			
	Food ; care; habitat/ gathering zone, hunting, fishing, culture	Present	- Agriculture (encroachment , clearing; use of pesticides ; farming technic);	- Support initiatives for the improvement of farming technics.
				- Refreshing and surveillance the limits of FMUs;
				- Establishment of a surveillance team of unauthorized activities
			Poaching (destruction of wildlife potential)	- intensify the fight against poaching – Proposal of alternative sources of protein;
				- Opening of stewardship.
			- Collection of NTFPs (intensity and take away technic) ;	- Implementation of a protocol for the protection and regeneration of NTFP tree providers;
			- Forest logging: felling and skidding noise et sound unloading harmful effects ; road network (destruction of crops);	- Consultation of local residents in the planning of forest roads;
			pollution (oil spills and pesticide) ; felling (obstruction of river course) Abandonment of works (culvert and tube) poor water drainage;	- Strengthen the implementation of forest-based intervention standard (NIMF).
			- Fishing: intensity and take away technic;	- Popularization of low-impact harvesting technics;

6	Forest areas fundamentally necessary for the traditional and cultural diversity			
	Traditional cultural identity /ritual site (odji, djengui, zanga; assom), bantou tomb and Baka camp	Present	- Forest logging: forest roads, harmful sound effect, intrusion, expropriation	- Avoid as much any form of intrusion;
				- Harmonize the calendar of cultural activities to the exploitation activities;
				- Identify and secure areas of particular interest for the BAKA around the camp;
				- Incorporate cultural sites in the concession exploitation maps;

4. Discussion

The process of implementation of FSC Principle 9 related to HCV used on this study is in accordance with Daïnou & al. (2016) who insist on the capital role of participatory management and precautionary principle when studying HCV.

Thus, category 1 of high conservation values that is equivalent to zones containing high concentrations of biological values at the global, regional and national level is one of the categories with the largest number of attributes. As Brown & al. (2013) argue in the common directives on high conservation values, the presence of one of these four attributes namely: protected areas, the concentration of threatened species, endemic species and zones of seasonal concentration, is enough to accept and integrate this concession section to a forest of high conservation values.

The interest hunting zones (ZIC), though not matching the profile of classic protected areas like national parks, game reserves, sanctuaries for conservation objectives, are all the same considered by the 1994 forestry law as protected areas and should rightly benefit from the status being conferred (Jennings & al., 2003). However, the results of the HCV identification in FMU 10 009 attributed to SEFAC do not mention any protected area relative to hunting zones and yet this FMU is within the space allocated to the ZIC 29.

The presence of threatened or endangered species is subjected to no contestation. The IUCN lists, MINFOF list and CITES index allow to identify some threatened plant and animal species of the forest concession 1025. These species are present on the results of Daïnou & al.(2016) study. The real difficulty is to quantitatively establish that these species are present in the forest concession. According to Steward and Rayden (2008) in « A National Interpretation of Forests of High Conservation Value for Gabon », the presence of emblematic species like gorilla, chimpanzee and forest elephant can be considered as Indicators of this type of attribute. In addition, Brown & al. (2013) in the common directives of high conservation values stipulate that the presence of a single species critically endangered to extinction in a forest is enough to consider the forest as containing a concentration of threatened species. It is indeed the case of gorilla in the forest concession 1025. The insufficient inventory data do not allow to locate areas of abundance of threatened flora.

It is certain that a more thorough assessment of the biodiversity in these FMU shall reveal an impressive endemism in view of biodiversity as the Cameroonian forests abound (Onana, 2013). The sub-regional endemism is the only type that was identified in the concession 1025. This concession contains animals (Loxodonta africana cyclotis and Syncerus caffer) that exclusively belong to the Central African sub-region. To take this type of endemism into account, Rayden and Steward (2008) revealed in the national interpretation of high conservation values in Gabon that: "the center of abundance of identified endemic species must be located in a country where study has been conducted on high conservation values". Furthermore, the Gabonese interpretation of high conservation values considered rare ecosystems as an indicator of this type of attribute. This is the case of swampy forests of the forest concession 1025.

Category 2 refers to the vast intact forests of global, regional or national importance at the landscape scale harboring a management unit or being part. These forests must contain viable populations of several, even all natural species and that, according to a distribution model and natural abundance. This milieu must be intact in other words, less marked by human activities. The present study and that carried out at FMU in East regions of Cameroon by Daïnou & al. (2016), although using different arguments nevertheless approve the existence of the Category 2 of high conservation values in their respective study zones. On the other hand, Ndenga (2008), argues that a forest zone dedicated to forest exploitation cannot be considered as being intact. Furthermore, the Gabonese interpretation of HCV (Steward and Rayden, 2008) equates Category 2 of high conservation values to a concept which is particularly suitable for regions where the forests are highly fragmented. In these regions, there are only a few isolated forest blocks of very great extent, which therefore are of great importance at the national level. This category does not seem to achieve the unanimity.

Forest zones containing or found in rare, threatened or endangered ecosystems correspond to the category 3 of high conservation values. Jennings (2003) in the global toolkit of high conservation values recommends that the size of these forests is of the order of tens of thousands of hectares. However, they also emphasize that considerations related to the size depend on the context. This is effectively the case of swampy forest which, according to OFAC (Anonymous, 2009c), represents less than 03% of the total area of the Central African dense forest. Gabon's interpretation of forests of high conservation values (Steward and Rayden, 2008) and interpretation of forests of high conservation values at the level of community forests in Cameroon (Mbolo and Mimbimi, 2009) also consider these forests as rare and threatened ecosystems. In the forest concession 1025, the 5406 hectares of permanently flooded swampy forests can thus be considered a high conservation value of category 3.

Category 4 of high conservation values refers to forest areas that provide natural basic services in critical situations. The identification of high conservation values in the FMU 00 004 conducted by Wanders (2007) reveals that several villages around the FMU depend on water coming directly or indirectly from the FMU. The same results were obtained by Ndenga (2008) during the identification process of high conservation values in the FMU 10 009 of the Forest and Agricultural Exploitation Company of Cameroon (SEFAC). The results obtained for the category 4 of high conservation values in the forest concession 1025 are consistent with those of the FMU 00 004 and 10 009.

The forest concession is an area fundamentally necessary to satisfy the basic needs of local communities (Semereab & al., 2010). Indeed, this forest meet the needs of most if not all of the surrounding populations like food, healing and other needs (artisanal gold mining, crafts). Furthermore, investigations made by Ndenga (2008) in the different surrounding villages of the FMU 10 009 clearly show that these population depend on forests for their subsistence. The same results were obtained by Wanders (2007) and Djeuteu (2009) during the work on forests of high conservation values respectively at Transformation Reef Cameroon (TRC) and Pallisco. Agroforestry zones are under severe pressure due to the progression of farming activities truly regarded as the economic engine of this locality. Some residents are threatened with expropriation following a delineation of FMU, who did not follow the normal process and therefore would have incorporated their plantations in the private domain of the State. It is therefore for the State to find a compromise with the owners of these farms. On behalf of the principle of precaution underlying this study, it would be prudent for FCC to delineate and secure these agroforestry disputed enclaves.

Forest areas fundamentally necessary for the cultural and traditional identity were also identified in the forest concession. These are the bantou tombs and baka «settlements ». Unlike the results obtained by Ndenga (2008) and Djeuteu (2009) not making mention of any pygmy camp, baka « camps» with paces of bantou villages identified and considered as cultural values. Indeed, these human occupation called « settlements » by nostalgia are actually baka villages whose creation dates back to forty years.

The results obtained by this study are the proof of the importance of identification of HCV in order to be well managed and are similar with Meijaard & Sheil, (2013) in " how to protect what it cannot identify".

5. Conclusion

The objective of this research was to propose a management mode of forest of high conservation values in order for them to be included in the management plan of FMU managed by the Forest Company of Cameroon. Specifically, it was necessary to identify high conservation values, draw up their maps and finally propose management measures in order to maintain or improve them. The forest concession 1025 contains together six categories of high conservation values with a variety of attributes, although Category 2 is not being unanimous. The high social conservation values, with few exceptions, are similar from one study to another. This similarity is related to almost homogeneous socio-cultural practices in the sub-region. The absence of a national interpretation of high conservation values is not likely to facilitate the identification of high ecological values. The management proposals suggested in this work could be taken into account during the revision of the management plan to better respond to ecological and social concerns of the forestry concession. However, the overlapping of incompatible activities in the massive forest offers an uncertain outcome to the implementation of the management process of high conservation values which requires a revision of the land use plan.

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