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ECONOMIC EVALUATION OF CAMPO MA'AN NATIONAL PARK, SOUTHERN CAMEROON: AN ESTIMATE OF THE EXPECTED BENEFITS FROM THE CONSERVATION OR EXPLOITATION OF NATURAL FOREST RESOURCES

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ABSTRACT: *How is it that, despite its rich and unique biodiversity, Campo Ma'an National Park contributes so little to economic development and its integrity is so severely threatened by poaching, encroachment, and land grabbing? This situation has led to a debate over whether to maintain the park's current status or convert it. Cost-benefit analysis (CBA) provides a theoretical basis and relevant and objective comparison tools for choosing between the options of exploitation and conservation of natural resources, through the calculation of total economic value (TEV). TEV represents the diversity of economic benefits that a conserved natural asset can provide to the human community. The annual TEV (TEVa) of the park for the conservation scenario was estimated at USD 77,712,710, while the TEVa of the park favorable to exploitation was calculated at USD 77,105,472. The relative advantage of TEW for conservation over exploitation can be explained by the low contribution of tourism to the local and regional economy, the low financial contribution to conservation, and the conflictual relationships between stakeholders. The study revealed that local communities (97%) are more interested in the park for its economic benefits and show less interest in conservation, believing that their activities pose less of a threat to the environment than those of other stakeholders. Furthermore, 93.37% of the people surveyed are in favor of converting the park for development, provided that only social or community projects are implemented, such as the creation of a communal forest, the construction of a dam, a port, a road, etc.*

KEYWORDS: Economic evaluation of forest natural resources, cost-benefit analysis, total economic value, Campo Ma'an National Park, stakeholders, development, exploitation, conservation.

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INTRODUCTION

Specific Context

Located in southern Cameroon, the Campo Ma'an area has benefited for more than six decades from various forms of attention from both the public authorities and the international community for the implementation of strategies contributing to the conservation of its rich biodiversity. This attention began with the creation of the Campo Wildlife Reserve in 1932 and continued with the establishment of the Campo-Ma'an Operational Technical Unit (UTO) in 1999.

The results of archaeological surveys conducted in the park and its surroundings demonstrate a strong potential for learning about ancient populations and their impact on plant formations (Osisly, 2001). In addition, Tchouto (2004) has catalogued 1,500 plant species, including 114 endemic species, and more than 80 species of large and medium-sized mammals, 23 of which are threatened with extinction. More than 300 species of birds have been recorded, 24 of which are classified as rare or endangered. Similarly, more than 249 species of fish have been identified, four of which are endemic (Tchouto, 2004; Ngandjui et al, 2001).

In a country such as Cameroon, political science research has established the pre-eminence of neo-patrimonial governance, which continually blurs the boundary between the public and private spheres (Nguiffo, 2001; Karsenty et al., 2010; Bigombe Logo, 2004). Furthermore, the establishment of protected areas (PAs) corresponds to subcontracting regimes whereby NGOs flock to an area that was previously isolated because it is now classified as a PA. Finally, at the local level, at least two actors should be distinguished, namely businesses and populations. Multinationals/companies are often entrusted with ‘enclaves’ within PAs and enjoy special protections and privileges.

As for local communities, the stated objective of international actors and states is generally to contribute to their well-being. In practice, however, this objective is very often ignored or poorly implemented (Zaland, 2004). This should not lead us to believe that the communities living in the PA are completely passive. Due to a lack of opportunities, some communities engage in intensive exploitation of fauna and flora, which alters biodiversity. The authorities are struggling to offer alternatives to these phenomena (Gemenne, 2011).

The existence of a common border with Equatorial Guinea, which is difficult to control, poses problems. The island of Dipikar suffers from intensive poaching by nationals of this neighboring country, who are able to operate there undisturbed due to the difficulty of access from Cameroon. These access difficulties are paralyzing agricultural development and creating a feeling among the population that they have been abandoned by the public authorities. (Development plan for Campo Ma'an National Park and its peripheral zone, 2006-2010:45). The permanent presence of military personnel, who have set up three outposts inside the park to protect the border, could affect the park's resources, as they are sometimes involved in poaching. Conflicts arise from the overlap between the park's boundaries and those of the agro-industrial concessions of the Cameroonian palm oil company,”SOCAPALM” HEVEA of Cameroon “HEVECAM” and forest management unit (UFA) 09-025. In some cases, village lands extend into the park. This is the case at the north-eastern boundary, as in the villages of Messama and Minkan Mengalé, where the lands are reduced by the presence of UFA 09-021, which is sandwiched between the park and the villages. Furthermore, the boundaries of the

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Campo Ma'an National Park (CMNP) are not marked and remain unknown to the local population. A solution must therefore be found to reconcile the need to ensure the integrity of the park with the development of socio-economic activities on its periphery.

The underlying intention of using economic assessment is therefore to protect tropical forests by demonstrating to governments and international agencies that forests have significant monetary value when they are conserved and used sustainably (Pearce, 1990 & Barbier, 1991).

The purpose and authorized uses of the CMNP are aimed at conserving biodiversity and protecting ecological functions. Only ecotourism and scientific activities are therefore authorized, with a minor possibility of exercising certain customary rights. All of these activities together constitute a specific management scenario for this area, known as the 'scenario with Park'. The creation of the park prevents the implementation of a number of activities that would otherwise have taken place, such as logging, farming, mining,and harvesting by local populations. These alternative uses of the park area constitute a second management scenario, the 'scenario without Park'. The purpose of this double estimation is to determine whether the expected benefits of the PNCM (i.e., the total economic value (TEV) of the scenario with park) are significantly higher than those that would have resulted from standard use of this forest area (i.e. the TEV of the scenario without a park). What level of stakeholder engagement is expected in order to maintain the current conservation status at the expense of development?

Issues

Research Questions

To what extent does the PNCM actually constitute a source of well-being at the local, national, and international levels? In other words, how does the calculation of the TEV enable stakeholders to choose between maintaining the current conservation status of the park or allocating it for exploitation and development?

Hypothesis

The TEV of the scenario with the park (the expected benefits of conservation) is higher than the TEV of the scenario without the park (the expected benefits of development or exploitation).

Objectives

Overall

Analyze the TEV of Campo Ma'an National Park.

Specifically

1. Determine the current and potential natural resources of the PNCM for conservation or development.
2. Determine the economic value of PNCM according to the conservation and development options.

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3. Analyze stakeholders' representations for the conservation of PNCM.

METHODOLOGICAL APPROACH

Conceptual and Theoretical Framework

To the extent that impacts on the natural environment can be assessed, cost-benefit analysis can prevent investments that would reduce social welfare by damaging the environment. The main methods used to operationalize the cost-benefit approach in relation to the valuation of natural assets are the stated preference method and the observed preference method.

Basis and Operating Logic of Cost-Benefit Analysis (CBA)

This method derives directly from the principles of welfare economics. Indeed, welfare economics maximizes the social welfare function calculated from the sum of individual utilities in order to answer the question, 'among several possible economic situations - each situation being characterized by the way in which resources and income are distributed - which is the best?' (Varian, 1997).

The CBA method estimates in monetary terms the net benefits (i.e., total benefits minus total costs) generated by any resource use project. Optimal resource allocation is achieved when CBA allows the selection of projects/programs that offer the maximum net benefits (Ray, 1989; Dixon et al., 1994).

In other words, to what extent do the benefits of ecosystem preservation outweigh the opportunity costs plus the costs that preservation imposes on the community? It should be understood here that the concept of preservation excludes any form of resource use that would lead to its irreversible degradation (Dixon et al., 1990).

Economic Assessment Method Applied to Calculating the Economic Value of Flagship Resources

Calculating the total economic value of a park is a major undertaking. First, all the ecosystem goods and services provided by the park must be listed and assessed in order to assign them a monetary value.

The total economic value is very often estimated using either the stated preference method, which employs tools such as contingent valuation through willingness to pay or pair comparison, or using the revealed or observed preference method, which includes productivity effects, monetization at market prices, restoration and replacement costs, and hedonic prices. The economics of the different valuation methods used in this study are summarized in the table below:

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Table 1: Economic Evaluation Method Used in this Study

Services Categories	CMNP Example	Selected Valuation Methods	Observations
Supply or procurement services			
Collection of Non-Timber Forest Products (NTFP)	Irvingia gabonensis kernels… Caterpillar collection…	Monetization at the market (local) price	Opportunity cost (estimating its market value): How much would it cost a household head to buy their food? (Economic surplus or gross margin calculation)
Products from artisanal fishing	Fresh Fish	Monetization at the market (local) price	Opportunity cost (Economic surplus)
Agricultural Products	Cocoa, food crops	Monetization at local market price	consumer surplus or cost price
Collection of Fire Wood		Monetization at local market price	Its commercialization does not contribute to conservation and therefore has no value.
Collection of medicinal plants		Monetization at local market price	Marginal activity for households (its marketing in local markets is negligible)
Beekeeping	Honey production	Monetization at local market price, Productivity Effects (Economic Surplus)	Marginal activity found mainly in a few Bagyeli Pygmy households. However, its commercialization in local markets is negligible)
Regulation services			
The forest "the flora"	Carbon sequestration in the forest	Based on substitution or replacement costs	Opportunity cost (In addition to regulatory functions, estimate of its value if established as a UFA)
Biodiversity maintenance	Buffalo caves, Ntem Rapids, Avifauna observation site, Elephant, buffalo, and great ape clearings, Saltlicks, Tree Museum	Based on the cost of damage avoided (restoration cost) either Contingent valuation	Taking into account additional flows either Consent to pay or receive

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Cultural services			
Ecotourism	Ntem Rapids Archaeological and historical sites interesting for the practice of certain rites, Buffalo caves, Ntem Rapids, Avifauna observation site, Elephant, buffalo, and great ape clearings, Saltlicks, Picathartes caves, Tree Museum	Transportation costs	It only takes into account the development of related activities linked to ecotourism. But it only considers expenses incurred by the tourist (transportation, food, accommodation, park entrance fees, hiring a guide).

As part of this study, and as illustrated in Table 1, three types of services were used, and the main approaches and tools recommended are detailed as follows:

Supply Service

The objective is to assess the contribution of non-timber forest products, agriculture, and fishing to the household economy. The approach used is that of consumer surplus or cost price.

Consumer surplus is the difference between the market price of a good produced and the cost of producing that good. To calculate consumer surplus, the following data are required: the number of households engaged in the activity, total annual production, share of that production consumed by the producers themselves, cost of production, and selling price of the product. Once this data has been obtained, the calculation is as follows:

- Annual production / number of households = production per household

- Annual production per household – share consumed by the household = actual share sold

- Actual share sold * selling price = gain per household

- Gain per household – production cost = actual gain per household

Actual gain per household * total number of households = surplus of producer households

Regulation Services: Estimating the Value of the Forest

Operationally, two principles are possible for estimating the value of the forest: the capacity-based principle and the content-based principle (volume). The content-based principle answers the implicit question: what would the PNCM forest have yielded if it had been allocated to logging? This relates to a consumptive use value.

The second method follows the capacity-based principle. It uses a recursive reasoning process. Recursive reasoning proceeds by analogy with public auction, as the Ministry does for the sale of UFAs (Forest Management Units). Based on the area, the annual forestry fee is assessed.

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The annual forestry fee is equal to the area multiplied by the surplus price of the additional supply.

Cultural Services: Calculating the Value of Ecotourism

The value of ecotourism was estimated using the transport cost method. The estimated transport costs are the sum of all the expenses necessary to visit the study site. This value represents an opportunity cost for exploitation and an added value for conservation. The expected benefits of tourism operations at Campo Ma'an were assessed by multiplying the average number of visits per year by the average expenditure that a domestic and international tourist is willing to pay to visit the park. In the context of the PNCM, this includes park entrance fees, food, and accommodation and transport costs.

Selection of Respondents: Reasoned Choice Sampling Method

Reasoned choice sampling refers to various techniques that consist of constructing a sample that resembles the population under study as closely as possible, based on a priori information about that population. Several techniques can be identified at this level. For the purposes of this thesis, we have focused on the standard unit method and the 'hot' survey method.

The Standard Unit Method

This method involves defining control variables that are used to determine an 'average' individual, known as a standard unit. Only individuals who are close to the standard unit are then surveyed. This method was recommended for selecting respondents for participatory surveys.

The 'Hot' Survey Method

These surveys are conducted in specific locations, following the occurrence of an event, to gather opinions on the spot or 'hot.'These surveys are aimed solely at volunteers who are affected by an event. This method was recommended for selecting respondents for the tourism contribution.

ANALYSIS AND INTERPRETATION OF STUDY RESULTS

Determination of the current and potential natural potential of PNCM

Determining the potential of Campo Ma'an National Park means visualizing the opportunities, disturbances, and human or natural interference that may contribute to conservation or development. The results of this analysis were carried out using the Strengths, Weaknesses, Opportunities, and Threats matrix and are shown in Table 2:

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Table 2: **Summary of Strengths, Weaknesses, Opportunities, and Threats related to the PNCM**

	Positive (To achieve the objective)	**Negative (To achieve the objective)**
Internal Origin (Organisational)		
Strengths (Positive factors of internal origin)	**Ecosystem Values:** - Only habitat of the mandrill that benefits from protection in Cameroon (Matthews and Matthwes, 2000) - Encompasses the terrestrial environment, Atlantic and coastal façade **Specific Values** - Important populations of great apes (western lowland gorillas and chimpanzees) (Matthews and Matthwes, 2000) - One of the last refuges for forest elephants (IUCN, 2000) **Natural Values** - High variability of plant formations in a very small area. (Tchouto, 2004) **Economic Values** - Feasibility study for the habituation of western lowland gorillas for responsible ecotourism; **Cultural Values** - Rites, beliefs, and living environments of the Bagyéli and Bantu; - presence of caves, interesting archaeological and historical sites. **Educational and Social Values** - True natural laboratory for research and training on ecology, ecosystem management, and nature-culture relationships. **Zoning** - Existence of a relatively developed legal and institutional framework	**Weaknesses** (Negative factors of internal origin) - Insufficient valuation of tourism potential - Weakness of funding - Insufficiency of human, material, and financial resources - Insufficient institutional coordination and collaboration; - Insufficiency of scientific data; - Limited surveillance system; - Lack of harmonization of laws; - Absence of a strategy for conflict management; - Status of the various managers.

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	Positive (To achieve the objective)	**Negative (To achieve the objective)**
External Origin (Environment)		
Opportunities (Positive factors of external origin)	- Promotion of participatory management; - Presence of economic operators in the periphery; - Favourable legal and institutional framework; - Presence of projects and partners; - Establishment of a process for a transboundary protected area (Rio Campo-Ma'an Binational) for conservation; - Signing of Voluntary Partnership Agreements (VPA-FLEGT) - Indigenous knowledge and beliefs - Ministry of Wildlife and Flora - Ministry of Tourism	**Threats** (Negative factors of external origin) - Habitat destruction; - Poaching; - Hostility of populations towards eco-guards and park rangers; - Timidity in law enforcement; - Epizootic. - Poor condition of roads and engineering structures - Weakness of tourism infrastructures (Hotels, restaurants…)

As illustrated in Table 2, the PNCM has diverse resources that can be attributed several values: ecosystemic; specific; natural; economic; cultural; educational and social.

Four forest clearings and one salt pan have been identified in the PNCM, including the clearings at Site A, Minsolo I and II, and Biwomé, and the Ntebezok salt pan. These plant formations, which are unique in terms of their floristic and edaphic composition, play an important role in the dynamics of animal population movements. Several species of large and medium-sized mammals visit these sites to feed on the mineral salts contained in the water and certain plants such as Cyperaceae (Rhyncospora corymbosa, Kyllinga polyphylla, etc.) and Onagraceae (Ludwigia spp.). Species regularly observed in these sites include elephants, mandrills and sitatungas.

The mangroves and riparian forests along the Ntem River are spawning grounds for all fish species.

The coastal Atlantic forest along Campo-Ebodjé maintains a microclimate favorable to sea turtle nesting on the outskirts of the park. However, this ecosystem is now being disrupted by the negative effects of the Kribi industrial port complex.

Despite the legal protection afforded to the park, its various heritage values are all under threat. The most significant and direct threats to the biodiversity of the PNCM are the high population density caused by the development of large-scale projects and extractive industries, which

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increases pressure on resources; illegal hunting; and habitat destruction, both within the park and in the surrounding area.

Comparative Calculation of the Economic Profitability of the Forest According to the Conservation and Exploitation Scenario

As part of the economic calculation for the forest, two scenarios were considered in order to illustrate the most profitable scenario. Namely, the conservation and exploitation of natural resources scenario.

Calculation of Economic Value According to the Development Option

In the development scenario, two activities are recommended: the park is developed for exploitation purposes, and the population exploits the land to ensure subsistence and generate income for the benefit of the family.

Scenario 1: Campo Ma'an National Park is developed for the purpose of exploiting forest resources.

In this scenario, the following issues are addressed:

- Formulating the development objectives we want for this park;

- Identifying the different plant formations and formulating possible land uses;

- Conducting a phytogeographical assessment of the area;

- Conducting a cardinal triangulation of exploitable species and density per hectare;

- Identifying a VET of titles related to the PNCM and conducting a financial assessment

Forest Management Objectives

For this scenario, timber production has been assigned. The secondary objectives are protection (preservation of areas inhabited by great apes, archaeological sites, etc.), conservation of biodiversity and the environment in general, and sustainable use of woody and non-woody natural resources by local populations. In this case, the park's management therefore aims to reconcile all of these objectives through various measures (subdivision of the forest into series, sylvicultural measures, environmental protection measures, research activities, etc.).

Plant Formations and Land Use

Land use must comply with sustainable forest management standards, preserve part of the forest by delimiting a protection zone, and, more generally, ensure the preservation of the important environmental and socio-cultural attributes of the exploited forest. To this end, we have produced a map of the existing vegetation formations in the area and used this map to identify the different possible uses (allocations) that can be assigned to the forest.

As illustrated in the MAP 1 below, the different strata of vegetation formations present in the PNCM are mainly forests and swamps.

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MAP 1: Illustration of vegetation formations in the CMNP

The characteristics of the different strata and their uses are listed in the table below:

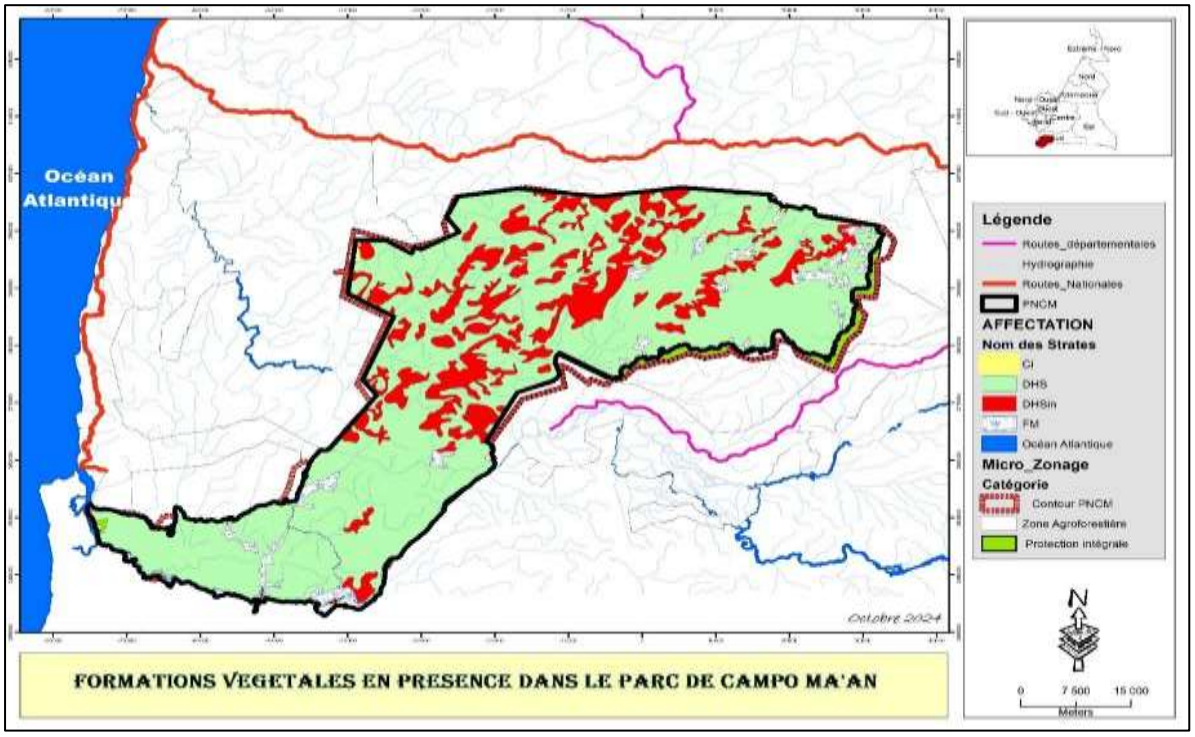

Table 3.Different strata's and their uses are listed in the table below.

Strata	Designations	Area (ha)	Allocation / Purpose	Category
DHS	Dense Humid Evergreen Forest	196,960	Productive	Primary
DHS in	Inaccessible Dense Humid Evergreen Forest	51,133	Non-Productive	Primary
Ci	Industrial Crop	43		Secondary
FM	Swamp Forest	767		Hydromorphic
TOTAL		**248,903**		

In order to meet the various objectives and obligations, the PNCM is subdivided into three series (or allocations), corresponding to areas subject to the same regime. These series are:

- The production series (187,960 ha),

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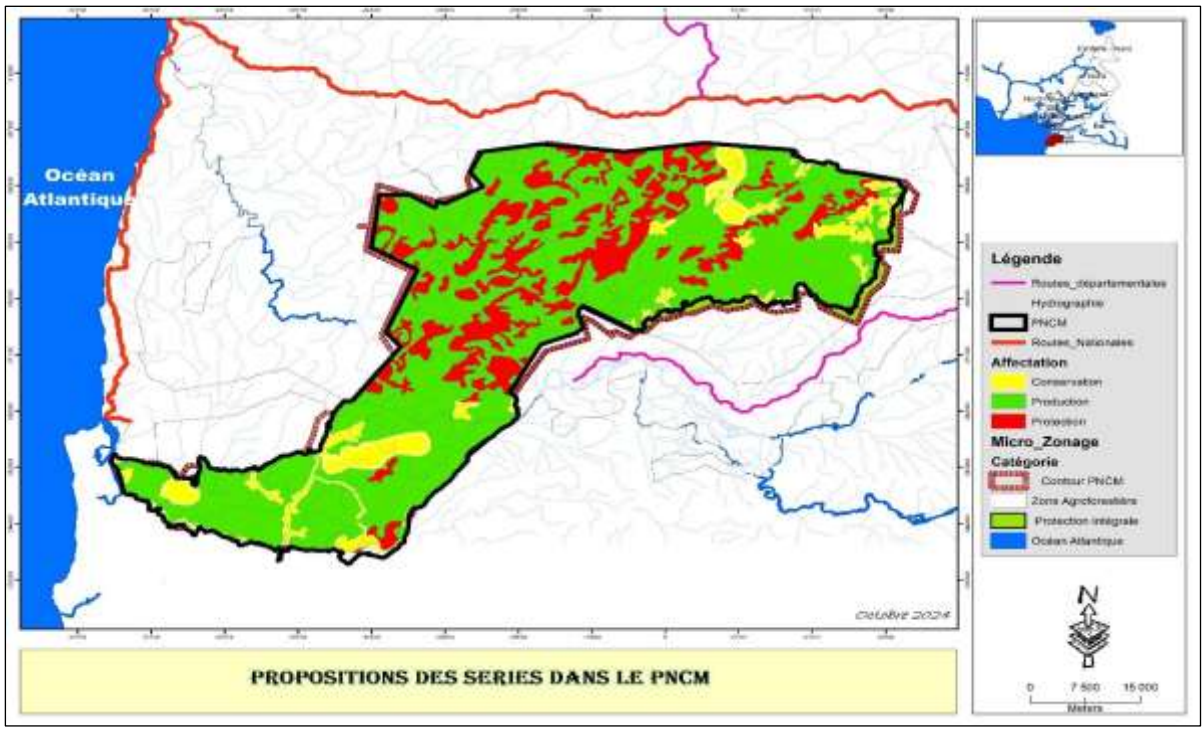
- The conservation series (9,000 ha) and the protection series (54,133 ha).

Land use is therefore determined here by the definition of series. Interventions are adapted and regulated according to the series concerned, as illustrated in the map below:

MAP 2: **Map of series in the PNCM**



A3 Phytogeographical assessment

The forests of Campo-Ma'an are characterized by rich and diverse flora, with more than 2,297 species of vascular plants and ferns belonging to 851 genera and 155 families. Among them are nearly 114 species endemics to Cameroon, 29 of which are known only in the Campo region (Tchouto, 2004). According to conservation status, 92 plant species found in Campo-Ma'an are listed on the IUCN Red List (2002) and the World Conservation Council's list of threatened trees (WCMC, 1998). Ten (10) of these species are threatened with extinction. These are Sclerochiton preussii, Boutiquea platypetala, Swartzia fistuloides, Millettia laurentii, Testulea gabonensis, Vepris heterophylla, Tieghemella africana, Cola philipi-jonesii, Mansonia altissima, and Diospyros crassiflora (Tchouto, 2004). Six (06) others have special protection status in Cameroon, namely Diospyros crassiflora, Baillonella toxisperma, Anickia chlorantha, Sacoglottis gabonensis, Guibourtia tessmannii, and Milletia laurentii.

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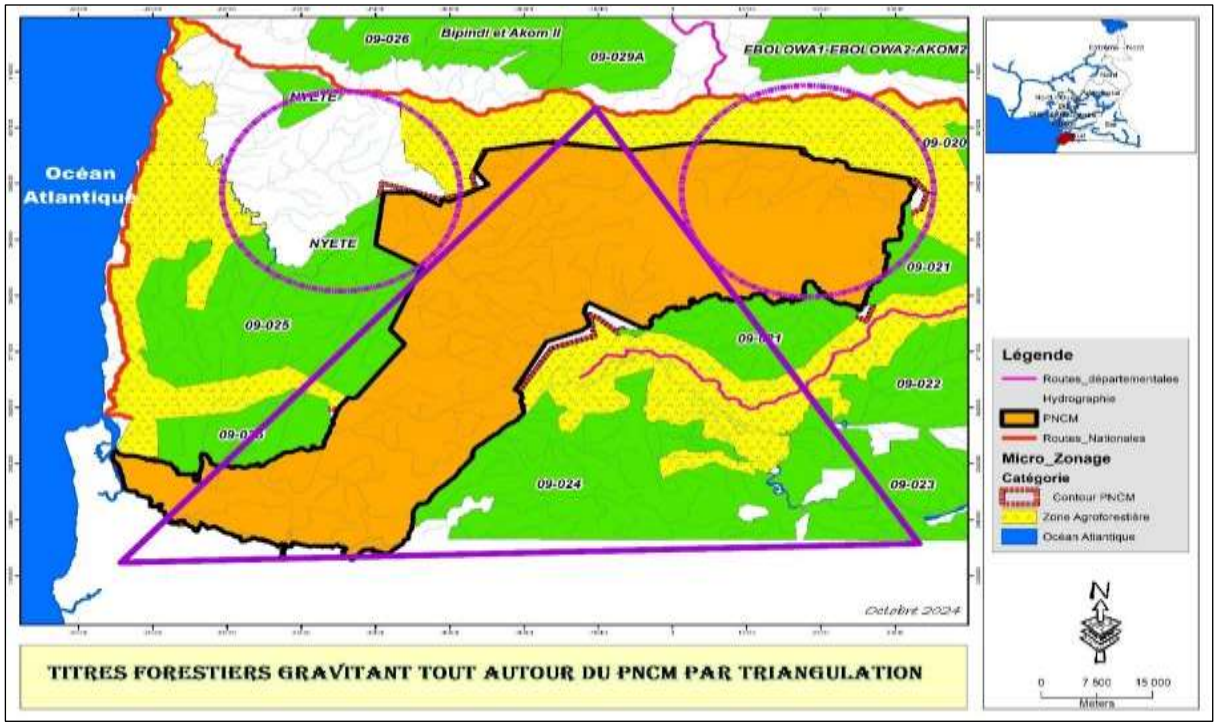
The phytogeographic assessment is shown in Map 3 below:

MAP 3: **Forest Titles Surrounding the PNCM**



The triangulation of the PNCM area illustrates the presence of the following forest titles:

- In the south-east: Forest Management Unit 09-024
- In the west: Forest Management Unit 09-025
- To the northeast: Forest Management Unit 09-021

A4-2 Assessment of Productive Strata Encountered

The assessment only covers 09-024, as the same species are found in the other titles (09-025 and 09-021). The exploitation of the management plan for the aforementioned UFA (09-025) made it possible to visualize the following strata:

Table 4: Strata Encountered in Forest Management Unit (UFA) 09-025 and Contiguous to the PNCM

Strata	Strata Abbreviation	Area (ha)	Proportion of the UFA (%)
Dense Humid Evergreen Forest with high density	DHS/b	17,395	17
Dense Humid Evergreen Forest with low density	DHS/d	32,384	31

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Strata	Strata Abbreviation	Area (ha)	Proportion of the UFA (%)
Adult Secondary Forest with high density	SA/b	14,578	14
Adult Secondary Forest with low density	SA/d	4,943	5
Adult Secondary Forest with high density with partial windthrow	SA/b cp	6,497	6
Young Secondary Forest with high density	SJ/b	12,233	12
Inaccessible Dense Humid Evergreen Forest with low density	DHS/d IN	1,133	1
Inaccessible Dense Humid Evergreen Forest with high density	DHS/b IN	723	1
Inaccessible Adult Secondary Forest with high density	SA/b IN	584	1
Dense Humid Evergreen Forest with low density with partial windthrow	DHS/d cp	3,335	3
Permanently flooded swamps	MIP (EA)	1,178	1
Temporarily flooded swamps	MIT	39	0
"Young Secondary Forest, fallow and cultivation"	CU...	...	...

Source (Forest unit Plan management 09-025, 2021)

A4-3 Valuation of Contiguous Species with the Same Strata as the PNCM

Table 5: **Forest Species with the Same Strata and Contiguous to the PNCM**

Species	Code	Volume m^3/ha	Total UFA Volume (m^3)	Volume (m^3)> MED*
Red-haired Abam	1402	0	32	0
Evélé Abam	1408	0.04	3,307	1,432

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Species	Code	Volume m³/ha	Total UFA Volume (m³)	Volume (m³)> MED*
True Abam	1419	0.03	2,904	0
Bassam Mahogany	1103	0.32	27,153	12,362
Aiélé / Abel	1301	0.53	44,598	21,170
Alep	1304	2.61	219,215	209,026
Brown Andoung	1305	0.60	50,480	28,066
Pink Andoung	1306	2.59	217,326	198,161
Aningré A	1201	0	58	0
Aningré R	1202	0.05	4,163	0
Awoura	1527	0.24	20,243	13,376
Azobé	1106	...	...	...
Ekaba	1314	2.47	207,053	74,876
Ekop léké	1596	0.57	48,183	47,750
Emien	1316	2.93	246,241	215,276
Eveuss	1646	1.89	159,128	144,025
Eyong	1209	0.84	70,720	58,486
Eyoum	1660	9.34	784,228	410,952
Faro	1319	0.02	1,638	1,638
Faro mezilli	1665	0.19	16,360	15,812
Fraké / Limba	1320	0.74	62,082	48,023
Fromager / Ceiba	1321	1.16	97,475	95,084
Gombé	1322	1.58	133,011	99,325
Ilomba	1324	0.87	72,949	44,169

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Species	Code	Volume m³/ha	Total UFA Volume (m³)	Volume (m³)> MED*
Iroko	1...	...	...	...

MED: Minimum Exploitable Diameter

Table 6: Forest Species with the Same Strata and Contiguous to the PNCM

Essences	Code	Volume m³/ha	Total Volume UFA (m³)	Volume (m³)> MED
Abam à poils rouges	1402	0	32	0
Abam évélé	1408	0,04	3.307	1.432
Abam vrai	1419	0,03	2.904	0
Acajou de bassam	1103	0,32	27.153	12.362
Aiélé / Abel	1301	0,53	44.598	21.170
Alep	1304	2,61	219.215	209.026
Andoung brun	1305	0,6	50.480	28.066
Andoung rose	1306	2,59	217.326	198.161
Aningré A	1201	0	58	0
Aningré R	1202	0,05	4.163	0
Awoura	1527	0,24	20.243	13.376
Azobé	1106	5,57	468.129	418.505
Bahia	1204	2,89	243.122	146.971
Bilinga	1308	0,89	74.553	11.966
Bongo H (Olon)	1205	1,34	112.382	43.899
Bossé clair	1108	0,05	4.111	1.389
Bossé foncé	1109	0,23	19.384	3.628
Bubinga E	1207	0,01	677	0
Bubinga rose	1208	0,09	7.397	0
Dabéma	1310	0,72	60.717	54.479
Dibétou	1110	0,35	29.470	9.607
Doussié blanc	1111	1,45	121.494	52.585
Doussié rouge	1112	0,1	8.786	5.949
Ebiara Edéa	1313	0,58	48.890	38.924
Ebiara Yaoundé	1564	2,14	179.400	130.258
Ekaba	1314	2,47	207.053	74.876
Ekop léké	1596	0,57	48.183	47.750
Emien	1316	2,93	246.241	215.276
Eveuss	1646	1,89	159.128	144.025
Eyong	1209	0,84	70.720	58.486

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Eyoum	1660	9,34	784.228	410.952
Faro	1319	0,02	1.638	1.638
Faro mezilli	1665	0,19	16.360	15.812
Fraké / Limba	1320	0,74	62.082	48.023
Fromager / Ceiba	1321	1,16	97.475	95.084
Gombé	1322	1,58	133.011	99.325
Ilomba	1324	0,87	72.949	44.169
Iroko	1116	0,04	3.161	2.405
Kossipo	1117	0	188	0
Kotibé	1118	0	19	0
Koto	1326	0,27	22.418	9.248
Lati parallèle	1330	0,02	1.473	832
Longhi	1210	0,11	9.515	1.593
Mambodé	1332	0,87	72.968	72.115
Movingui	1213	0,36	30.179	26.780
Naga	1335	8,34	700.241	632.019
Naga parallèle	1336	0,05	4.591	4.063
Nganga	1337	2,82	237.213	189.517
Niové	1338	1,97	165.422	111.020
Oboto	1339	0,4	33.360	30.689
Okan	1341	0,01	1.102	1.102
Omang bikodok	1868	0,05	4.344	0
Onzabili K	1342	0,03	2.247	2.087
Onzabili M	1870	0,02	1.456	1.423
Padouk blanc	1344	0,02	1.723	442
Padouk rouge	1345	1,11	93.506	77.735
Pao rosa	1215	0,03	2.818	2.643
Sipo	1123	0,56	47.063	40.472
Tali	1346	1,6	133.995	125.422
Tiama	1124	0,01	775	568
Tiama Congo	1125	0,03	2.647	2.647
Zingana	1349	0,01	473	473

A4-4 Proportionality coefficient 'K'

Following on from Table 1, we will draw an analogy with that of the PNCM.

Titles	**Productive Strata**	**Area (Ha)**	**Proportionality Ratio**
PNCM	DHS	187 960	0,48629496
UFA 09-024	DHS/b ; DHS/d ; SA/b ; SA/d : SA/b cp ; DHS/d cp MIT	91 404	

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This table shows a proportionality coefficient of 0.4863. It is this value that made it possible to obtain the economic value of the PNCM using data from UFA 09-025.

Tableau 6: UFA financial statement 09-024

Headlines	Estimated Amounts (XAF)
Amount of revenue over 30 years discounted at an inflation rate of 2%	+45.743.002.042
Amount of expenditure over 30 years discounted at an inflation rate of 2%	-43.063.877.708
Cumulative result over 30 years at a rate of 2%	+2.679.124.334

In summary, the development of UFA 09-024 is productive, with economic forecasts amounting to 2,679,124,334 CFA francs over 30 years. Using the proportionality factor, it is possible to determine what is expected from the development and operation of the PNCM

Table 7: Financial Assessment and Cost-Benefit Analysis

Headings	Amount (XAF)	K	Additional Amount
With integration of K			
Amount of revenues over 30 years discounted at an inflation rate of 2% of K	+45,743,002,042	0.48629496	+22,244,591,348
Amount of expenditures over 30 years discounted at an inflation rate of 2% of K	-43,063,877,708	0.48629496	-20,941,746,687
Cumulative result over 30 years at a 2% rate of K	2,679,124,334	0.48629496	1,302,844,661
COMBINATION OF INITIAL AMOUNT + AMOUNT * K			
Amount of revenues over 30 years discounted at an inflation rate of 2%	+67,987,593,390		
Amount of expenditures over 30 years discounted at an inflation rate of 2%	-64,005,624,395		

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Headings	Amount (XAF)	K	Additional Amount
Cumulative result over 30 years at a 2% rate	3,981,968,995		
Economic Surplus	3,981,968,995		

The economic surplus or profit generated by the exploitation of PNCM timber is 3,981,968,000 XAF (7,047,735 USD) for the 30 years of exploitation, or 132,732,300 XAF (234,925 USD) per year.

Calculation of the Economic Value of the Collection of Consumer Products

Based on empirical data, we have calculated the economic surplus generated by agriculture, fishing, and NTFPs.

Calculation of Income

- **Agriculture**

All households (75%) are involved in agriculture. Agriculture is the main source of income. Most of the production is for self-consumption, and only a small amount is sold. The main agricultural crops found on the market are agriculture, cocoa, plantains, and cassava.

Agricultural plots range in size from 250 m² to 3 hectares. Mixed farming is practiced, namely: combinations of cocoa and plantains, cassava and peanuts, etc. Areas under cultivation are as follows, by category of agricultural household. Agricultural households are presented according to the size of the area cultivated, using the following nomenclature:

- Top: proportion of households with the largest plots
- Bottom: proportion of households with the smallest plots
- Overall: represents the most common plot sizes among households.
- Average: represents the median plot size per household

Table 7: Estimated quantities of cocoa produce per plots size

	Area of cocoa plots by class of agricultural households			
	Biggest	Average	Representative	Smallest
%	5%	21%	62%	12%
Areas	2-4ha	0,5-1ha	0,25-0,5ha	500m^2-250m^2

Source: *Field data*

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- **Cocoa**

Cocoa is harvested twice a year, corresponding to two production periods. A main harvest from November to March and a smaller harvest from May to July. The yield profile of cocoa in Cameroon shows a difference between the production areas in the south-west and those in the centre and south. According to research by CIRAD (2017). Cocoa yields in the southern region range from 100 to 500 kg/ha, with an average yield of 300 kg/ha. In Cameroon, the highest cocoa yields are found in the south-western region, where production ranges from 600 to 1,200 kg/ha. Over the last ten years, cocoa prices have ranged from 2,000 to 5,000 CFA francs/kg.

- **Plantains**

Plantains are grown in ten of Cameroon's twelve regions, with the exception of the Far North and North regions. Plantain profitability is around 30 tons/ha. They are generally grown as part of a mixed crop on plots not exceeding 2,500 m². However, survey results reveal that 27.5% of households surveyed grow plantains as a monoculture on plots ranging from 1 to 3 hectares. The weight of a bunch of plantains varies from 10 kg to 35 kg, and the price of a bunch of plantains, depending on its weight, is 1,000-3,000 CFA francs/kg.

Self-Consumption

Following various interviews conducted in the field with producers, it appears that, on average, plantains consumed by households account for 65% to 80% of total production.

- **Non-Timber Forest Products**

Wild mango kernels are generally processed using traditional methods (paste or balls) before being sold. Unlike cocoa and raffia wine, which are sold by men, the collection, processing, and sale of wild mango kernels is mainly carried out by women. Raffia wine is sold by the liter and wild mango kernels by the pile. A liter of palm wine sells for 300 CFA francs and a kilogram of processed wild mango kernels for 5,000 CFA francs.

The production of Irvingia gabonensis is seasonal, due to the absence of domestication practices. The quantities processed are low due to the long distances involved in collecting the fruit, a lack of knowledge of processing techniques, the arduous nature of the processing process (which is mainly manual), and low market demand.

Surveys have made it possible to estimate the annual quantities of palm wine and wild mangoes sold, as summarized below:

Tableau 7 : Estimated the annual quantities of palm wine and wild mangoes

Annual quantities sold			
	Highest	**Average**	**smallest**
Wild mango paste	21-50kg	11-20kg	5-10Kg
Liter of palm wine	3000-5000 liter	1000-2000 liter	500-1000 er

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- **Calculation of Economic Surplus from Small-Scale Inland Fishing**

Fishing takes place in two seasons. The period from February to March corresponds to the main fishing season. The minor fishing season runs from October to December.

Fish products are sold in batches (large, medium, and small). The weight of fish batches varies from 0.5 to 2 kg. Annual fish production ranges from 20 to 100 kg per household per year. The average annual fish production per household is 63 kg per year. However, 83% of the fish caught is consumed fresh or dried in households. The price per kg of fish varies according to size, ranging from 1,000 to 4,000 CFA francs. However, whether it is fishery products or wild mango kernel processing, 65% is consumed by households, and the rest is sold.

- **Calculation of Costs**

The costs of cocoa production consist of the purchase of inputs (pesticides, fertilizers), packaging costs, and paid labour. Furthermore, only households with large plots of land use paid labour. Family labour is used on a regular basis. This labour is free of charge.

Surveys have shown that expenses related to cocoa represent an average of 35% of income.

The expenses generated by other products are negligible. The processing and sale of non-timber forest products mainly involves human labor to crush wild mango kernels with stones. Fishing is carried out using traps, lines, and nets. However, in the context of this thesis, the costs associated with fishing (processing and marketing) are estimated at 5% of annual income.

Scenario 2: Campo Ma'an National Park is Developed for Conservation or Protection Purposes

Calculating the economic value of PNCM for the natural forest resource conservation scenario involves calculating: the surplus from tourism, the value associated with the development of PNCM, and the budget for financing the park.

Calculation of the Economic Value of Cultural ESGs: Ecotourism

Cultural services through ecotourism were calculated in this study by estimating transport costs. The estimate of transport costs is the sum of all expenses necessary to visit the study site. This value represents an opportunity cost for exploitation and an added value for conservation.

In the case of the PNCM, in addition to seeing gorillas, visitors can enjoy other attractions: hiking in the park, walking along the Ntem River to the Dipikar rapids, visiting the Ndiva house (sea turtles) in Ebodjé, visits to pygmy camps, cultural activities featuring local stories and dances, exploration of German ruins on Dipikar Island, the Memve'ele waterfalls, buffalo caves 17 km inside the park, and picathartes caves on the outskirts of the park.

Tourism is still very underdeveloped in Campo-Ma'an. In fact, between 2014 and 2024, only 1,401 visits were recorded by the PNCM conservation services (see Figure 1), with an average of 130 visitors per year. The years 2014-2019 saw high visitor numbers, with peaks recorded in 2016 and 2019 with 207 and 206 visitors respectively. The COVID years 2020-2022 explain the low number of visitors.

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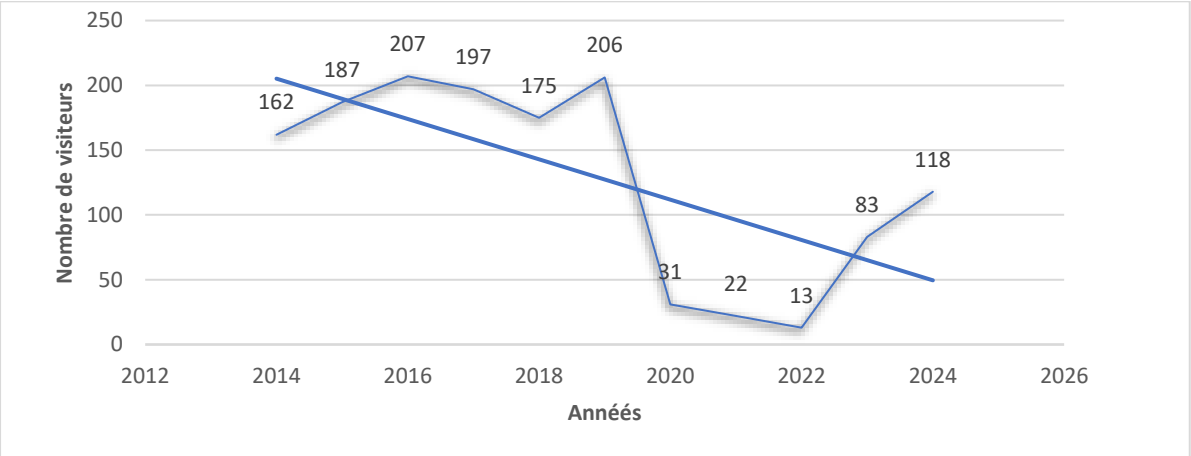
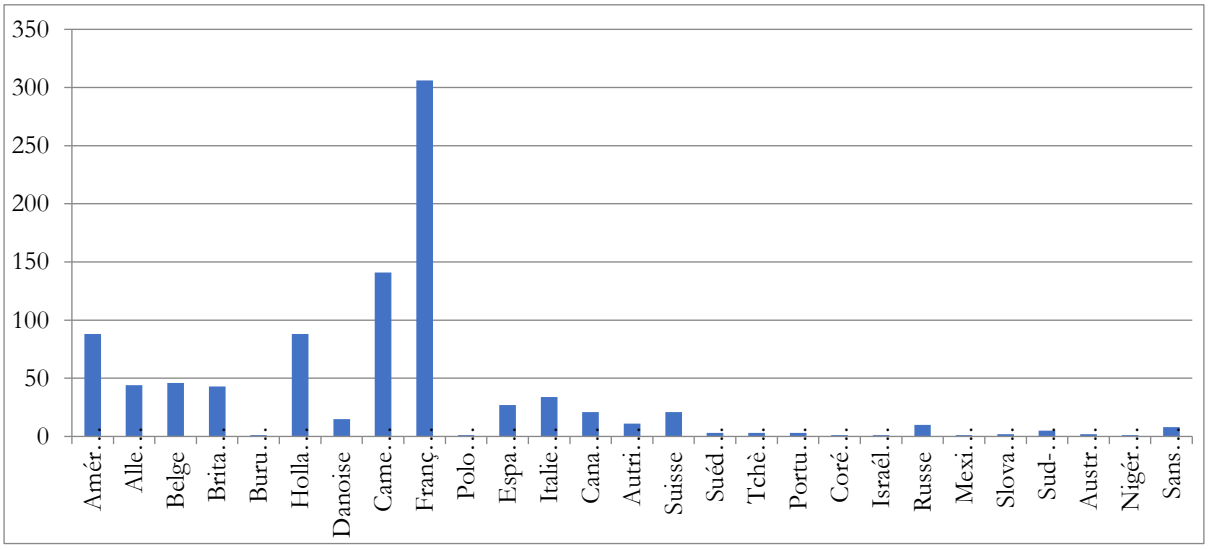
This figure also remains well below that of major tourist destinations for viewing mountain gorillas and even lowland gorillas, such as Dzangha Sangha in the Central African Republic, which attracted 400 visitors in 2009 alone. Difficulties in access are probably the main cause of this situation. Campo is 74 km from Kribi, one of the main, if not the main, tourist destinations in Cameroon, but it takes no less than two hours by road (unpaved) to make this journey. There is also a lack of hotels as such. Visitors arriving in Campo have only two hostels to choose from. Overall, accommodation capacity is limited to less than 20 rooms. Figure below illustrates the evolution of visitor numbers to the PNM from 2014 to 2024.

Figure 1: Change in Visitor Numbers from 2014 to 2024



Visitors come from a variety of backgrounds: nationals and expatriates. Nationals and residents (31.27%) and expatriates and non-residents (65.5%), as illustrated in Figure 2. A small number (3.23%) of these visitors did not declare their origin.

Figure 2: Nature of visitors from 2014 to May 2024



Cameroon's finance law sets the rates applicable in protected areas. Thus, entrance fees to the PNCM are 5,000 CFA francs per visitor for non-resident foreigners; 3,000 CFA francs per person for non-resident foreigners and 1,500 CFA francs per person for nationals. Visitors with

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a camera or video camera pay an additional 2,000 CFA francs and 1,500 CFA francs, respectively. The revenue generated in this way is paid in full into the public treasury. Hiring a local guide costs 5,000 CFA francs. Visits last from 3 to 14 days. The vaste majority of tourists spend an average of 5 days in the PNCM.

Calculation of the Economic Surplus Linked to Tourism in the PNCM

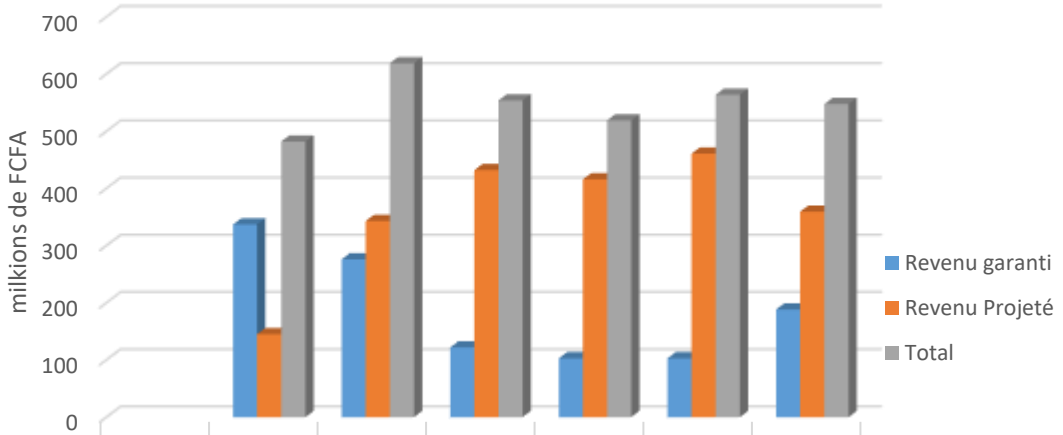
To calculate the revenue generated by tourism, it has been estimated that an average of 130 people visit the park annually. Using the travel cost method and based on the current origin of tourists, the average projection of total annual revenue under current conditions is US$193,919.28. The majority (96.15%) of the park's revenue is generated by foreign tourists. However, this result is negligible compared to the revenue generated by tourism in other parks located in the Congo Basin. Balole (2018), using the travel cost method, projected total revenue in Virunga National Park at US$248,117,353. For this author, international transport accounts for two-thirds of total revenue.

Calculation of the Economic Value of the Park's Development

The development plan reflects the capacity of the various stakeholders (the State, international cooperation partners, municipalities, village communities, and economic operators) to participate in the development of the park through the mobilization of projected and guaranteed revenues.

The following paragraphs present the evolution of guaranteed or actual revenues and projected revenues extracted from the current 2015-2019 development plan. Figure 3 provides an overview of the costs to be mobilized for development through projected revenues, where the amount allocated for financing the park is based on guaranteed revenues.

Figure 3: Evolution of the Park's Budget for the Years 2015-2019



Année	2015	2016	2017	2018	2019	Moyenne
Revenu garanti	337	276	122	103	103	188
Revenu Projeté	145	343	432	416	461	359
Total	482	619	554	519	564	548

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It can be seen that the highest guaranteed amounts allocated to the park are those for the first two years (2015, 2016). This is explained by the need to build several infrastructures to promote ecotourism, such as ecolodges, visitor centers, watchtowers, and the base camp.

Looking at the revenue projections in Figure 3, we can see that the highest guaranteed amounts (68%) come from funding from development partners, followed far behind by budget allocations from public authorities (30%). While the majority of the projected amounts are covered by public authorities (81%), followed by contributions from development partners (12%) and businesses and economic operators (7%).

Tableau 8: Estimate of the Contribution to be Paid by Stakeholders for the Financing or Development of Campo Ma'an National Park

Groups of actors	**Guaranteed average income**		**Projected average income**	
	Millions FCFA	**%**	**Millions FCFA**	**%**
Public authorities	29	29,52	150,66	80,76
Businesses	2,5	2,54	12,5	6,70
Development partners	66,75	67,94	23,4	12,54
Totaux	98,25	100	186 ,56	100

Source: *field datas*

Since 2015-2019, when the PNCM development plan was last drawn up, there has been a stagnation in the contribution of various businesses to projected income, while this income has seen a relative decline in the share of public authorities and a drastic reduction in programmes and projects involving development partners. The results of participatory surveys and the comments of respondents confirmed this general downward trend in projected income. Thus, the contribution of stakeholders was estimated as follows: a decrease of around 20% for public authorities and 50% for development partners through external financing. Taking into account the contribution of stakeholders to projected income for the period 2015-2019, the cost of development was calculated based on the average projected income for this period minus 25%.

Practical application: the average annual cost for the development of Campo Ma'an National Park = projected average annual cost for the period 2015-2019 * 0.75%. Estimated at **359,000,000 * 0.75 = 269,250,000 CFA francs; or 477,394 USD**

Calculation of the Economic Value Linked to the Financing of the PNCM

The value of the park's financing was estimated based on the guaranteed revenues from the 2015-2019 development plan. The results of participatory surveys and comments from respondents revealed a general downward trend in financing. Thus, the trend in stakeholder contributions to park financing was estimated as follows: a decrease of around 20% for public authorities and 50% for development partners through external financing. Taking into account the contribution of stakeholders to guaranteed income for the period 2015-2019, the economic value for the park's funding was calculated based on the projected average income for this period minus 45%.

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Practical application: average annual income for the financing of Campo Ma'an National Park = average annual guaranteed income for the period 2015-2019*55%. Estimated at 18,800,000*0.55=103,400,000 CFA francs, equivalent to 183,335 USD.

Furthermore, this amount is far below the funding amounts for other parks. Balole (2018), as part of his doctoral work, points out that the amount of funding for the conservation of Virunga National Park and related projects is estimated at $27,535,000 per year.

Summary of the Calculation of the Park's NPV for Exploitation and Conservation

The summary of the calculation of the park's NPV for conservation and development is presented in the table below:

Tableau 9: Summary of the Economic Value of Campo Ma'an National Park Allocated to Exploitation or Development

Calculation of the economic value in USD				
Ecosystem goods and services (EGS)	The park is subject to management for exploitation or development		The park is subject to management for the conservation and protection scenario	
Supply	76 893 24		76893243	
Tourism	/		193820,12	
Forest Exploitation Value	212 229		/	
Wildlife Value	/		/	
Development Cost	/		283010	
Financing Budget	/		342697	
Totaux	**77 105 472**	**49,80%**	**77 712 770**	**50,19%**

Source: *Field datas*

The calculation of the economic value of the park under development for exploitation or development (49.30%) is slightly higher than the economic value of the park under development for the conservation and protection scenario (50.19%).

Furthermore, if the park is developed for exploitation, the benefits come from the economic goods and services (EGS) supplied and the allocation of the park as a Forest Management Unit, whereas if the park is developed for conservation, which corresponds to its current use, the benefits would come from the financing of the park, conservation projects and programmes, the carbon market and tourism.

If the development scenario were considered, in addition to allocating a portion of the forest for exploitation as a Forest Management Unit (FMU), the government could authorize the two agro-industries to extend their activities within the park and authorize industrial gold mining. This scenario would multiply the benefits of developing and exploiting the park.

However, this development option as envisaged does not contribute to the well-being of the population, as it will deprive them of their land for the benefit of private companies or public authorities. Exploiting the park will deprive the world of its rich biodiversity. In addition, the benefits of exploitation are short- and medium-term and do not benefit local populations, but rather the public authorities.

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This possibility should encourage the public authorities to promote tourism, increase funding for the park, and increase the budget for the development of the PNCM.

Analysis of Stakeholders' Preferences for the Conservation or Exploitation Option for the PNCM

The analysis of stakeholder preferences for development or conservation options was based on two aspects: the level of knowledge of the ecosystem goods and services provided by the PNCM among population groups and the factors that influence the willingness to pay for the conservation of the PNCM's natural resources.

Knowledge of the Ecosystem Goods and Services Provided by the PNCM among Population Groups

The following table shows the preferences of the population regarding the importance of the services provided by natural resources

Table 10: Levels of Information on the Ecosystem Services Provided by the PNCM According to Social and Professional Groups

Services / Stakeholders	Products	Men	Women	Youth	Mix
		Levels of Importance (X) Not Applicable - Very High			
Supply	Fish	XXX	X	XX	XX
	NTFPs (Non-Timber Forest Products) and Medicinal Plants	XX	XX	X	X
	Wood	X	X	X	X
Regulation	Air Regulation	/	/	/	/
	Carbon Sequestration	/	/	X	X
	Protection against Soil Erosion	X	X	X	X
	Water Depollution/Purification	/	/	/	/
	Drinking Water Resource/Reserve	X	X	X	X
	Dust Particle Capture	/	/	/	/
Cultural	Preservation of Pygmy/Baka Identity	XXX	XX	X	XX
	Recreational	X	X	X	X
	Heritage	X	X	X	X
	Education/Research	X	X	X	X
	Traditional Knowledge	XXX	XX	X	XX
Support	Reproduction for Fish, Nesting	X	X	X	X
	Nesting for Birds	X	X	X	X

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	Heritage Services and Biodiversity Maintenance	X	X	X	X

Source: *field data*

Natural resources provide various services, including provisioning, regulating, supporting and cultural services. Respondents, regardless of their status (men, women and young people), express their importance for provisioning and cultural services. Overall, social groups living near the park are well aware of the importance of its resources for the environment. However, while the tangible benefits are well known, the intangible benefits, especially those related to regulation and support, seem less important: heritage services, reproduction, air regulation, carbon sequestration, water purification, etc. It appears that the argument for exploitation is mainly related to provisioning, while the preservation scenario is related to cultural values.

Factors Influencing Willingness to Pay for the Conservation of the PNCM's Natural Resources

The econometric models formulated to determine the factors influencing the willingness to pay of the populations surveyed show that, of the 24 variables included in the questionnaires, seven variables influence the willingness of the individuals surveyed to pay for the conservation of the Park, namely: attachment to nature, intention to visit the park in the future, center of interest, knowledge of the risks associated with the degradation of the park's ecosystem, knowledge of the park, activity status, and marital status. In other words, people who have a strong interest in nature, who intend to visit the park in the future, who are familiar with the park and the risks associated with the degradation of its ecosystem, who are active, and who live as a couple are more sensitive to the issue of paying for the conservation of the park than others.

DISCUSSION

The Relevance and Effectiveness of the PNCM's VET

The Relevance and Effectiveness of Using VET Tools and Approaches in the Context of Tropical Forests

Cost-Benefit Analysis-Based Decision-Making (CBA)

According to Barde (1991), compared to other decision-making methods for economic environmental management, cost-benefit analysis is the one that, in theory, leaves the least room for subjective choices. According to this author, it constitutes a criterion of economic efficiency in the use of resources. Furthermore, for Lescuyer (2000), cost-benefit analysis is a technique that derives directly from the principles of welfare economics: its objective is to maximise social welfare calculated from the sum of individual utilities. CBA corresponds to the net benefits (i.e., total benefits minus total costs) generated by any resource use project. According to Randall (1986), as such, it provides important information for decision-making, but this information remains economic and strictly linked to the standard model of welfare economics. Other decision-making methods allow for a broader range of criteria to be taken into account

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What other decision-making methods are available for the economic management of the environment?

Several other decision-making methods can be used in contexts where cost-benefit analysis is considered inappropriate or insufficient: cost-effectiveness analysis, risk-benefit analysis, multi-criteria analysis, and environmental impact assessment are the main alternative methods (Pearce & Markandya, 1989; Garrabé, 1994). According to Lecuyer (2000), cost-effectiveness analysis is based on the same assumptions as cost-benefit analysis, namely that economic analysis must be based on individual preferences and that these must be weighted by a common factor, namely money.

Ultimately, cost-effectiveness analysis, like cost-benefit analysis, pursues profitability, which is the maximization of profits. However, these economic decision-making techniques are single-criterion methods. Yet ecosystem management is complex and based on economic, social, and ecological aspects. No single criterion can therefore be considered predominant. This idea is defended by Faucheux & Noël (1995, p. 235). Indeed, "an action that is better than another on a single criterion will often be less good than others on all criteria. Multidimensionality is reflected in the existence of a large amount of data, relationships, and objectives, all of which are characteristics that must be taken into account in multi-criteria analysis.

The Environmental Asset Valuation Framework Applied to a Tropical Forest: The Case of Campo Ma'an National Park (CMNP)

According to Chevassus au Louis (2009: 21), this type of economic valuation encounters certain limitations. The first is that partial knowledge of ecosystem functioning does not allow for a correct assessment of the loss of production of ecosystem goods and services. A second limitation is that the low monetarization context of developing countries, particularly for populations isolated within the forest, makes it difficult to implement stated preference methods. In practice, only certain values can be quantified, and the total economic value that can be estimated does not represent the aggregate value of all ecosystem services.

This observation is also confirmed by Lescuyer (2000), who stresses that one of the major difficulties of this arbitration approach is the absence of economic value for most natural assets. Indeed, the central difficulty in applying this reasoning to environmental goods is that most of them do not have a price.

Review of Previous Work on TEV Analysis (Total Economic Value)

In the context of this work, the Total Economic Value (TEV) of the park was estimated at USD 77,924,999. However, the largest share of benefits (99.56%) comes from use value and 0.44% from non-use value. Furthermore, 98.92% of the benefits come from direct use value. The direct use value is composed of benefits from tourism (0.25%) and, predominantly (98.92%), from low-impact resource extraction.

However, this result is negligible compared to the revenue generated by tourism in other Parks located in the Congo Basin. Balole (2018), using the travel cost method, projected the total revenue in the Virunga National Park (PNVi) at USD 248,117,353. For this author, international transport represents two-thirds of the total revenue. This assertion is confirmed

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by this research, which shows that 93.38% of the annual benefits generated by tourism come from non-resident foreign visitors.

Balole (2018), in his thesis work, estimated the annual Total Economic Value of the Virunga National Park (PNVi) at USD 1,250,475,784. This was calculated by valuing the socio-economic value of fish in Lake Edward, water, hydroelectric potential, wildlife, forest, financing, tourism, and existence value. This value could reach up to USD 2,910,601,046 if the ecosystems were restored to their 1990 state.

With the existence of a Protected Area (PA), the distribution of benefits is modified by taking environmental benefits into account. Moreover, without the PA, the benefits would be distributed equally among the State, local populations, and private operators, whereas with the PA, the international community becomes the primary beneficiary of the tropical forest's goods and services.

CONCLUSION

Despite its rich biodiversity, the Campo Ma'an National Park (PNCM) contributes very little to local development and tourism within the Campo Ma'an Technical Operational Unit (TOU). The main factors limiting the effectiveness and viability of conservation within the PNCM are, in order of importance: The chronic lack of money to cover the cost of required conservation measures; intensive cross-border poaching in its central part; the enclosure (isolation) of the area; the insufficiency of basic socio-economic and tourist infrastructure; the failure of co-management initiatives; and the low level of implementation of management plans developed to date.

This situation leads stakeholders within the Campo Ma'an TOU to question the necessity of prioritizing conservation options over exploitation.

The Cost-Benefit Analysis (CBA) provides a basis for comparison between exploiting or not exploiting natural resources. CBA helps determine the optimal environmental management scenario that efficiently allocates resources and maximizes social welfare (Bohm & Henry, 1979). According to Barde (1991), the CBA thus allows for both ranking projects and making an objective choice for the optimal allocation of projects/programs.

The calculation of the economic value of the park managed for exploitation or development (49.30%) is slightly higher than the economic value of the park managed for the conservation or protection scenario (50.19%). Furthermore, this value for protection would be greater if information allowing the calculation of the financial value of carbon emitted in the park and the value of wildlife through viewing tourism and sport hunting were available...

Moreover, if the exploitation option for the park is chosen, the benefits would come from provisioning goods and services, as well as timber exploitation, whereas if the park were managed for conservation (which corresponds to its current use), the benefits are generated through financing, the cost of development, ecotourism, and other sources such as the carbon market, viewing tourism, and sport hunting...

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If the development scenario was envisaged, in addition to allocating a portion of the forest for exploitation in a Forest Management Unit ("UFA") or through logging sales, the government could authorize the expansion or establishment of new agro-industries or industrial mining operations... This scenario would multiply the development and exploitation benefits of the Campo Ma'an TOU. But for whose benefit?

Indeed, the development option does not contribute to the well-being of the populations since it will deprive them of their land, to the benefit of industrialists and the state through the collection of taxes and duties. This eventuality should stimulate public authorities to value tourism, increase Park funding, and the budget for the development of the PNCM.

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