community, and if, alongside, there is an increase of the added value, be it direct of indirect, at the level of the entire economy (Profitability at National level). Also summarized below)see detail in annex III) is a series of actions that aim at increasing the value of the fishing activity. In any case, the economic and social feasibility of these actions are yet to be precise and verified at this level, and the economic and financial profitability, yet to be calculated.

16.5.1 Conservatory Measures of Control and Stock Management

These measures would mainly comprise of :

(i) Control of the fishing effort, and notably the number of fishermen (system of permit, to be established)

(ii) Control of the non motorization of the fishermen owing to the restricted dimensions of the lake and the engines and fishing techniques (restriction of the size of meshes of the nets, notably)

(iii) Re-alleviation of the lake from the start (with 3 main species Tilapia sp, clarias Lazera and Heterotis nibolicus) at the Yaounde station and the Ebolowa future station.

(IV) Organization and control of the annual reproduction zones (10% of the total are of the lake) and the guidance of fishermen. This measures will require the creation of a fishing post under MINEPIA, at Nsebito or at Nyabessan with a fishing-guard sent to work permanently. His salary would be paid by MINEPIA, or could, on the contrary be provided under the compensatory measures which will include financing his lodging/office, material and small necessary equipment, a motorcycle and a motor boat as well as a running cost budget (2 years). The total costs sustained by the project would amount to some 9.3 million F CFA (see detail in annex 3).

The costs of re-alleviation by the end of the year of the filling of the dam, depending on the area of the lake to be re-alleviated, would be respectively: 16.7, 6.2 and 4.2 millions F CFA for variants V3, V2 and V1 (see technical-economic details in annex III)

16.5.2 Actions on Construction, Equipment and Economic Organization (Annex III)

As previously announced, these measures require a more profound feasibility study. The actions and installations identified at this level are:

(i) Construction of fishing paths: (see par. 15.2, Chap. XV).

(ii) Regular resettlement operations (to be justified)

(iii) Construction of a fishing Center at Nsebito as a complementary fishing post which may later on be assigned the center will have two main mission, - the collection of statistics of the catches, for a better follow-up of the stock management; - the guidance of fishermen. (sensitization, animation on regulation measures, on fishing techniques and improved smoking measures on cooperative organization). The total cost for such a fishing center is estimated in annex III at 15.7 million F CFA (Salary and running cost excluded).

(iv) Construction of two concrete wharves (1 at Nsebito, 1 at Nyabessan) estimated cost: 4.1 million F CFA/unit

(v) Construction of a collective cold store estimated at 15 millions F CFA (capacity: 12 tons) in the case of maximal variant. This investment would be regained through a renting-fee by the fishermen.

(vi) Equipment of sales hall in each wharf total cost 1.3 millions F CFA.

(vii) Cooperative organization of the fishermen for the supply of fishing material, the marketing and training-popularization expected from the guidance.

To these actions and investments, we can add the equipment in infrastructures of the villages of the fishermen (village platform, wells, eventual school, access paths) with the modalities and costs which have to be defined per variant at this level, and according to the objectives, of the revenue, and thus, the number of fishermen to be authorized. For example, on the basis of a production of 1.2 tons per fisherman, and per year (540,000 net income per year) and 10% of stretch of right for the reproduction of fishes, we would have 285,105 and 70 fishermen for the variants V3, V2, and V1 respectively. Distributed in two villages (near Nyabessan and Nsebito) and on the basis of a 500 m2 platform per fishing family, for the construction of improved manual pump wells, for the additional need in school for a village, and the access paths, the village infrastructure would roughly cost 66, 39.8 and 36 ,million F CFA respectively for variants V3, V2, V1.

16.6 General Organization and Follow-up of Compensatory Measures

Each component of compensatory measures, be it direct/indirect, previously defined have their proper specific organization and corresponding Ministerial tutelage departments, which take care of the smooth running of the compensatory measures within their respective domain of competence and responsibility. Finance for the project are previously identified and should be allocated to the Ministries and other institutions responsible for the realization of programs for compensations. Another part of finance, identified but not systematically quantified in the Ministries involved. but even without the project, the intervention of the ministry is necessary, (post of agents notably) etc... On the hand, certain measures that would arise from some technical Ministries have been deemed to be financed within the Memve Ele project either through realism (at times by transition) or because they don't involve politics and in present programs of the ministries concerned.

Meanwhile, the coordination of actions and programs between the entire Institutions to participate, the supervision and the follow-up of programs for compensatory measures must be strictly ensured by SONEL, during the works and the first years after the filling of the dam. SONEL must set up a coordination and a follow-up unit to this effect, to be installed at the project site. This unit should be composed of two senior motivated and active staff, highly qualified; one must have the profile of a senior sociologist-animator, the other, the profile of a general-management technician. This unit will be equipped with an all-weather-vehicle, means for secretarial duties, and ordinary function and should be set up for a period of 5 years (3 years for the site and 2 years after the filling of the dam). Under the assumption that the managing-technician is a SONEL staff, and that the Sociologist-animator is a non institutional external participant for 2.5 years in all, (main stay and supporting missions, from start to the end) the total cost of the unit for coordination and follow-up would vary between 79.5 and 145.5 millions F CFA (see details in annex III according to the status of the sociologist-animator (NGO, Specialist Cabinet or Independent Expert).

16.7 Other Recommendations

These general recommendations are beyond the direct or indirect compensatory measures, justified with regard to the Memve Ele project. They concern the different Ministries and organizations, national or international that will be involved and interested. Thus, recommendations are as follows:

(i) To reinforce the administrative management of the project area and police services: particularly for the control of immigrants and future population booms, mainly during the working phase.

(ii) To envisage the promotion and development of tourist Activities, from the triple potential: the falls-site-dam through the encouragement and control (MINTOUR) of private operation (guest house, tourist circuits...)

(iii) The Restoration and dynamization of schools in the project area (out of resettlement zone and those to be re-established) Total rough cost 131 million F CFA for 5 schools)

(iv) The Setting up of a scientific Research program in social and cultural anthropology: in the extended project area, which will be composed of 3 elements:

- evolution of family structures, values of relationship and behaviors and attitudes vis à vis health and hygiene;
- evolution of anthropological of the imaginary, the sacred and witchcraft.
- knowledge on the pharmacy and traditional medicines and their evolution.

(v) A research program on hydro-biology dealing on the present and future aquatic ecosystems, the dynamics of the species and tropic chain, extensive and semiextensive pisculture tests.

XVII. SUMMARY COSTS AND PROGRAMMING OF COMPENSATORY MEASURES

The total recapitulative costs of direct and indirect compensatory measures are given per component in the following table. Programming of the cost has been done for a total period of 6 years: 3 years for the works (year 3 to 1 in the table) and 3 years after works (year 0 being the year of filling the dam). The bills per year is given below only for the main variant (No. 1). The various tutelage Institutions responsible and indicated in the last column for each component or sub-component.

In all, and according to the options and estimates retained, at this stage, the entire compensatory measures to be financed under the project amount to 375.5, 522.3, and 851.7 million F CFA (1.36, 1.90 and 3.10 US dollars) respectively, for the variants V1 (main), V2 (median) and V3 (maximum).

distribution in % per main thematic mass and per variant is as follows:

	V1	V2	V3
- Direct Compensatory measures	36	53	63
- Indirect compensatory measures	64	47	37
- Conservation of the natural patrimony	8	6	4
- Medico-Sanitary measures	15	11	7
- Compensation on housing and private property	2	5	16
- Compensation on farms and food production	17	24	20
- Re-establishment of public infrastructures	6	12	11
- Resettlement Infrastructures	1	5	12
- Improvement of Water Supply system (affected area)	4	3	2
- Agricultural Extension Program (food stuff)	4	3	2
- Development of fishing	16	13	16
# Control and conservation measures	4	3	3
# Infrastructures and fishing equipment	3	2	5
# Infrastructures of fishermen's villages	9	8	8
- Organization, Coordination and Follow-up	26	19	11

Table 25 Summary of Costs and Programming of Compensatory Measure

Unit = million F CFA

COMPONENTS AND ACTIONS	Variants of project			Programming						Organization in Charge
	3	2	1	-3	-2	-1	0	1	2	
• DIRECT COMPENSATORY MEASURES	538.8	276.8	135.8							
1. Preservation of the Memve Ele Falls	p.m	p.m	p.m		X	X				Provision of river outlet facility
2. Realization of the wood capital	p.m	p.m	p.m	X	X	X				Allocation to private firms
3. Partial sabing of the wildlife in the future flood area	p.m	p.m	p.m			X				Payment on animal killed/MINTOUR
4. Socio-sanitary preventive measures (technical measure + epielemiological follow-up)	18.5	18.5	18.5	6.7	3.9	2.9	2.6	2.4	-	SONEL - MINSA
5. Compensations	322.2	171.2	90.1		15.0	20.4	36.7	17.2	0.8	
5.1. Housing and collective prifate Infrastructures (church buildings, private schools)	133.8	28.2	7.5	-	7.5	-	-	-	-	CLIR (Con Loc. compensation - resettlement) NINUH
5.2. Cocoa Trees (cost of seedlings in nursery)	102.6	72.2	35.8			11.9	11.9	12.0		CLIR - MINAGRI
5.3 Fruit Trees	2.8	0.6	0.2			0.2				CLIR - MINAGRI
5.4 Food Production	64.8	52.0	28.4				24.4	4.4		CLIR - MINAT - MINAGRI - MINASCOF
5.5 Inventory of property and prganization of compensations	18.2	18.2	18.2		7.5	8.3	0.8	0.8	0.8	SONEL - CLIR
6. Re-establishment of public infrastructures	97.4	60.2	24.2			24.2				
6.1. Roads	79.9	52.7	16.7			16.7				MINITPMINUH
6.2. Wells	17.5	7.5	7.5			7.5				MINUH
7. Resettlement (development of sites: platforms, roads, paths, wells, schools)	100.7	26.9	3.0			3.0				CLIR - MINUH - MINITP - MINAT
• INDIRECT COMPENSATORY MEASURES	312.9	245.5	239.7							
1. Conservation of the flora and fauna	31.5	31.5	31.5	9.5	9.5	9.5	1.5	1.5		
1.1. Scientific inventories	24.0	24.0	24.0	8.0	8.0	8.0				MESIRES
1.2. Reinforcement of control on hunting, protected areas, education of populations	7.5	7.5	7.5	1.5	1.5	1.5	1.5	1.5		MINTOUR - MINEF - MINEDUC
2. Improvement of the guidance and health education	37.3	37.3	37.3	19.0	5.6	4.4	4.2	4.1		
2.1. Restoration and reinforcement of the Nyabessan h. C.	29.0	29.0	29.0	17.2	3.8	2.7	2.7	2.6		MINSA
2.2. Health Education Campaigns	8.3	8.3	8.3	1.8	1.8	1.7	1.5	1.5		MINSA - MINEDUC - MINASCOF
3. General improvement of the water supply system of the population	14.5	14.5	14.5	14.5						MINUH
4. Agricultural Extension Programme (food crops - group forming)	16.6	16.6	16.6		4.2	3.2	3.2	3.0	3.0	
4.1. Fruit nursery and palm oil tree	0.4	0.4	0.4			0.2	0.2			MINAGRI (costs for cocoa counted in 5.2)
4.2. Guidance of production and animation of the groups (women + male youths)	16.2	16.2	16.2		4.2	3.0	3.0	3.0	3.0	MINAGRI. MINASCOF
5. Organization of fishing development	133.5	66.1	60.3			8.8	51.5			MINEPIA
5.1. Reinforcement of control on fishing	9.3	9.3	9.3			8.8	0.5			MINEPIA
5.2. Basic Re-alevination of the lake	16.7	6.2	4.2				4.2			NB: End of 1st year of filling
5.3. Infrastructures and equipment for an additional fishing development	41.5	10.8	10.8				10.8			NB: End of 1st year of filling
5.3.1 Construction of a fishing Centre	15.7	-	-							NB: End of 1st year of filling
5.3.2 Concrete wharfs (2) sales hall (2) collective cold store (1)	25.8	10.8	10.8				10.8			Collective Cold Store: Variant 3 only
5.4. Equipment in basic infrastructure of the villages of the fishermen	66.0	39.8	36.0				36.0			MINUH. MINAT - MINEPIA
6. General Coordination and follow- up of compensatory measures	79.5	79.5	79.5	11.4	14.8	22.0	22.0	9.3		SONEL
TOTAL COMPENSATORY MEASURES million F CFA	851.7	522.3	375.5	61.1	53.0	98.4	121.7	37.5	3.8	
(million US $)	3.10	1.90	1.36							

FEASIBILITY STUDY
ON
MEMVE ELE HYDROELECTRIC POWER DEVELOPMENT PROJECT

APPENDIX IV ENVIRONMENTAL ASPECTS

ANNEX I

INITIAL ENVIRONMENTAL EXAMINATIONS

CONTENTS

ANNEXES

INTRODUCTION AND STUDY CONCEPTS

1. This report constitutes the first document produced within the framework of the impact study on the environment of the Memvé Elé Hydroelectric Power Development Project on the Ntem river (Maan District (Arrondissement), Ntem Department, South Province). The owner of this future project is SONEL, while the project feasibility and impact study is financed and undertaken by JICA (Japan International Cooperation Agency). This report is a preliminary report of the first mission, consisting of a first partial analysis of the initial environmental condition of the project, on the the hand, and recommendations and specifications for continuation of the impact study, on the other hand (See Item 3 below).

2. The environment concept, in the present study, must be interpreted in its broadest meaning: physical and natural environment, social and cultural environment, economic and institutional environment. As to the impact of the project on the economy, the impact study will be limited, on the contrary, to local and micro-regional economy, particularly up to the definition of compensatory measures, justification and economic analysis of the project (at national collectivity level), as well as the financial analysis (at SONEL level) which classically forms an integral part of the feasibility study.

3. The impact study consists of 3 stages:

   (i) Analysis of the initial condition of the influence zone or the neighborhood close to the project (natural, socio-cultural and economic environment), and its relation to the institutional and legal environment.

   (ii) Study of the impacts of the project [1], once it is sufficiently defined, on the environment as previously defined. This impact study shall also include the related works of the project (building sites, access roads, electric lines etc.) as defined in the feasibility study.

   The project impact evaluation at this stage should also examine as much as possible the resulting effects, direct and indirect, primary and secondary, on the induced or potentialized projects or programmes of action (prospects of national development and regional development). This last aspect is normally tackled partially in the economic analysis of the project

[1] In fact, it is possible even now to envisage the extent of impacts of the project feasibility study itself, in view of the intensity of path clearing works for topographic survey and the psycho-sociological changes of the population

(iii) Study of necessary and desirable compensatory measures for the negative impacts of the project on the one hand, and the project's opportuneness for local development on the other hand. Compensatory measures may involve all aspects of local and regional environment as formerly defined. They will be identified, defined, evaluated and programmed at a "detailed scale" in the feasibility study which will incorporate the costs and benefits at the level of economic and financial analysis.

The impact study may also eventually comprise general recommendations and recall outstanding issues in the economic, institutional or legal aspects (at national or regional level), which may not concern the project itself, but could be revealed through the study of the project impacts on its overall environment.

4. It should finally be reminded that if the project is adopted by decision makers as a result of the feasibility study, supplementary impact studies shall be carried out along with the detailed studies for project execution, in order to clarify and actualize the evaluation of impacts and especially the compensatory measures, and to better define the organizational aspects of the latter.

5. The following first report attempts to be as factual and synthetic as possible (See figures and detailed information in Annex). Interpretations and more theoretical confirmations (in particular in the field of social sciences) could subsequently be completed in the final report on the initial condition analysis, after integrating the results of supplementary studies defined in Annex and detailed reference/comparison of the bibliography (See Annex 1).

PART I: INSTITUTIONAL AND LEGAL FRAMEWORK OF THE ENVIRONMENT

6. It is indeed not attempted in this report to make an actual institutional and juridical analysis of the environment concept and consideration in Cameroon. It would be enough at this stage to only draw the framework of the environment. Detailed specific studies can be carried out later during the determination of compensatory measures with regard to the legal, institutional and organizational aspects.

7. The general concept on the environment, as it has been definitely accepted by the international community, is not among the priority concerns of the Government of Cameroon as well as its population. Conciousness of the environment in Cameroon, created essentially by pressure from the international community, is recent, partial and punctual as reflected through a few concrete actions in this field... Moreover, the national

political and economic conjuncture mobilizes social actors towards priorities other than the environment. In this context, it is not surprising to find that the environment issue is somewhat dissolved, atomized and marginalized through various institutions and through many legal texts without general cohesion on this question.

I. MAIN INSTITUTIONS CONCERNED

8. The ministry responsible for environmental matters in Cameroon is the Ministry of Planning and National Development (MINPAT) with only its Sub-Department of Environment (DATE). This Sub-Department is at present equipped with few means and there seems to be a contradiction between the missions of environment protection and those of national development within DATE, making it difficult to put the two together in a same Technical Department.

9. Many other ministries directly or indirectly have formal authority on the question of environment. They are listed hereafter by main sectors of competence [1] :

(i) Population

- Ministry of Territorial Administration (MINAT): General administrative management of the population and their organized movements (migration, resettlement), supervising the regional and local administrations and authorities (provinces, departments, districts, administrative villages)

- Ministry of Public Health (MINSA): Compensatory measures.

- Ministry of National Education (MINEDUC): Possible improvement of educational structures as compensatory measures.

- Ministry of Planning and National Development (MINPAT): Planning of human resources and integration of demographic data for national development (Department of Planning, Sub-Department of Human Resources).

(ii) Mineral, water and power resources, pollutions and nuisances: Ministry of Mines, Water and Power (MINMEE) —(SONEL is under this Ministry).

(iii) Fauna, hunting and preserved areas [1] (reserves and national parks): Ministry of Tourism (MINTOUR, Department of Wildlife and Preserved Areas).

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1) Only the main ministries involved in the particular environmental problems of the study area are cited herein.

(iv) Forestry: Ministry of Agriculture (MINAGRI), through its Forestry Department and the National Forestry Development Authority (ONADEF, formerly CENADEFOR) mainly responsible for exploitation and management of forests.

(v) Soil resources and agriculture: MINAGRI and its specialized research institutes (namely IRA) and sectorial development companies (namely SODECAO in the study area)

(vi) Stock Farming and Fishery: Ministry of Stock Farming, Fishery and Animal Industries (MINEPIA) with its Specialized Research Institute (IRS).

(vii) Touristic resources and development: MINTOUR (Department of Studies and Promotion)

(viii) Housing (expropriation and resettlement etc.) Ministry of City Planning and Housing (MINUH)

(ix) Road Infrastructures: Ministry of Public Works and Transportation (MTPT) and MINPAT (infrastructures planning)

10. It is worthy of note that most of the above-mentioned technical ministries have provincial and departmental representative offices with sectorial structure identical to that of the central administration [2]. At the level of districts (Sub-prefecture), the administrative structure is not complete, however the Health, Education, Agriculture, Stock Farming and Hunting Ministries are systematically represented.

II. MAIN LAWS DEALING WITH THE ENVIRONMENT IN CAMEROON

11. A list of laws on environment protection in Cameroon, prepared by the Sub-Department of Environment and Human Establishments (DATE/MINPAT), is given in Annex 3. For the purpose of the study at this stage, however, only some essential characteristics of these laws are to be noted:

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1) It is to be noted that the concept of faunal patrimony exists but the concept of botanical patrimony is completely ignored, even by foresters.

2) Except for MINMEE and MINTOUR, the Mission could not obtain legal texts concerning organization of other main ministries and their related agencies.

(i) Absence of a code or a basic law on the environment, but existence of a multitude of legal texts dealing with the environment at sectorial level.

(ii) The land tenure system allows private ownership of a land, provided that such a land be developed, through obtaining a land title on the one hand, and possible concessions of state land on the other hand. This system is inspired by a production-oriented spirit and favors the rich over the small producers whose lands are not protected.

(iii) The forestry, wildlife and fishery system is being under revision with an aim to better conciliate the new objectives of long-term protection, conservation and management of resources with the economic imperatives of short-term exploitation of these resources.

(iv) At present, there is neither an overall code nor a basic law on water: Legal texts deal essentially with development of water resources and water supply.

Generally, the legal framework defines and encourages economic development of natural resources without any concern about their conservation and renewal in the long run

12. It should be further noted that traditional jurisdictions are being always applied, especially in East Cameroon: These consist of first degree courts and customary courts with competence in family, civil, inheritance and commercial laws. At times, there is contradiction between the common law and the modern law (especially with regard to family law and inheritance regulation). Problems which cannot be settled by these jurisdictions are referred to higher jurisdiction of magistrates' courts (the first jurisdictional level of the modern law).

PART II: FIRST ANALYSIS OF INITIAL CONDITION OF LOCAL AND REGIONAL ENVIRONMENT OF THE PROJECT

A. NATURAL ENVIRONMENT

13. In case of a pinpoint project in a given site (dam and hydroelectric power station), the geographic extent of its natural environment depends on the factors considered and their foreseeable modification after completion of the project and related works and the possible ensuing economic effects. Since the project has not yet been defined at this stage, one may temporarily consider a principal zone of natural environment that corresponds to the socio-economic influence zone close to the project (See Fig-1).

I. SUMMARY OF PHYSICAL FACTORS OF NATURAL ENVIRONMENT (CLIMATE, GEOLOGY, HYDROLOGY)

14. The topographic conditions of the project site, the local and regional geological structures, the meteorological data and the hydrology of Ntem river have already been described in detail in the "Progress Report No. 1" of March 1991. These are referred to in the study. It is to be reminded only that the project area is located in the south-west part of the forest plateau of South Cameroon, at a direct distance of 50 km from the Ocean, and less than 40 km from the borderline with Equatorial Guinea. It has a hilly relief.

15. The climate is of the Equatorial Guinean type with 4 seasons with an average annual rainfall ranging from 1,500 to 2,000 mm.

    If it rains all year long, two remarkable periods could however be distinguished: the heavy rainy season from September to November (Sougué) and the small rainy season from March to May (Esep). The long dry season (Oyono) lasts from December to February, the short dry season or "dead season" (N'koroboué) is from June to August. The average annual temperature is 24°C, with a maximum average of 28°C and a minimum average of 20°C. The relative humidity is high and varies between 62% and 98% according to the months and the time of the day.

16. The project area lies on a metamorphosed Precambrian shelf referred to as the Ntem complex, composed of various crystalline rocks: migmatite, microgranite, granite, gneiss and pyroxemite.

17. The average discharge of Ntem river is about 420 m^3/s with seasonal variations ranging from 240 m^3/sec to 610 m^3/s. The average discharge of Ndjo'o and Biwomé rivers together would hardly exceed 30 m^3/sec. The water is of "clear" type, yellow to green in colour with important development of phytoplanktons and is relatively poor in mineral elements. The pH value is neutral (See results of analysis in Annex 1 of the Progress Report No. 1).

II. SOILS

18. The soils formed on metamorphic crystalline rocks are ferralitic forest soils, yellow, zonal, orthic and not well developed. The texture is sandy-clayey to clayey-sandy. These soils are poor in nutritive elements (hydrolysis of minerals and leaching of bases), the exchange capacity is limited by content and type of clay (kaolinite).
    The potential agricultural fertility of these soils is also restricted by the structural instability of the absorbing complex as soon as the forest cover is cleared off, (weakness of

the humus horizon), and by an acid pH. These soils are therefore fragile, and degrade and erode rapidly as soon as they are cleared off forest. On the crests of hills and at the upper parts of slopes, the soils are lithosols and regosols lying on geological shelf. In lower parts of slopes, in lowlands and areas which are regularly flooded and swampy, the soils are characterized by a permanent or occasional hydromorphy (humid, acid, swampy forest soils, and pseudo-gley soils subject to temporary flooding at the foot of slopes).

III. VEGETATION

19. According to R. Letouzey's classification [1] , the natural vegetation in the project area is part of the Guinean-Congolese dense and humid evergreen forest, in the Nigerian-Cameroonian-Gabonese or Atlantic evergreen forest sector of the Atlantic Biafran District. The project area is located at the border (Ntem and Biwomé) of the Campo wildlife reserve, where large forest area is being exploited by the Campo logging company up to Nko'elon, 35 km from Nyabessan (See Chapt C.I below).

    From the phytogeographical point of view, this zone is a transitional zone between the typical Atlantic Biafran evergreen forests of Cesalpiniaceaes and the more continental semi-deciduous forests with continuous disappearance of Cesalpiniaceae as approximatly shown in the following map (by R. Letouzey).

20. The Atlantic Sempevirian humid and dense forest of Cesalpiniaceae is composed of the following typical species: Sacoglottis Gabonensis, Lophira Alata (Azobé), Gilbertiodendron Derxevei, Baillonella Toxi Sperma, Brachystegia Sp. It presents a very large biodiversity as shown in the description made from the notice attached to the vegetation map given in Annex 4. The dense and humid forest composed predominantly of elements of deciduous forest has however the following typical species: Celtis Sp, Oloptecles Grandis, Triplochliton Scleroxylon (Obéché), Terminalia Superba (Fraké), Mansonia Altissima, Entendophragma Sp.

21. Secondary forests (logging and clearing for cropping) are characterized at the young stage by Musanga Cecropioides and Albizia Sp, and at the mature stage by Albizia Sp, Terminalia Superba, Triplochiton Scleroxylon, Pycnanthus Angolensis. In the Biafran

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1) This chapter refers at this stage mainly to the phytogeographic map of Cameroon prepared by René Letouzey on a 1/500,000 scale and its attached notice.

district, the degradation of secondary forests is marked by the invasion of continental semi-deciduous species over the Cesalpiniaceae.

22. Besides these large forest formations which are evolutionary under the effect of exploitation by man, one can notice here and there the presence of forests in humid lands which are periodically or constantly flooded (riparian forests, raffia forests and swampy forests). The typical floral composition by biotops of these forests remain to be clarified by scientific authorities.

IV. FAUNA

23. In spite of an increasing cynegetic pressure (See Chap. IV below) from riverside inhabitants, worsened by among others the cocoa crisis, the wildlife is still diversified and abundant outside inhabited areas [1] , as indicated by the first analysis of field reconnaissances. By comparing the results of surveys and field observations (free, captured and shot down wild animals) with published literature (especially the Campo wildlife reserve description sheet in Annex 5), it is possible at this stage to draw a list of the main or noticeable fauna of the zone neighbouring the project, with indication of the Endemic (E), Menaced (M) or Vulnerable (V) species [2] :

Simiidae

- Gorilla (gorilla gorilla): (E)
- Chimpanzee (Pan troglodytes): (M)
- White-collared mangabey (Cercocebus torquatus): (E)
- Black colobus (Colobus satanas): (E)
- Mandrill (Mandrillus sphinx): (E)
- Various cercopithecuses (Cercopithecus sp.)

Canivora

- Leopard (Panthera pardus): (M)
- Golden cat (Felix aurata)
- Civet (Civetiatis civetta)
- Ichneumon mongoose (Herpestes ichneumon) ?
- Genet sp ?

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1) Cultivated fields (banana, plantian, maize, etc) are however subject to damages by small monkeys and gorillas in particular, to the great displeasure of farmers who do not fail to complain often, as if to better justify their hunting.

2) This implies continuous menaces if appropriate measures of protection are not taken.

Hyraxes

- Tree hyrax (Dendrohyrax arboreus): (V)

Suidae

- River hog (Potamochoerus porcus)
- Giant forest hog (Hylochorus meinertzhageni): (E)

Proboscidae

- African Elephant (Loxodonta africana cyclotis): (M)

Ruminantia

- Ash-grey duiker (Cephalophus monticola)
- Yellow-backed duiker (Cephalophus sivicator): (M)
- Red duiker (Cephalopus nigrefrons)
- Other duikers (Cephalophus sp.)
- Buffalo (Syncerus caffer)
- Harnessed guib (Tragelaphus scriptus)
- Situtunga (Limnotragus spckeï or Tragelaphus spckei)
- Bongo or forest antelope (Boorcercus euryceros or Tragelaphus euryceros): (E)

Rodentia

- Aulacode (Thryonomis sp) (locally called as hedgehog?)
- Spiny-tailed squirrel or flying squirrel (Anamalurus sp)
- Palm squirrel (Epixerus sp)
- Porcupine (Atheruvus africanus)
- Gambia rat (locally called palm rat?)

Tubulidentata

- Aardvark (Orycteropus afer)

Edentata

- Giant pangolin (Manis gigantea): (E)
- Other pangolins (Manis sp)

Saurians

- Nile crocodile (crocodylus sp)
- False gavial (crocodylus cataphractus): (E)

Reptiles

- Horny viper (Bitis sp.)
- Common python
- Varan

Batrachia

- Giant frog (courauana goliath): (E)

Chelonians

- Fresh water hawksbill turtle (Tortudo sp): (E)
- Fresh water soft-shell turtle (Tortudo sp): (E)

Birds

- Long-tailed goshawk (Uratriorchis macrourus): (E)
- Black guinea fowl (Alegaster niger): (E)
- Touraco
- Red-tailed grey parrot (common in raffia forests but vulnerable due to the hunting pressure)

Insects

Numerous and diversified; some lepidopteras are scarce and endemic (?)

Fish

The ichtyofauma will be examined in a supplementary study aimed in particular at a component of fishery development related to the future reservoir (See Chap. V, Part III and Annex 8).

We only mention hereunder the corresponding names of some vernacular terms in Mvaye-Ntoumou obtained during the field surveys, such as those kindly provided to us by Mr. Edmond Dounias who is in charge of a research programme with ORSTROM (See Annex II).

Fish Family	Name in Mvaye/Ntoumou	Scientific Name
- Bagridae	nsin ndoo /ze ndoo	Auchenoglanis balayi
	mvong	Auchenoglanis sp.
	ndoo	Auchenoglanis sp.
- Characidae	nkyeme	Brycinus sp.
	mvaa	Microlestis occidentalis
- Cichlidae	efila	Tilapia sp.
	efaabum	Tilapia sp.
- Claridae	ngoo	Clarias camaerunensis
	mvas	Clariallabes sp.
- Cyprinidae	nkpwa	Barbus sp.
	lingi	Labeo sp.
- Cyprinodontidae	mbong	(Aphyosemion lugen
		(Epiplatys sp.
- Hepsetidae	nsoo	Hepsetus adoc
- Mastacembeliodae	ngwong	Caeco mastembelus sp.
- Mochobidae	ngongo	Synodontis tessmanni
- Mormyridae	anèn	Campylomormyrus tamuanda
	ntotom	Hippopotamyrus sp.
	anèn	Marcusenius mirei

The above list shows already about twenty species or kinds among 35 vernacular names obtained on the spot. It may be concluded from this figure that the ichtyofauna is abundant and diversifed as well in the Ntem river and in its tributaries.

B. ECONOMIC AND SOCIAL ENVIRONMENT CLOSE TO THE PROJECT

I. DEFINITION OF THE SOCIO-ECONOMIC INFLUENCE ZONE CLOSE TO THE PROJECT (ADMINISTRATIVE ORGANIZATION)

31. The socio-economic influence zone close to the project (roughly shown in Figure No. 1) was identified under the assumption that the highest water level of the future reservoir would not over El. 400 m, and taking into account the administrative entities as well as the present and potential attraction radius of the Nyabessan micro-center which will undoubtedly develop through implementation of the project. The administrative organization and number of hamlets in the retained study area are shown in Table 1 below:

Table 1 Administrative organization of the socio-economic influence zone close to the project

Department	District (Arrondissement)	Canton	Administrative village (chieftaincy) (1)	
Ntem	Maan	Mvaye-Ouest	Nyabessan	(6)
			Abem	(5)
			Ntebezok	(3)
			Alen II	(2)
			Melen I	(3)
			Nhemeyong	(4)
			Nsebito	(8)
			Akom	(1)
			Jom	(2)
			Asseng	(2)
		"Boucle du Ntem I"	Aloum I	(3)
			Melen II	(8)
			Aya Amang	(4)
Ocean	Campo	Nko'Elon?	Ebenmeyong	(5)

Remark: (1) The figures in brackets indicate the number of hamlets per village.

32. In fact, the study area covers the two Cantons of Mvaye-Ouest and Boucle du Ntem I (excluding the Ngo Abang hamlet located at the borderline with Equatorial Guinea) plus the Ebenmeyong village on the right bank of Biwomé and Ntem rivers in the Campo District (Arrondissement). In total, there are 56 hamlets [1] in 14 administrative villages (3rd degree chieftaincies). It should be noted that some villages-chieftaincies are discontinuous and are composed of different hamlets sandwitched between the villages, as shown in the detailed list in Table 1, Annex 6.

II. Socio-demograPhic and anthropologicAL characteristics of the socio-economic influence zone close to the Project

33. It would be useful to provide, at this stage, the results of initial analyses of the objective characteristics of the population. As already mentioned in the introduction, more theoretical clarifications could be made at the end of the second stage study, and after

1) An exhaustive survey of which has been carried out by the Mission.

taking into account the results of supplementary studies, in order to better characterize the cultural patrimony of the project area, which should at least be given the same consideration as the natural patrimony (in fact the first shapes the second).

a) History and origins of the population

34. The population of the study area belongs to two ethnic groups: the Mvaye (Mvaye West Canton and Ebenmeyong village) and the Ntoumou (Boucle du Ntem I Canton). These two groups are descendants of a larger group called Pahouin which has a general history of migration from North/East to South/West towards the Ocean. Without entering further into the details of myth, legend and history, it can be said that the present groups settled in this area at the end of the 19th Century under German colonization and following the development of cacao plantation. The Mvaye population of Mvaye-Ouest Canton was, on the contrary, distributent along the old road constructed by the Germans which linked Campo to Akom II via Nko'elon, Ebenmeyong, Nyabessan, Aben and Massama (this road crossed the Ndjo'o river several times). The section of the road between Abem and Massama was later abandoned in 1936-1937, and the Mvaye population was obliged by French colonial authorities to come and settle along the new road, which became the road linking Nyabessan to Maan and Meyo-Centre.

b) Estimates of resident population in 1991, their evolution and basic socio-demographic structures

35. A preliminary estimation of the resident population was made by the Mission through a thorough survey of the 56 hamlets in the study area (See detailed results by hamlet in Table 2, Annex 6). The total resident population was thus estimated at 1,599 as of July 1991. Table 2 below gives the detailed figures by administrative units and a comparison with the census data of 1967, 1976, and 1987 (Source: Maan Sub-Prefecture). It is noted that the 1987 census data seem to be somehow excessive when compared to those of 1976 and 1991 (Mission) in terms of annual growth rate. The period of 1976 - 1991 is thus taken as the representative period in terms of expansion of resident population: +0.8% only per year in the whole study area (+2.8% in whole Cameroon), varying according to villages and districts (See details in Table 2) in proportion with their degree of enclavement and their socio-economic dynamism (+1.3% in Mvaye-Ouest Canton; but -0.6% in the enclaved Boucle du Ntem Canton, in which Melen II shrinks while Aloum I and Aya'amang have continued to expand up to the present). In general, the project study area is a demographically depressed zone where the active labour force is compelled to emigrate as a result of the lack of non-farming jobs, on the one hand, and the loss of

interest of young people in agriculture, aggravated by the present cocoa crisis, on the other hand.

Table 2 Socio-economic influence zone close to the project. Evolution of population by village - chieftaincy and canton, and taxable population

Village-chief-taincy/canton. (clan of origine)	Pop. 1967 (1)	Pop. 1976 (1)	Pop. 1987 (1)	Pop.91 (25.07) Mission	Average annual growth rate % 67/76	76/87	87/91	No. of taxable pers. 89/99 (1)	No. of fam. Mission 1991 (2)	Population growth rate 76/91
Nyabessan (1)	87	167	125	172	+7.5	-2.5	+9.6	21	25	+0.6
Abem (Ekan)	117	115	158	160	-0.2	+2.9	+0.3	22	23	+2.2
Nteberok (Ekan)	57	69	90	100	+2.1	+2.4	+2.7	14	11	+2.5
Alen II (Ebokaye	45	46	60	68	+0.2	+2.4	+3.2	10	10	+2.6
Melen I (Essamendzene)	84	96	78	106	+1.5	-1.9	+8.0	13	16	+0.7
Nhemeyang (Eyanfok)	116	124	156	133	+0.7	+2.1	-3.0	26	23	+0.7
Nsebito (Essokaye)	237	245	342	274	+0.4	+3.1	-5.4	58	54	+0.7
Akam (Essakak)	20	25	78	30	+2.5	+10.9	-21.2	11	8	+1.2
Tom (Essamendzane)	79	91	114	132	+1.6	+2.1	+3.7	19	24	+2.5
Asseng (Eyanfok)	43	43	54	47	0.0	+2.1	03.4	8	11	+0.6
Mvaye-Quest Canton	885	1021	1256	1232	+1.6	+1.9	-0.4	202	205	+1.3
Aloum I (2)	32	41	84	55	+2.8	+6.7	-10.0	14	11	+2.0
Melen II (3)	152	186	144	112	+2.3	-2.3	-6.1	25	22	-3.3
Aya'Amang (Essamengone)	120	118	174	146	-0.2	+3.6	-4.3	29	31	+1.4
Boucle du Ntem I Canton (partim)	304	345	402	313	+1.4	+1.4	-6.1	68	64	-0.6
Eben meyong (4)	?	?	?	54	?	?	?	14	12	?
Whole Study Area	?	?	?	1599	+1.6*	+1.8*	-1.7*	284	281	+0.8

(*) Estimated by the Mission due to lack of data on Eben meyong for 1967, 1976, 1987 and growth rates between "censuses.

Remarks: Villages-chieftaincies with presence of many clans (See Table 2) (but always one clan per hamlet, as a "general rule):
(1): Nyabessan : Ekan + Eyanfaki (Mvaye) + Essambira (Ntoumou)
(2): Aloum I : Essamengone + Essambak + Essambira (Ntoumou)
(3): Melen II : Essambak + Essambira (Ntoumou)
(4): Eben meyong : Essamendzane + Eyanfok + Essakaye (Mvaye)

36. The socio-demographic structures are based on the restricted family or home (simple family) which forms the elementary unity of family relationship and socio-economic solidarity, composed of a family head (generally a male adult), his monogamous or polygamous household, and a number of dependents (children, grand-children under his care, unmarried mothers, young couples, elderly persons, etc.). In total there are some 282 homes in the study area with an average size of 5.7 residents per home (with extreme cases ranging from one to more than 20 persons per home. See details by hamlet in Table 2, Annex 6).

The following average socio-demographic composition of families is observed in the study area as a whole (See details by clan in Table 3 below):

- Widowed or divorced men, family heads	:	5%
- Single women, family heads	:	13%
- Polygamous households in % of married men	:	13%
- Depending households in % of married men	:	5%
- Unmarried mothers in % of married women or family heads	:	14%
- Number of illegitimate children in % of dependent persons	:	8%

It is worth noting the relatively large number of single women family heads (often widowed and divorced) and unmarried mothers. Polygamy is, on the contrary, quite reduced in general; this reflects among others the low economic level of the society, on the one hand, and probably the influence of old Christianity on the other hand. It should be noted also that if illegitimate child-bearing has become frequent and socially admitted, a large number of cases of eventual sterility are observed on both men and women during field surveys; would there be a sort of implicite socio-demographic compensation between these two phenomena?

We should also know that in this society a married son becomes soon autonomous from his father, contrarily to some other more patriarchal societies. In fact the eldest son assumes power on the extended family (See explanation in the following sections) as far as he is physically apt and fully controls his intellectual faculties.

c) Social structures and spatial organization

37. The tribe (Mvaye, Ntoumou) constitutes the top linguistic identity reference of populations. However, the tribe is not so highly important within the larger Pahouin group, and it may sometimes be confused with the clan, both being called by the same name (ayon). In fact, according to two opposite fundamental versions, the tribes could either be descendants of a common legendary ancestor: Afrikara [1] , or historical socio-political aggregates of clans that are found in all tribes, each clan having its own eponymous ancestor. (In fact two major theories of tribal structure are observed: The segmental dissimulation and the pluricultural assimilation). Whatever the case may be, the territories of the two tribal groups, Mvaye and Ntoumou, are clearly delineated in the area studied (Refer to Item 34 above).

38. The clan (ayon) certainly remains the fundamental structure of the Pahouin groups in general, and of the Mvaye and Ntoumou groups in the study area in particular. It is through this structure that the society "most spontaneously reveals itself and communicates with the outside". The clannish identity of individuals is still strongly marked as it is observed during the field surveys. Without going into any historical analysis of the symbolic and objective functions of the clans, the study at this stage is limited to only an identification of these clans in the area (See list of hamlets and corresponding clans in Table 2, Annex VI) and their comparative socio-demographic characteristics (Table 3 below). There are 6 Mvaye clans and 3 Ntoumou clans.

These are strictly patrilineal and patrilocal clans with, almost as a general rule, one clan occupying one hamlet. Villages, chieftaincies are also generally monoclannish. However, one clan may, according to its size, cover many village-chieftaincies with sometimes scattered hamlets (See Table 2, Annex 6). A hamlet, a village is thus identified at first by the clan of people residing in it and according to an absolute rule of inter-clannish exogamy and virirolocality [2] : one will never find a married woman of the same clan residing in the same hamlet. Only in case of divorce, but not systematically, can a woman come back and live in her father's village.

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1) See the Legend transcribed in Ntoumou for instance by the Presbyterian Mission, which extends into historical times: "Bulu ban be Afrikara".

2) However, "uxorolocality" is sometimes observed in the cases of widowed or divorced women being re-married with "strangers" who are not Mvaye or Ntoumou, because the traditional levirate (captation of offspring) law tends to fall in abeyance.

Table 3 hereafter provides a series of indicators enabling to evaluate the respective "strength" of different clans in relation to their demographic dynamism.

39a) Extended family or minor lineage: This is a level involving at the same time common family relationship and co-residence, immediately higher than the level of home (simple family) or restricted family. This structure is in fact clearly observed in the case of a same family group identifying itself as such and constituting a hamlet. It can be thus classified as village family (Ndabot). Anthropologically it corresponds to a "patrilineage" qualified as minor and involving 4 - 5 generations in maximum (grandfather, father, uncles, sons in general). Familial hamlets are therefore clearly identified during the field surveys (See Table 4, Annex VI).

39b) Lineage family or major lineage, or clan fraction:

At an intermediary level between the village family and the clan, there is at present a more striking and unprecise anthropological stratum. In fact this is practically found in large monoclannish villages consisting of many extended families and homes which are not identified by a known relationship of 4 - 5 generations ago but invoke, beyond their membership to a same clan, an older intermediary relationship (why there is the notion of clannish fraction or major lineage - Ndzan) dating back to more than 5 generations. Only some notables who have memorized the knowledge of generations by rote (this was usual when they were young) [1] could partially distinguish this level, which is fading from collective memory, between the two more "palpable" unities of extended family and its sub-unit (the co-residence hamlet) and the "universal" cultural clannish structure of the Pahouin. Four hamlets could however be identified as belonging to a same fraction or major lineage within the Essamendzane, Ekan and Ebokaye clans during the field surveys (See Table 4, Annex VI).

40. As a tentative synthesis of social organizations, a classification of 56 hamlets in the study area by simplified typology based on their level of anthropologic structuration is given in Talbe 4, Annex VI. This topological classificastion is summarized as follows for the whole study area:

1) Traditions potentialized since the 1940s by the political movement of the Mfulanmeyon, based on the return to traditions, and the Pahouin-Bassa pan-ethnism in Central and South Cameroon.

Type of hamlet	Number. of hamlets	% of total pop.	Number of homes per hamlet	No. of pers./ home
Home-hamlet (HF)	9	5	1	7.4
Extended family hamlet (HFE)	24	36	4	6.4
Major lineage hamlet (HL)	4	12	7	6.6
Monoclannish composite hamlet (HC) (none group with significant extended relationship)	10	19	6	5.2
Mixed hamlet (HL+HC or HFE+HC)	8	24	11	4.5
Pluriethnic centre (pre-urban type) Nyabessan	1	4	(1)	8.8
Total	56	100	5	5.7

d) Marriages, family relationship and woman's status

41. Within the framework of clannish "exogamy" which forms an absolute rule, prohibitions of marriage are determined by the taboos of incest involving the union with a woman from the clan of the mother, grand mothers, nieces, etc., i.e. according to an "exogamy" rule in maternal lineage, but always identified in patrilineal way. However, after about 3 to 4 generations the rule seems to suffer from many exceptions because of the little importance attached to keeping maternal genealogy in the Mvaye and Ntoumou communities. On the contrary, clannish exogamy is strictly observed as shown in Tables 3 and 3A in Annex 6 which indicate interclannish marriage matrixes from the 9 clans found in the study area (investigation and field survey conducted on 319 cases of married women). When comparing Table 3 above and Table 3A in Annex 6, it becomes clear that certain clans are "over-represented" through housewifes provided by the clans to the study area, compared to the number of patriarchal households identified in the same clan (especially in the cases of Essambira and Essambak). For the other 7 clans, the opposite phenomenon is observed and a large number of marriages with wives from clans or tribes not patriarchally represented are recorded in the project area.

Table 3: Socio-Economic Influence Zone Close to the Project - Importance and Comparative Socio-Demographic Characteristics of the Patrilineal Clans of Men

Patrilineal clans of men	Number of hamlets (Tab. 2)	Number & % of families		Resident Population (1)		Number of resi-ding pers. per fam.	Widowed or divorced men-heads of family,%	Women-heads of family %	Polygamous households, % of married men	Dependent households, % of married men	Single mothers, % of married women or heads of family	Number of illegitimate children,% of dependents	Annual growth rate of population 1976-1991, %
		No.	%	No.	%								
Ekan	12	42	15	370	23	8.8	5	3	20	13	3	1	+1.5
Essokaye	9	56	20	284	18	5.1	4	7	8	6	21	11	+0.7
Essamendzane	7	45	16	250	16	5.6	9	11	14	-	20	11	+1.6
Ebokaye	2	10	4	68	4	6.8	(-)	(10)	(10)	(-)	(15)	(6)	+2.6
Eyanfok (5)	10	43	15	232	14	5.4	8	23	14	4	10	6	+0.7
Essakak (5)	1	8	3	30	2	3.4	(-)	(33)	(-)	(-)	(38)	22	+1.2
Total Mvaye Clans	40	204	73	1234	77	6.1	5	12	13	5	15	7	+1.3
Essamangone	5	38	14	165	10	4.3	5	22	11	4	8	4	+1.4
Essambak (5)	5	14	5	55	4	3.9	(7)	(14)	(17)	(-)	(6)	(16)	
Essambita	6	17	6	128	8	7.5	6	6	14	10	19	13	) -1.7
Total Ntoumou Clans	16	69	25	348	22	5.0	6	16	14	6	11	9	-0.6
Total Study Area	(2) 56	(3) 282	(3) 100	(4) 1599	(4) 100	5.7	5	13	13	5	14	8	+0.8

1) Estimated population in 1991 according to survey by the Mission
2) 1 hamlet is composed of two clans (Ndjo'op has in fact 2 sub-hamlets)
3) Including 8 families of which heads came from other regions (mainly Central Nyabessan)
4) Including 22 inhabitants (8 families) who came from other regions
5) The percentages in brackets are not significant considering the low representation of the clans concerned in terms of number of hamlets or population in the study area.

42. As to the form and rite of marriage, there are at present two main types:

- "Rapt" (forced) marriage (abom), which is most frequent now;

- Regular marriage (Eyala)

Without making any detailed analysis of these two systems of marriage and their ritual aspects (this could be dealt with at a later stage), it should simply be noted that these two forms of customary marriage are based on the negotiation of a dowry which constitutes some sort of value of buying the woman by the man's family. Dowries are paid in cash (from CFA 50,000 to 400,000 in the project area; average value: CFA 150,000 - 200,000). These are very important sums [1] resulting often in debts. They are paid in many installments, must be reimbursed in case of confirmed divorce and cause frequent disputes leading to traditional courts. Nonetheless, the traditional marriage is actually valued as the best at present, compared to religious and civil marriages which are practised secondarily.

43. From the biological consanguinity (uterine filiation and patrilineal filiation) to the clannish "relationship", it is understood that the systems of relationship are complex, opportunist and have "variable social geometry". They are of course untranslatable in the nomenclature and terminology of the "modern family law based on the monogamous couple/family". Study of the terminology and the systems of relationship, though being fundamental for understanding the elementary social structures, is out of the scope of study at this stage.

It should simply be said that individuals are classified and identified in the society per age group, sex and generations. In terms of terminology of relationship, let's cite some exemples: boys of the same clan, cousins, nephews and half- or full brothers can be called "brothers" (bobenyam) ("elder" or "younger" brothers according to the age); grand-parents are called bimvemvemm regardless of sex and lineage; close or far relations on the mother's side are identified from the village of origin of the mother (dzan); there is no sex distinction between grand-children (ndaïzem); appellation "father" (essawom) may designate the biological father as well as the grand-father, paternal uncle or tutor brother; the parental terminology changes depending on the vocative subjects (for instance, my father: essawom, your father: essova, his father: essaouï, fahter in general: essa), etc.

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1) This excessive monetary dowry compared to the average financial level of the families would have result from colonization with its values based on commerce, profit and productivity. According to some notables, in the past dowry was more of a symbolic exchange which sealed an alliance between two families as decided by the elders.

44. The woman's status is characterized by a relative economic autonomy rendered possible by cultivation of food crops, especially groundnuts and plantains, and heavy daily domestic and farm tasks. On the contrary, socially speaking, the woman is a minor, dependent in turn either on a father, a husband, a brother or on a son. There is often dispute on the ownership of children who are often passed over to and kept by the husbands in case of separation after leaving and return of the voman to her father's village (in such a case the dowry must therefore be refunded by the woman's family). It is only at a certain mature age that a widowed or divorced woman (remarried or not) can attain a recognized social majority status and become economically autonomous or even become head of family if she still has little children under her care.

e) Sacred: Christianity and Invisible Forces

45. Christianization of the study area is old and dates back to the beginning of this century. It began with the coming of Presbyterian missions into this area through the Campo-Efelan axis. The catholic mission of Ngobayan (Lolodorf) came next and settled directly at Abem during the French era, at the start of the 1920s.

46. What is stricking is the diversity of religions represented in the study area and the relative luxury in number and quality of the churches compared to the economic level of the population. Thus, it is revealed that within the study are there are 9 religious establishments for some 1,600 inhabitants, with the following distribution by village and by religion:

Canton	Village/ Chieftaincy	Presbyterian Church (EPC)	Orthodox Presb. Church (EPCO)	Catholic Chrch
West Mvaye	Abem	1		1
	Alen II	1		
	Nhemeyong	1		
	Tom		1	
Ntem Loop	Alom I	1		
	Melem I	1		1
	Aya'amang			1
	Total	5	1	3

47. New socio-cultural and socio-political structuration developments based on traditional clannish structures and their interrelations are yet to be studied. As regards the fundamental Christian values, there has been conciliation here like elsewhere, without problem, with polygamy and the illegitimate conception. If the worshipping of ancestors

(bieri) seems to be definitely forgotten, food taboos still exist. Beliefs in the magic, sympathetic magic, desenchantment, witchcraft and superstitions of all kinds are continuing on [1] in parallel with other official cults mentioned above. In the study area, there are 6 healers [2] two of whom are "officially recognized", some practising simple traditional medicine while others "going further" according to the cases and the demands. Thus, there remains a complete hierarchic and categorial structuration of the sacred (which is out of the scope of this study) to be studied. Theses aspects are part of the daily life of the peoples and their cultural patrimony; they condition the daily life and the elementary social inter-individual and inter-group relations, both internally and externally.

f) Psycho-sociological associations and other aspects

48. It seems from a first analysis that organized mutual aid and traditional association between families is not so strong as seen in some other African regions. There are indeed some traditional forms of women groups doing farm works together (ekama), or land cultivation at a man's request for claiming a new farmland (also ekama), but these forms of mutual assistance and collective work seem to be given a lesser importance nowadays.

By contrast, individualism, and wait-and-see atttitude seem to be more prevailing, especially with the men (youth and children). There is a lack of interest in the cultivation of cacao, the only agricultural crop that actually mobilized male work force. Now every body expects either through migration and education of children or, more recently, through the dam project [3] , the coming of a beneficent manna; this reminds of the founding myth of the Pahouin migrations based on the search for a maritime Eden in the West.

III. SOCIAL INFRASTRUCTURES: HEALTH AND EDUCATION

a) Health infrastructures and health condition of the population

49. The aspects of public health should be analyzed in a particular study, considering the specific and important nature of the subject (See Chap. I, Part III below and Annex VII). Health infrastructures in the study area are limited to the Nyabessan Developed Health

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1) Cases of Telekinesy ("curers"), sympathetic magic ("vampires"), murders by bewitchment, etc. are frequently reported.

2) They are from the Eyenfok clan, reputed with its powerful "healers".

3) There are many signs of this problem: Pressing demand of young men for daily salary jobs to cover their studies, plans of construction of secondary houses for men coming from the zone and working "in the town", in Yaoundé or elsewhere, individual plans of land registration, "minor" dispute with SONEL for land utilization for encamping, etc.

Center with 3 health agents including the Center Chief, who is State-registered Nurse. The buildings are decayed and poorly maintained, the equipment for treatment and minor surgery as well as the drugs are in their most elementary status. People prefer self-medication (buying drugs available from traders in Maan, traditional medicines, consulting traditional curers). When this self-medication reveals not effective, it is most often "very late" for the Nyabessan Center to take action, and the last resort is to order evacuation of the patient to the Maan District Hospital at the expense of the patient, if his family has the means and the will...

50. The Mission has also visited the Maan Hospital. The buildings are new, large and in a relatively good condition. A surgery bloc is even under construction (works are however being suspended at present due to lack of fund). The hospital personnel includes 10 staffs, but there is no doctor. Drugs are not much better than in Nyabessan and treatment equipment is also quite limited. Only a stock of vaccines is kept in a refrigerator for use in children vaccination operations. Under these conditions it is not surprising to find that the hospital is empty, as same as its pharmacy, in spite of its theoretical capacity of 54 beds.

According to the Chief of Ntem Health Department, the Maan District is the poorest in the whole Province in terms of health services. In such a situation, it can be envisaged that the health condition of the population in the district is particularly to be worried about.

(i) The following points are noticed at Nyabessan Center:

- A heavy rate of infant mortality due to malaria, multiform diarrhea, lung infections and whooping cough.

- Among the adults, malaria is endemic and particularly affects non residents who are in passage; helminthiasis and other intestinal parasitoses are frequent, as well as rhumatismal syndrones and lung infections; bilharziosis is scarce and there are a few cases of blindness due to onchocerchosis; venereal diseases are not so much observed and are under systematic self-medication.

(ii) At the Maan Hospital the following points are remarked:

- General problem of "focal danger" and consumption of dirty waters, due to inadequate water supply system;

- A recent breakout of measles;

- Problems of infant malnutrition in protein and calory, which may result from the persistence of certain food taboos mainly among children on the one hand, and the restriction of family food rations on the other hand, linked to the fall in cash revenues

from cocoa which were used essentially to buy food, due to insufficient land area for cultivation of food products.

(iii) At the level of Ntem Health Department in Elsolowa:

It is finally noted that besides classical parasitoses in these forest zones (malaria, onchocerchosis, intestinal parasitoses) there is an outburst of leprosy (363 cases recorded) and tuberculosis. As for sexually transmissible diseases (STD), the list is alarming with 20 cases of AIDS noticed at Ebolowa, many cases of syphilis and poorly treated chronic gonococcies resulting in complications, which are obviously one of the causes of relatively frequent sterility cases observed during the field investigations.

51. In conclusion, amelioration of the health infrastructures and services as well as the hygienic lifestyle of the population is worth of attention in priority in the future and should also be taken as one of the supporting actions of the project development, if not a a compensatory measure.

b) Educational infrastructures

52. The existing educational infrastructres in the study area in 1990-1991 are the following (primary schools):

School/ village	No. of teachers	No. of pupil enrolled	% of repeaters	No. of classrooms	No. of classes	No. of seats
Alem II	1	52	50	1	2	70
Nhemeyong	3	86	?	3	6	112
Nyabessan	3	191	45	4	6	84
Total	7	329	"	8	14	266

At this stage the following are worth noting:

- the overloaded capacity of the Nyabessan school which also receives pupils from the neighbouring villages of the Boucle du Ntem I Canton;
- the large number of repeaters;
- a relative high rate of schooling.

Studies will be carried out later on the possibility of improving the educational network within the zone of influence close to the project.

IV. ECONOMIC ACTIVITIES

53. The present and potential economic activities should be subject to supplementary studies. The study at this stage is to define only an outline based on the findings during the field surveys as follows:

a) Agriculture and animal husbandry

54. Agriculture, primarily cacao cultivation, constitutes the main economic market activity in the study area. Unfortunately this activity is on the decline since some years because of the drop in world prices and the suspension of SODECAO's support since the 1989-1990 cocoa season. (Its main activity was to provide plant protection products, selected seedlings and, secondarily, technical guidance).

55. From a general agronomic viewpoint, the regional climate determines two food cropping cycles per year (2 rainy seasons), but the practice of associated food crops with shifted cycles enables in fact to harvest food crops throughout the year. In this sense, food crop fields are indeed a real living larder. All the crops are planted on cleared forest lands under fragile fertility condition as aforementioned. There are three main types of crop fields:

(i) Cacao fields, half-shaded by forest trees (tall trees are left during clearing), with caring and weeding of underplanted cacao-trees being done by men;

(ii) Food crop fields, on more open cleared forest land (more heliophile crops), cultivated mainly by women (men are mainly engaged in the first clearing). In these fields, there are various intercropping systems according to a certain number of associations and successions of crops.

The food cropping patterns could be outlined in 2 main types:

- Groundnuts, at the beginning of the rotation, followed by various associated food crops with shifted cycles (cocoyam, maize, plantain, banana, yam, eggplant, squash) and cassava (which is a crop difficult to plant) at the end of the planting cycle, before the return of fallow period (average period of planting cycle: 18 months, followed by a fallow period of 2 to 3 years).

- Squash (locally called cucumber) at the beginning of the rotation, associated with plantain and/or mainly with cocoyams, then cassava again at the end of the cycle as same as in the above pattern.

(iii) Home vegetable gardens with various vegetables planted in small areas (cocoyam, pepper, squash, eggplant, etc.) and a belt of familiar fruit trees (safout, mango, banana, citrus trees, etc.) sandwitched between and behind dwelling houses (on the "garden" side as opposed to the "street" side of the village).

56. Generally, cacao and food crop fields are not located further than 2 - 3 km from the hamlets. They are sometimes nearer (this should be clarified later, among others, by photo-interpretation). The yields and incomes from cocoa could be relatively well determined through the extension services of SODECAO (according to the Agricultural Delegation of Maan District, the average production of cocoa beans in Nyabessan area is 200 kg per hectare) This has fallen since 2 years and production was no longer recorded due to lack of staff. As to food crops, their productions have never been actually grasped by agricultural agencies. Agro-economic parameters by operation, cropping pattern, area unit, work day and household are to be clarified at a later stage. At present agricultural services of Maan District utilize the following rough criteria for establishing their statistics: 0.5 ha of cacao per active person, 0.25 ha of food crops per active person; 40% of active persons among the population.

57. Since the extension services for cacao cultivation are suspended for the time being, the role of extension staff of Agricultural Posts (1 post in Nyabessan with 2 staff members) is totally symbolic and must be reviewed again from A to Z...

58. Animal husbandry is limited to poultry (fowl, duck) in wandering condition and to goats and sheep (introduced by the missions), also in wandering condition. The economic weight of the latter is not high, as they are kept as prestigious animals and are only sacrified or offered at feasts and ceremonies.

59. Besides necessary resettlement and compensation for damages of houses and crops which would be inundated by the future reservoir, it seems most important to promote a local agricultural development component for ensuring a certain stability of the rural population within the area, and for satisfying the future local food demand, especially during the stage of execution of construction works (this constitutes also an opportunity to secure outlets for the food crops to be developed).

b) Hunting and fishery

60. Hunting is a real economic activity of the population in the project area. It is the main source of animal proteins in food rations; it also provides substantial cash income through the sales of animals in larger villages, Nyabessan and Maan centers and also to "passing people". Recent researches carried out in the Ocean Department [1] lead to estimate the daily intake of bush meat at 185 g for the Mvaya population in the forest area of this Department.

In the study area, this ration is undoubtedly not lower than 100 g. If the sold volume of more or less cured meat is added, the total annual volume is roughly estimated at:

0.120 kg/inhabitant/day x 1,600 x 365 = 70 tons

for the entire study area, which is very important. These figures are indicated just for reference only at this stage and will be examined again later in a more detailed complementary study on this subject. [2]

61. Most frequently captured animals are cephalophus and situtonga (hare and antelope in local French), porcupines and aulacodes (locally called hedgehog?) [3]. Hunting is made either by gun (for monkeys and big animals), or by different kinds of traps (neck traps for monkeys and squirrels, ground neck traps for rodent and small carnivorous animals, ground foot traps for hares, antelopes and suidae, bar traps, ekoumou which is traditional and still in use, for rat moles and porcupines).

62. The Mission took note of the hunting law in force and also met with a forest-guard of the Maan Post (3 agents in total in this Post with only 1 motorcycle in running condition for all of them). The main tasks of these forest-guards are in principle:

(i) Prevention of poaching: Consumption of wild animal meat is permitted to riverside inhabitants but its sale is forbidden; their main activity is indeed to seize animals transported in vehicles passing through Maan Center.

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1) Provisional report of surveys on foods, nutritional anthropmetry, octograms and energy spending. - GJA Kopert, ORSTM-CNRS-ISH, March 1991, cited in Bibliography

2) With forecasting of the activity under the dam project and examination of foreseeable evolution of the resource.

3) But gorillas, elephants, panthers also are not spared by "great" hunters, if they have a chance.

(ii) Check of hunting arms and issuance of permits: Only two permits for limited hunting were issued in 1990 in the Maan District for a total of 139 guns officially registered by the authorities.

63. These first prominent aspects of hunting activity without any further comments at this stage sufficiently show the existing "gap" between theoretical hunting law and the actual social practices. The situation could be further aggravated in future with the new demand for wild animals from the dam construction site, and the possible Campo-Nyabessan road connection, etc... The topic will be discussed later again, but only the development of new economic activities would allow to timely relieve the fauna from a growing cynegetic pressure, which is conjuncturally provoked also by the fall in income from cocoa, in order to once again preserve natural resources for future generations.

64. It is to be noted also that capture of living animals is also observed in the study area (especially catching of living parrots, and also young monkeys). Four capturers are officially licensed in the Maan District. They have theoretical catching quotas and must pay taxes, but it is difficult here again to control them.

65. Fishery: Traditional fishing is practised here and there during dry season on the Ntem, Biwomé and Ndjo'o rivers (as well as hunting for crocodiles whose meat is much appreciated). This component will be elaborated later in supplementary studies, on the present situation as well as the development potentials brought about by the future reservoir. It can be noted simply at this stage that the Mvaye and the Ntoumon peoples in the study area are traditionally neither good fishermen, nor good users of pirogues; and fishery activity is of course secondary to hunting activity as far as animal protein supply to the population is concerned [1].

c) Other economic activities

66. Apart from agriculture and hunting, other economic activities remain secondary up to the present and are restricted to artisanal activities (mason, carpenter, tailor) and small businesses (there are 5 shops and 1 drinking spot in Nyabessan), some other sales spots

1) Researches carried out in the Campo Department, as cited previously, estimate the daily intake of fish per capita of the Mvaye population in the forest area of this Department at some 40g, a significant part of which comes indeed from seafish bought in the local markets.

scattered in Ntebezok, Melen, Nsebito, Nhemeyong. In this area, like in others, it is remarked that beer as well palm wine consumption is high, essentially among the men.

The study works (topographic survey, construction of paths) have indeed already brought about some cash income to Nyabessan area to which young people rush in quest of job, and this in turn benefits traders and sellers of alcoholic drinks.

67. For the time being there is no actual forest exploitation activity in the study area. Wood is taken by the local population only for their fuel and construction needs.

C. ON-GOING OR PLANNED REGIONAL ACTIVITIES AND PROJECTS

68. Since the main objective of this study is to evaluate the impacts of the Memvé Elé Hydroelectric Power Project on the local and regional environment, it should be reminded that other on-going or planned projects in the area might condition the development of the environment on the one hand, and might be potentialized or otherwise constrained by the Memvé Elé Project on the other hand. At this stage, these projects are only identified. They will be further examined at a later stage, especially after discussions which are recommended to be organized between different institutional partners and social actors.

I. FOREST EXPLOITATION AND CAMPO WILDLIFE RESERVE

69. The Campo wildlife reserve is described in the description sheet given in Annex V. The notion of fauna reserve in this place is totally theoretical, because the developable flat area (including the Bongola islet) has been under relatively intensive logging since 1968, and the site is being crisscrossed and squared by many paths in excellent condition as it was noticed during the visit to the Campo Logging Company (formerly HFC). Without making any detailed analysis of the activities of this Company, it should be noted that the logging license will expire in 1994 and its renewal is not yet decided for the moment.. On the contrary, the company has a long term plan (10 years) to expand logging up to the area near Ebenmeyong and Ntem, and to extend for this purpose the forest path beyond Nko'elon to reach Ntem river downstream of Nyabessan, where a bridge site has already been identified.

This company constitutes a major economic activity that creates job opportunities in the Campo Department. For its long term operation the company envisages to obtain a permit for exploitation of the forest massif of the Boucle du Ntem, which is rich in

okoumé, [1] and this would be subject to an allocation of forest reserve by the Forestry Department for the time being.

70. At the same time, however, the World Bank would be ready to finance a project aimed at strengthening protection and developing the Fauna Reserve under which certain cantons could be abandoned, and others set up under full protection (the hilly enclaved area situated within the quadrilateral of Nko'elon, Ebenmeyong, Akom II, Akok). But until now the Bank has exiged as a sine qua non condition that the logging license be not renewed. Thus there still remain some stakes and problems being unsettled at present. Anyhow, a decision must be taken in 1994 when the exploitation license expires.

II. FORESTRY AND NATIONAL DEVELOPMENT MASTER PLANS

71. The Forestry Department has conducted a master planning study on forestry development in the entire southern forest plateau of the country, including the zone of influence of the project. This plan envisages spatial allocations for forest reserve zone, preserved forests, logging zone, agro-forestry zone. The respective plans are however under study and discussion and are not considered as official for the time being. They are based on forest inventory survey on 1/200,000 map and detailed map on 1/5,000 scale, for which reports, mapping documents and 1/20,000 aerial photos related to the study area should be provided to the Mission (See Bibliography and Chap. II, Part III below).

72. In parallel with the above, another master planning study on national development would be conducted by DAT/MINPAT under financing by CEE/German biltaeral assistance. The Mission this time could not get more information on the ins and outs of the said study.

III. OTHER PROJECTS

73. Other significant projects related to the study area as identified at this stage are the following:

(i) USAID-SESA "American-Cameroon Cooperation for Primary Health Care" Project covering the three Central and South districts in the first phase. Its main components consist of medical and pharmaceutical supplies, providing means of transport, family planning, health training and education. The Maan District is not

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[1] The creation of a wood-peeling industry in the vicinity of Nyabissan could be planned due to the presence of Campo Logging Company; and the Memvé Elé Project, supplier of industrial power, would therefore facilitate such an installation.

focused on for the time being due to lack of resident physician. This should be reconsidered in the future, in view of the health situation in this district and the opportunity of the Memvé Elé Project.

(ii) SODECAO Restructuration Project aimed at transferring the task of supporting the farmers to the staffs of agricultural agencies of departments and districts.

(iii) National Plan of Research and Agricultural Extension, which would lay more emphasis on the development of food crops. In the study area, the agronomic reseach station of reference is the Ekona station near Ebolowa. The Mission was unable this time to get information on eventual existence of precise research/development and extension programmes related to the project area. Suggestions will however be made later within the framework of the study on a local agricultural development component, which should accompany the measures of resettlement of the affected populations.

PART III: RECOMMENDATIONS AND SPECIFICATIONS FOR FURTHER IMPACT STUDY

I. PROGRAMMING OF IMPACT STUDY AND SUPPLEMENTARY STUDY AND EVALUATION WORKS

74. This report constitutes a first provisional report on the analysis of the initial environmental condition of the project, which should be completed later especially in the aspects of health condition of the population and quantification of local economic activities. For reasons of rationality and economy, these supplementary analyses of the initial condition will be executed at the same time with the study of the project impacts and the compensatory measures to be envisaged in corresponding areas.

These supplementary study works (defined more in detail below and in Annexes VII and VIII) can therefore be started only after selection of a project alternative which determines at least at this stage the sites and principal dimensions of major structures and service roads, the highest water level of the future reservoir (elevation of spillway crest) and its features (area, depth, volume), guidelines for its operation as well as the discharges (fluctuations of water level, characteristic of discharge released to downstream of power plant, unutilized discharges of Ntem, Biwomé and Ndojo'o rivers which will (or not) continue to run through the falls, etc.).

It is known that these technical options can be decided only after the results of topographic survey of the basin are obtained and analyzed.

75. For the same reason, the JICA consulting environmentalist/coordinator of the study should start his job again only after the main features have been determined and he should be ahead with a minimum overlapping with the supplementary evaluation and study works. This would enable him to finalize the analysis of the initial condition during his second mission, to integrate the results of studies on impacts and compensatory measures conducted for the corresponding areas, and to carry out the second stage field work to confirm these studies and complete the items to be undertaken by him in the impact study (especially on the natural environment).
The 3rd stage work would include the finalization of the impact study with the preparation of final and synthesis reports covering the 3 components of Initial Condition - Impacts - Compensatory Measures. The following organizational and chronological diagram summarizes the principles explained above:

Selection and definition of a project alternative	Submittal of final report on the initial environmental condition	Submittal of final report on impact study
⇓	⇓	⇓
Supplementary evaluations and studies	2nd mission of the consultant	3rd mission of the consultant
(Health, economic activities, resettlement, indemnification, infrastructures (±3 months)	Environmentalist (±1 month)	Environmentalist (±1 month)
	⇓	⇓
	Period to be decided later according to the progress of the feasibility study and the determination of related works of the project, of which impacts and compensatory measures shall also be evaluated.	

76. Another fundamental recommendation to be made to this effect is to take advantage of the topogarphic survey of the basin on 1/10,000 scale to pick up the residential areas, buildings, cultivated lands and plantations located below the limit survey elevation (410m?), and to reproduce them by rough survey on the topographic map of 1/10,000 scale. This work alone would permit, by completing with standard field works envisaged in the supplementary study, to estimate correctly with sufficient precision the number of people to be resettled and the properties to be compensated according to the highest water level of the reservoir.

77. The recommended supplementary evaluations and studies involve two major sectors (detailed specifications are provided in Annex):

(i) Health

- evaluation of the present health condition of the population (not restricted to parasitology) and health structures and services;
- evaluation of the the project impacts on vectors, parasitoses and other health aspects;
- proposed countermeasures for negative impacts and general actions for improvement of condition of health service to the population.

(ii) Economic activities, resettlement and infrastructures

Sectors involved: fishery, hunting, agricultural activities, housing, water supply to the population, eventual construction of village service paths.

Types of investigation: complementary analysis of the present situation; evaluation of the project impacts, in particular in the aspects of affected populations (houses, crops, paths); determination and economic quantification of compensatory measures (resettlement, indemnification, new plantations, etc.), identification, justification and definition of additional economic and social components (local agricultural development, water supply, improvement of educational infra-structures and service paths, etc.)

Note: The above-mentioned supplementary studies shall be executed at the level of definition and detailed feasibility study, including cost estimates and expected effects of each component, as well as the required organizational and institutional measures.

The above supplementary evaluations and studies will be carried out under the management of SONEL as the executing agency, with the assistance of the JICA Consulting Environmentalist. For cohesion and convenience sake, the second study component (econonomic activities, resettlement and infrastructures) should be entrusted to only one public agency specialized as a consultant office which could in turn entrust the study to other expert agencies (IRZ, especially for fishery).

II. SUPPLEMENTAL DOCUMENTS TO BE COLLECTED BY SONEL

78. The following documents should be collected by SONEl before the beginning of the supplementary studies and the second assignment of the Consulting Environmentalist of JICA:

(i) Decrees related to the organization of the following ministries and agencies: MINPAT, MINAT, MINAGRI, MINEPIA, MINSA, MINUH, MISERES, IRA, IRZ, ONADEF, MINASCOF, MTPT.

(ii) Documents to be procured from ONADEF:

- Topographic base maps (fonds topographiques) on 1/50,000 scale, Nyabessan area, sheets No. 1D and 2C, on stable transparent support (CENADEFOR 1986)

- Forestry inventory reconnaissance map on 1/200,000 scale, Kribi area, on stable transparent support (CENADEFOR 1986)

- Detailed forestry inventory map on 1/50,000 scale, Nyabessan area, sheet No.1d (CENADEFOR 86?) on stable transparent support

- Aerial photographs: CAM 85-24 on 1/20,000 scale
  - Band L11: Photos No. 225 to 236
  - Band L12: Photos No. 107 to 120 and 194 to 207
  (CENADEFOR - Canadian Aid)

- Report on 1st stage inventory reconnaissance - Forestry Development Project in the South Area (CENADEFOR 1987?)

- Inventory report on development of the forest reserve of Maan (CENADEFOR)

III. INFORMATION ON THE PROJECT AND ITS IMPACT STUDY

79. It is recommended that SONEL organize at a convenient time an information-discussion meeting of representatives from main ministries and agencies concerned with the project and its impact study, as well as other on-going or planned regional projects.

80. As to the population involved, prudence is recommended and information must be limited strictly to the study activities at present, without other considerations on advantages and disadvantages, individual and collective strategies related to this project of which implementation can in any case be decided only after completion of the feasibility study and preliminary design.

IV. SELECTION OF A DESIGN ALTERNATIVE: SOME PRELIMINARY RECOMMENDATIONS

84. The Progress Report No.1 presents four possible alternatives. Taking into consideration the main hydroelectric power potential to be exploited by developing a fall with substantial discharge, and from a strictly environmental viewpoint, it may be recommended a priori at this stage:

(i) to strictly restrict the reservoir storage volume to a technically required minimum. To this effect, the highest water level at El. 400 m seems recommendable, in order to limit damages to inhabitants and crops (according to a preliminary analysis, even with a water level at 400 m a part of the Nhemeyong, Nsebito, Akom villages will surely be submerged).

(ii) not to tap water from the Ndjo'o and Biwomé rivers, and to reserve a part of the unutilized discharge of the Ntem river for maintaining the exceptional site of Memvé Elé Falls as a whole with a sufficient flow in its 3 downstream channels.

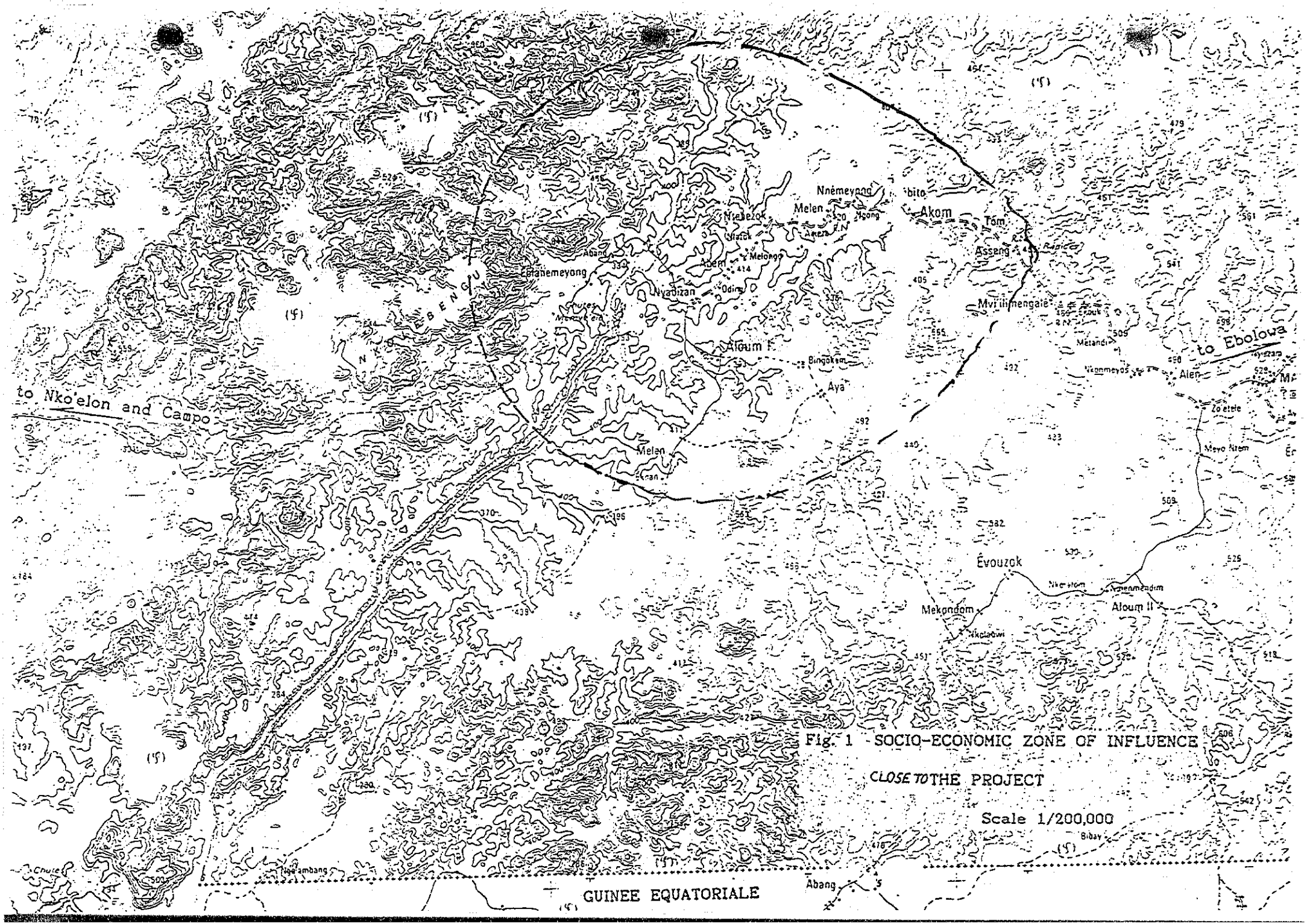

Fig. 1 SOCIO-ECONOMIC ZONE OF INFLUENCE *CLOSE TO* THE PROJECT

Scale 1/200,000

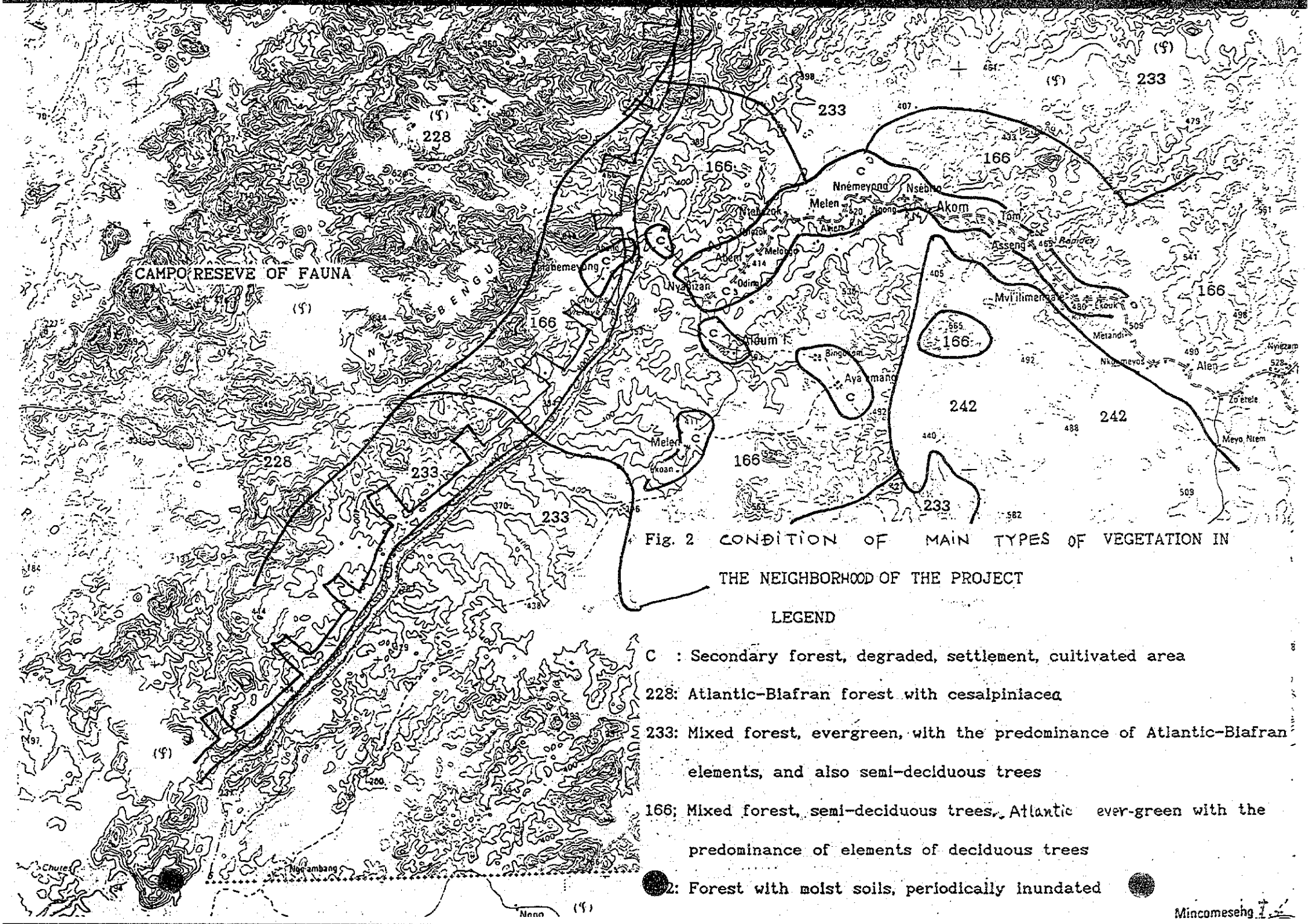

Fig. 2 CONDITION OF MAIN TYPES OF VEGETATION IN THE NEIGHBORHOOD OF THE PROJECT

LEGEND

C : Secondary forest, degraded, settlement, cultivated area

228: Atlantic-Biafran forest with cesalpiniacea

233: Mixed forest, evergreen, with the predominance of Atlantic-Biafran elements, and also semi-deciduous trees

166; Mixed forest, semi-deciduous trees, Atlantic ever-green with the predominance of elements of deciduous trees

2: Forest with moist soils, periodically inundated

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ANNEXE I

BIBLIOGRAPHY

ANNEXE I

BIBLIOGRAPHY

A. - GENERAL DOCUMENTS ON ENVIRONMENTAL STUDIES AND CAMEROON

1. Dams and the Environment Considerations in world Bank Projects
   J.A. DIXON, L.M. Talbot and G.J.M le Meigne W.B technical paper n[100, 64 p 1989
   :
2. Cameroun in Encyclopoedia Universalis -
   J. Cl. GAUTION - Corpus pp 91-96

3. Cameroun in Encyclopoedia Universalis -
   Symposium : les chiffres du Monde (1988) pp 146 147

4. Le Cameroun J. Imbert "Que sais-ji? PUF 3e édit 1982 128 p

5. Atlas de la Republique Unie du Cameroun :
   "les Atlas Jeune Afrique" Edit. J.A Paris 1979 70 p.

6. Histoire de l'Afrique Noire : Joseph K-ZERBO - Hachette Paris 1991 pp. 151-159 ; 285-293 ; 319-321 ; 361-367 ; 451-452 ; 521-523

7. Histoire des Institutions et des Faits Sociaux du Cameroun :
   Louis NGONGO - Vol. 1 : 1884-1945. Edition Berger Levrault 1987 234 p

8. L'Administration Publique Camerounaise : contribution de l'étude des système Africains d'administration publique"
   Roger Gabriel NLEP - Edition librairie Générale de Droit et de Jurisprudence : 1986 406 p.

9. Femmes du Cameroun - Mères pacifiques, femmes rebelles - collectif sous la direction de J.C Boibier ORSTOM/KARTHALA - 1985 392 p.

10. Le Reveil du Cameroun : Politique Africaine n[22 - collectif edition Karthala 1986 pp 3 - 157

11. Conséequences de la mise en eau du barrage de la Mapé - Etude du recassement des populations. MINPAT/SEDA Nov. 1986 162 p.

12. Synthèse des problèmes d'environnement du Cameroun - Centre de coopération Cameroun - Canada 57 p - Avril 1991.

13. L'etat de l'environnement au Cameroun : un profil des principaux problèmes par E.J.B 7 pages dactyle - mai 1991

14. Régularisation de la SANAGA - Réservoir de la Mapé - Travaux de terrain - Annexe 2. Conséquence de la mise en eau - Sonel Sept 1982 52 p.

15. "L'homme et l'eau au Cameroun" - impact des aménagements hydroélectriques sur la Santé des populations riveraines des lacs de retenue - Pr Christaian PIPERT Labo des Parasitologie Médicale de Bordeaux II - Rapport de mission FAC 19 p Mars 1989.

16. Etude épidemiologique de la bilharziose intestinale et de la necatorose dans la région du futur lac de retenue de la BINI (Adamaoua) - Cameroun par C. PIPERT et ALU in XIV conférence technique de l'OCEAN. 12-16 Nov. 1990 - 10 p

17. Perception de l'environnement au Cameroun : Centre de Coopération Cameroun Canada Avril 1991 p. 9

18. Cadre Institutionnel relatif aux próccupations environnementales au Cameroun. Centre de Coopération Cameroun Canada Avril 1991 p. 53

B. - DOCUMENTS CONCERNING THE PROJECTS REGION AND AREA

1. FANG. J. Maquet in Encyclopaedia Universalis. Capus pp. 765 - 766

2. Afrique Ambiqüé : G. Balandier - Plou Paris 1957

3. Sociologie actuelle de l'Afrique Noire - PUF Paris 1982 G. BALANDIER

4. Inventaire Ethnique du Sud-Cameroun. I. DUGOST - 1949 Mémoires de l'IPAN, Série "Populations" n[1, 159 p

5. Le Groupe dit Pohouin (FANG BOULOU BETI) P. ALEXANDRE ET J. BINET Institut International Africain PUf Paris 1958 158 p.

6. Les seigneurs de la Forêt - Essai sur le passé Historique, l'organisation sociale et les normes ethniques des anciens Béti du Cameroun PHILIPPE LABURTHE - Tobra - Publications de la sorbonne 1981 - 490 p

7. Proto - Histoire du Groupe Bulu FANg : essai de synthèse provisoire Cahiers d'etudes Africaines, volume V, n[20 Edition Mouton et Cie 1965 pp 503 560 par P. ALEXANDRE

8. Dictionnaire des villages Département du Ntem ORSTOM - Yaoundé 1965

9. Réserve de femme de CAMPO in "la conservation des écosystèmes camerounais" pp 110 - 115 par STEVE GARTLAN UICN

10. la réserve de faune de campo réalités et perspectives d'avenir - Bernard FOSSO - ENSA - MEMOIRE - DSCHANG 96 p + annexes 1986

11. Notice de la carte phytocographique du Cameroun au 1/500 000 par Réné LETOUZOU - Institut de la carte Internationale de la végétation - Toulouse 1985

    4) TV - Domaine de la forêt dense humide toujours verte

12. Fessibility Study ou Memve'eélé Hydroélectrique Power Development Project.

    1) INCEPTION REPORT. 37 p. JICA Dec 1990

2) PROGRESS REPORT 1 78 p + annexes JICA March 1991

13 Atlas Régional du Cameroun - Région SUD-OUEST - ORSTOM

14. Schema d'Aménagement de la zone Forestière - MINPAT - DAT 8. p. dactylo (non daté)

15. Aménagement forestier de la zone SUD - Rapport d'inventaire de reconnaissance de la phase I - CENADEFOR

16. Présentation Générale de la Province du Sud - Délégation Provinciale de la Province du Sud - Février 1990 - dactylo 23 p

17. Rapport Annuel de la Délégation Départementae de l'Agriculture du Ntem : Exercise 1989-90 80 p.

18. Rapport Annuel d'Activités Agricoles - Délégation d'Arrondissement de l'Agriculture de Maan - Juin 1990 - 16 p.

DULU BON BE AFRIKARA
Mission Presbytérienne - Halsey Memorial Press - Etat - Ebolowa 1954 61 p.

Probèmes Environnementaux dans la zone forestière du Sud Cameroun, Centre de Coopération Cameroun : CANADA Avril 1991 - 30 p

Projet anthropologie alimentaire des populations camerounaises (ORSTOM - CNRS 15 H/ CREA-IMPM/CN).

Rapport provisoire des enquêtes alimentaires de l'anthropologie nutrionnelle, des octogrammes et de la dépense énergétique. - G.J.A KOPPERT ORSTOM - Yaoundé : Mars 1991 - 181 p.

C - LEGAL TEXTS AND DOCUMENTS

1. Les Juridictions Traditionnelles du Cameroun Oriental : Imprimerie Nation de Yaoundé 1981 - 15 p.

2. Regime foncier et domanial. IN. Yaoundé Déc. 1981 - 82 p.

3. Regime des forets, de la faune et de la pêche - IN Yaoundé 1983 - 123 p.

4. Décret N[83/1756 du 29/11/1989 Portant organisation du Ministère du Tourisme 12 p.

5. Décret N[90 12 40 DU 22/08/1990 portant régime de production d'electricité, (i p) et arrêté d'application n° 021 du 12/07/1991 (7 p)

6. Décret N[90 12 41 du 22/08/1990 portant régime de transport et de distribution de l'énergie électrique (II p) et arrêté d'application n° 020 bis du 12/06/1991 (7 p).

7. Législation au Cameroun en matière de protection de l'environnement - 9 p. dactylo - Sous Direction de l'Environnement et des Etablissements Humains - DAT - MINPAT.

8. SONEL - ORGANISATION GENERALE - Note de Service n° 207 (mise à jour du 14 Juin 1990) 7 p.

9. Décret N° 86-1286 du 30 Octobre 1986 réoganisant le Ministère des Mines et de l'Energie - journal officiel de la République du Cameroun du 19 Janvier 1988 pp. 2401 à 2431

10. Droits et Timbres sur permis sportifs de chasse, Taxes d'abattage et de capture conformément à la loi des finances - Exercise 1989/1990 - Ministère du Tourisme - Direction de la Fuane et des Parcs Nationaux. 4 p dactylo

D - MAPS AND AERIAL PHOTOGRAPHICS

- Carte routière et touristique du Cameroun

- Carte du Cameroun au 1/200 000 - feuille KRIBI ORSTOM/ISH/CCN 1976

- General Project Layout of Alternative JICA: topographical base at the 1/10 000

- Carte phyto géographique du Cameroun au 1/500 000 1985 : R. LETAUZEY - Institut de la carte internationale de la végétation
  - Toulouse France

- Fonds Topographique au 1/50 000 - Nyabessan coupures 1 et 2 c CENADEFOR 1986

- Carte forestière au 1/50 000 (inventaire de détail) - Nyabessan coupure 1 d CENADEFOR 1986

- Carte forestière au 1/200 000 (inventaire de reconnaissance) - feuille KRIBI CENADEFOR - 1986

- Photographies aériennes - campagne CAM 85-024 au 1/20 000
  - bande L11 : photos n° 225 à 236
  - bande L12 : photos n° 207 à 194 et n° 107 à 120

- carte du site du projet

ANNEXE II

LIST OF PERSONS / INSTITUTIONS CONTACTED

ANNEXE II

LIST OF PERSONS / INSTITUTIONS CONTACTED (*)

- Mr SOLO Directeur des Forêts DF/MINAGRI
- Mr Denis BUTEAU Conseiller Technique - Direction des Forêts (Coopération Canadienne)
- MM Augustin BOKWE et MENGANG, respectivement, Directeur de la Faune et des Aires Protégées (DFAP) et Chef de Service des Aires Protégées - Ministère du Tourisme
- Mme KILO directeur Adjoint, Direction du Développement Communautaire (DDC) MINAGRI
- Mr B. NAMI - Directeur de l'Agriculture - MINAGRI
- Mr SAPOK - Directeur de l'Aménagement du Territoire et de l'Environnement (DATE) - MINPAT
- Mr TUTUWAN, sous Directeur de l'Environnement - DATE / MINPAT
- Mr Jean Félix LOUNG, Maître de Recherches à l'ISH (Institut des Sciences Humaines).
- Mr Gérard LEDOUX NANKO - Chef Département Développement Rural - SEDA (Société d'Etude pour le Développement de l'Afrique).
- Mr WERNER ROIDER, Senior Agricultural Economist. WORLD BANK Yaoundé
- MM MOUKIA et NAA ABOO, respectivement Directeur des Pêches et Chargé d'Etude à la Direction des Pêches - MINEPIA
- Mr Daniel KOUKA-BEMBA, Secrétaire Général de l'OCEAC (Organisation de Coordination pour la lutte contre Endémides en Afrique Centrale)
- Mr Edmond DOUNIAS, allocataire de recherche à l'ORSTOM (thèse d'éco - ethnologie) en cours d'achèvement touchant la réservce de campo)
- Mr Fréderic NGUIME EKOLLO, Directeur de l'Energie - MINMEE
- Mr Samuel NKAKA FRU, Director of Urbain Water and Sanitation - MINMEE

- Mr Dieudonné SAMBA, sous - Directeur des Activités Techniques et des Nuissances Industrielles (DMTNI) - MINMEE
- Mr Nicolas NGI NGI, Directeur des Mines, des Techniques et Nuissances Industrielles (DMTNI) - MINMEE
- Mr BETAH - Directeur de la Géologie - TINMEE
- MM Jean Claude do REGO et NGOH NKWAIN, respectivement, chargé de Programme et Programme Officier - UNDP - Yaoundé
- Mr D.O ADEFOLALU, Dean of Federal University of Technology of MINNA (Nigéria, Environmentalist consultant for UNDP
- Mr COURTEMANCHE, Centre de Coopération Canadien-Camerounais (CCCC) - Yaoundé
- Mr Joseph NGAN, Délégué Provincial de l'Agriculture du Sud - Ebolowa
- Mr J. NGUELE NGUELE, Dél´gué Départemental de l'Agriculture du Ntem - Ebolowa
- Mr Ferdinand KOUNGOU EDIMA, Gouverneur de la Province du Sud Ebolowa
- Mr Constantin N'DZOMO, Préfet du Département du Ntem - Ebolowa
- Mr BIVINA AMOUGOU, Chef du Service Départemental du Tourisme du Ntem - Ebolowa
- Mr Ambroise MELINGUI, Délégué Provincial de l'Enseignement Secondaire, Primaire et Maternel - (MINEDUC) Ebolowa
- Dr EYANGO, chef du Service de Santé Départemental du Ntem - Ebolowa
- Mr François DONKO - TADIA, Déwlégué Provincial du MINEPIA du Sud Ebolowa

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(*) besides SONE', Study team and simple interviewed villagers

ANNEX III

LAWS ON ENVIRONMENT PROTECTION
IN CAMEROON

(Source: Ministry of Planning and National Development -
Sub-Department of Environment and Human Establishments)

LEGISLATION AU CAMEROUN EN MATIERE DE PROTECTION DE L'ENVIRONNEMENT

I OCCUPATION DES SOLS, ETABLISSEMENTS HUMAINS MIGRATIONS DE LA POPULATION

A) LOIS ET ARRETES

1) loi n° 80/21 du 14 Juillet 1980 portant sur les atteintes à la propriété foncière et domaniale modifiée par la loi n° 81/21 du 27/11/1981,

2) arrêté n° 37 du 1/10/1937 fixant les règles générales d'hygiène et de salubrité publique à appliquer dans le territoire du Cameroun (+ arrêté n° 446 du 21 juin 1956 modifiant l'article 84 bis du présent arrêté).

B) ORDONNANCES ET DECRETS

1) ordonnance n° 74/1 du 6 juillet 1974 fixant le régime foncier modifié par l'ordonnance n° 77/1 du 10 janvier 1977,

2) ordonnance n° 74/2 du 6 juillet 1974 fixant le régime domanial modifié par l'ordonnance n° 77/2 du 10 janvier 1977,

3) ordonnance n° 73/20 du 19 mai 1973 régissant l'urbanisme en République Unie du Cameroun,

4) ordonnance n° 74/3 de juillet 1974 relative à la procédure d'expropriation pour cause d'utilité publique,

5) décret n° 76/166 du 27 avril 1976 fixant les modalités de gestion du domaine national

6) décret n° 76/167 du 27 avril 1976 fixant les modalités de gestion du domaine privé de l'état, modifié par le décret n° 77/339 du 3 octobre 1977,

7) décret n° 79/017 du 13 janvier 1979 relatif aux transactions immobilières privées,

8) décret n° 79/189 du 17 mai 1979 réglementant la délimitation des centres urbains,

9) décret n° 79/194 du 19 mai 1979 fixant les règles relatives à la création des lotissements,

10) décret n° 81/185 du 4 mai 1981 réglementant les conditions de réalisation des lotissements spéciaux par la M.A.E.T.U.R (mission d'aménagement et d'équipement des terrains urbains et ruraux).

C) ORGANISMES D'INTERVENTIONS

- Ministère de l'Urbanisme et de l'Habitat
- Ministère de l'Administration Territoriale
- Collectivités locales
- MAETUR (mission d'aménagement et d'équipement des terrains urbains et ruraux

II CONSERVATION DES FORETS PARCS NATIONAUX, FAUNE ET FLORE SAUVAGES

A) LOIS ET ARRETES

1) loi n° 81/13 du 27 novembre 1981 portant régime des forêts, de la faune et de la pêche,

2) loi n° 78/23 du 23 décembre 1978 relative à la protection des parcs nationaux,

B) DECRETS ET ORDONNANCES

1) décret n° 83/170 du 12 avril 1983 relatif au régime de la faune,

2) décret n° 83/169 du 12 avril 1983 fixant le régime des forêts.

C) ORGANISMES D'INTERVENTION

- Ministère de l'Agriculture
- Ministère du Tourisme
- Office National de Développement des Forêts (ONADEF)

III MISE EN VALEUR DES RESSOURCES MINERALES

A). LOIS

1) loi n° 64/LF/3 du 6 avril 1964 portant régime des substances minérales,

2) loi n° 73/16 du 7 décembre 1973 portant régime des eaux de source et eaux minérales,

3) loi n° 76/14 du 8 juillet 1976 fixant les taux et modalités de recouvrement des droits fixes d'exploitation des carrières,

4) loi n° 78/14 du 29 décembre 1978 fixant l'assiette, les taux et modes de recouvrement des droits fixes, redevances et taux miniers,

5) loi n° 79/14 du 30 juin 1979 complétant la loi n° 73/16 du 7 décembre 1973,

6) loi n° 80/23 du 27 novembre 1980 portant création d'une taxe sur les carrières,

B) DECRETS

1) décret n° 64/DF/163 du 26 mai 1964 fixant les conditions d'application de la loi n° 64/LF/3 du 26 mai 1964 fixant les modalités de recherche d'exploitation et de transport des hydrocarbures liquides et gazeux,

2) décret n° 68/DF/224 du 10 juin modifiant le décret n° 64/DF/163 du 26 mai 1964 fixant les conditions d'application de la loi minière,

3) décret n° 74/411 du 24 avril 1974 réglementant l'exercice artisanale de l'or,

4) décret n° 74/372 du 19 avril 1974 fixant les conditions d'application de la loi n° 73/16 du 7 décembre 1973,

5) décret n° 78/036 du 30 janvier 1978 portant réglementation des carrières.

C) ORGANISMES D'INTERVENTION

- Ministère des Mines, Eau et Energie
- Ministère du Commerce et de l'Industrie

IV POLLUTION MARINE ET GESTION DES ZONES COTIERES

A) LOIS ET ORDONNANCES

1) loi n° 63/14 du 19 juin 1963 portant code repressif de la marine marchande,

2) loi fédérale n° 63/20 du 19 juin 1963 réglementant la police à l'intérieur des domaines portuaires,

3) loi n° 67/LF/25 du 3 novembre 1967 modifiant l'article 5 du code de la marine marchande camerounaise,

4) loi n° 81/13 du 27 novembre 1981 portant régime des forêts, de la faune et de la pêche,

5) loi n° 89/027 du 29 décembre 1989 portant sur les déchets toxiques et dangereux,

6) ordonnance n° 62/OF/30 du 31 mars 1962 portant code de la marine marchande, modifiée par la loi n° 63/17 du 19 juin 1963.

B) DECRETS

1) décret n° 62/DF/275 portant réglementation des enquêtes sur les naufrages, abordages et autres accidents de la navigation,

2) décret n° 62/DF/236 du 7 juillet 1962 définissant les limites des zones de navigation à la pêche,

3) décret n° 64/DF/48 du 29 janvier 1964 fixant les circonscriptions maritimes camerounaises,

4) décret n° 71/DF/416 du 26 août 1976 portant modification du décret n° 62/DF/216 du 25 juin 1962 définissant les lignes à partir desquelles dans les golfes, baies et rades sont comptées les eaux territoriales camerounaises,

5) décret n° 83/171 du 12 avril 1983 relatif au régime de la pêche,

C) ORGANISMES D'INTERVENTION

- Ministère des Transports et des Travaux Publics
- Ministère des Mines, Eau et Energie
- Ministère de l'Elévage, Pêches et Industries Animales

V POLLUTION ET CONTROLE DE LA QUALITE DE L'EAU

A) LOIS ET ARRETES

1) loi n° 76/3 de juillet 1976 fixant les frais d'inscription des établissements dangereux insalubres ou incommodes,

2) loi n° 64/LF/23 du 13 novembre 1964 portant protection de la santé publique,

3) loi n° 74/23 du 5 décembre 1974 portant organisation communale,

4) arrêté n° 17/MINMEM/DMG du 21 octobre 1976 déterminant les conditions d'application du décret n° 76/372 du 2 septembre 1976 portant réglementation des établissements dangereux, insalubres ou incommodes,

5) arrêté n° 013/MINEM/DMG/SL du 19 avril 1977 portant nomenclature des établissements dangereux, insalubres ou incommodes,

6) arrêté n° 37 du 1/10/1937 fixant les règles générales d'hygiène et de salubrité publiques à appliquer dans le territoire du cameroun (arrêté n° 446 du 21 juin 1956 modifiant l'art 81 bis du présent arrêté),

- code pénal (art 261) institué par la loi n° 67/DF/91 du 12 juin 1967.

B) DECRETS

1) décret n° 76/372 du 2 septembre 1976 portant réglementation des établissements dangereux, insalubres ou incommodes

C) ORGANISMES D'INTERVENTION

- Ministère des Mines, Eau et Energie
- Ministère de l'Agriculture
- Ministère de la Santé Publique
- Collectivités locales

VI POLLUTION ET CONTROLE DE LA QUALITE DE L'AIR

A) LOIS ET ARRETES

1) loi n° 76/3 du 8 juillet 1976 fixant les frais d'inscription et de contrôle des établissements dangereux, insalubres ou incommodes,

2) arrêté n° 17/MINEM du 21 octobre 1976 déterminant les conditions d'application du décret 76/372 du 2 septembre 1976 portant réglementation des établissements dangereux insalubres ou incommodes,

3) arrêté n° 013/MINEM/DMG/SL du 19 avril 1977 portant nomenclature des établissements dangereux, insalubres ou incommodes,

4) code pénal (art 261) institué par la loi n° 67/DF/91 du juin 1977,

5) arrêté n° 37 du 1/10/1937 fixant les régles d'hygiène et de salubrité publique à appliquer dans le territoire du cameroun (+ arrêté n° 446 du 21 juin 1956 modifiant l'art 84 bis du présent arrêté)

B) DECRET

1) décret n° 76/372 du 2 septembre 1976 portant réglementation des établissements dangereux insalubres ou incommodes

C) ORGANISMES D'INTERVENTION

- Ministère des Mines, Eau et Energie
- Ministère de la Santé Publique
- Ministère du Travail et de la Prévoyance Sociale
- C.N.P.S (Caisse Nationale de Prévoyance Sociale)

VII DECHETS SOLIDES ET PRODUITS CHIMIQUES SPECIFIQUES

A) LOIS

1) décret n° 77/91 du 25 mars 1977 déterminant les pouvoirs de tutelle sur les communes et établissements communaux,

2) décret n° 76/372 du 2 septembre 1976 portant réglementation des établissements dangereux, insalubres ou incommodes,

3) décret n° 83/410 du 29 août 1983 fixant les conditions de préparation, de détention d'importation, d'exportation, de vente ou d'utilisation des radio-éléments artificiels

C) LES ORGANISMES INTERVENANT

- Collectivités locales
- Ministère des Mines, Eau et Energie
- Ministère de la Santé Publique

A) LOI

1) loi n° 74/23 du 5 décembre 1974 portant organisation communale

B) DECRETS

1) décret n° 77/91 du 25 mars 1977 déterminant les pouvoirs de tutelle sur les communes, syndicats de commune et établissements communaux,

2) code de la route (art 79) institué par le décret n° 79/341 du 3 septembre 1979

C) ORGANISMES INTERVENANT

- collectivités locales (police communale)

ANNEX IV

FLORISTIC DESCRIPTION OF THICK AND HUMID EVERGREEN FOREST IN THE ATLANTIC BIAFRAN FORESTRY DISTRICT

(Extract from Notice on Vegetation Map of Cameroon,
by R. Letouzey, scale: 1/500,000)

Le relevé synthétique pour le district atlantique biafréen peut être établi comme suit :

A) *CAESALPINIACEAE.*

Rappelons que sur 130 à 140 espèces de *Caesalpiniaceae* recensées en forêt dense humide au Cameroun, plus de la moitié et en réalité non loin des deux-tiers paraissent concentrées dans le district atlantique biafréen ; ce sont de plus pour grande majorité des arbres, assez souvent encore de grands arbustes, très rarement des lianes ; quelques espèces ont une adaptation écologique particulière ; quelques espèces ont une aire s'étendant un peu en dehors du district atlantique biafréen, le plus souvent vers l'Est dans le district atlantique central (—).

a) *Caesalpiniaceae* grégaires :

a1) Arbres : *Aphanocalyx margininervatus, Berlinia bracteosa* (ripicole, palustre), *Berlinia sp., Brachystegia cynometroides, Brachystegia mildbraedii, Brachystegia zenkeri, Cryptosepalum staudtii* (—), *Cynometra hankei* (présent très sporadiquement dans le district atlantique biafréen, cette espèce prend une extension remarquable seulement dans le district atlantique littoral ; elle se retrouve aussi dans la zone particulière du district congolais du Dja mentionnée au n° 186), *Daniellia pynaertii, Daniellia sp., Dialium pachyphyllum* (—) (la complexité du genre *Dialium,* encore mal connu au Cameroun, ne permet pas d'affirmer la stricte localisation de cette espèce au district atlantique biafréen), *Dialium sp., Didelotia letouzeyi, Eurypetalum batesii, Eurypetalum unijugum, Gilbertiodendron brachystegioides* (—), *Gilbertiodendron dewevrei* est connu par pieds isolés dans les régions de Nyabizan, Lolodorf, Eséka, Loum, Mélong, Mamfe (sa présence dans le district atlantique biafréen est sporadique et sans aucune mesure avec son rôle dans le district congolais du Dja, cf. n° 189), *Gilbertiodendron klainei, Gilbertiodendron* cf. *mayombense, Gilbertiodendron ogoouense, Gilbertiodendron preussii, Gilbertiodendron spp.* (2 ou 3 espèces semble-t-il) (le genre *Gilbertiodendron* reste en fait encore assez mal connu au Cameroun), *Gilletiodendron pierreanum, Julbernardia pellegriniana, Julbernardia seretii* (—), *Librevillea klainei, Microberlinia bisulcata* (qui se retrouve dans le district atlantique littoral), *Monopetalanthus hedinii, Monopetalanthus letestui, Monopetalanthus pellegrinii* (—, cf. n° 216), *Scorodophloeus zenkeri* (se retrouve aussi dans la zone particulière du district congolais du Dja mentionnée au n° 186), *Stachyothyrsus staudtii* (palustre), *Tetraberlinia bifoliolata* (—), *Tetraberlinia polyphylla, Toubaouate brevipaniculata, ...*

a2) Arbustes : *Aphanocalyx cynometroides, Hymenostegia afzelii, Leonardoxa africana* (le plus souvent myrmécophile, parfois non), *Plagiosiphon emarginatus* (—) (parfois ± saxicole, ou ripicole), ...

b) Autres *Caesalpiniaceae* (typiquement biafréennes) :

b1) Arbres : *Afzelia bella, Afzelia pachyloba, Amphimas ferrugineus* (—), *Anthonotha fragrans* (—), *Anthonotha sp., Berlinia confusa, Berlinia craibiana, Berlinia sp., Copaifera religiosa, Crudia gabonensis* (se retrouve aussi dans la zone particulière du district congolais du Dja mentionnée au n° 186), *Crudia klainei, Daniellia klainei, Daniellia oblonga, Daniellia ogea, Daniellia sp., Dialium bipindense, Dialium densiflorum, Dialium soyauxii, Dialium tessmannii* (vers Campo, cf. n° 232), *Dialium zenkeri, Didelotia unifoliolata, Erythrophleum ivorense* (se retrouve aussi dans la zone particulière du district congolais du Dja mentionnée au n° 186), *Gilbertiodendron pachyanthum, Gilbertiodendron* cf. *splendidum, Gilbertiodendron zenkeri, Guibourtia ehie* (vers Campo, cf. n° 232), *Guibourtia tessmannii* (—), *Hymenostegia breteleri* (aussi arbuste saxicole ?), *Hymenostegia felicis, Hymenostegia klainei, Hymenostegia sp.* (le genre *Hymenostegia* reste en fait encore assez mal connu au Cameroun), *Julbernardia sp., Lebruniodendron leptanthum* (présent çà et là dans le district atlantique biafréen mais beaucoup mieux représenté dans la zone particulière du district congolais du Dja mentionnée au n° 186), *Loesenera talbotii, Monopetalanthus ledermannii, Monopetalanthus microphyllus, Monopetalanthus pectinatus, Monopetalanthus sp.* (le genre *Mono-*

petalanthus reste en fait encore assez mal connu au Cameroun), *Plagiosiphon gabonensis, Plagiosiphon multijugus* (palustre), *Sindoropsis letestui, Tetraberlinia sp.*, ...

b2) Arbustes : *Baikiea insignis* (–), *Baphiopsis parviflora, Cryptosepalum ambamense* (ripicole), *Cryptosepalum pellegrinianum* (± ripicole), *Gilbertiodendron demonstrans, Gilbertiodendron grandiflorum* (palustre), *Hymenostegia brachyura* (ripicole), *Isomacrolobium leptorrhachis, Neochevalierodendron sp., Pellegriniodendron diphyllum* (ripicole), *Plagiosiphon discifer, Plagiosiphon longibus* (palustre) (–), ...

B) *AUTRES FAMILLES.*

Les espèces ci-après, presque toutes strictement localisées au district atlantique biafréen, représentent un relevé non exhaustif mais parfaitement caractéristique de la flore arborée et arbustive de ce district. Ne figurent dans ce relevé, en principe, que des espèces vivant normalement en forêt dense sur terre ferme, en dehors des milieux palustres, ripicoles ou dégradés.

B1) Arbres : *Allanblackia stanerana, Anisophyllea spp.* (*A. meniaudii, A. myriosticta, A. polyneura, A. sororia*), *Araliopsis soyauxii, Beilschmiedia grandibracteata, Calpocalyx cauliflorus, Cleistopholis staudtii, Cola megalophylla, Coula edulis* (mieux représenté dans le district atlantique littoral), *Cyrtogonone argentea, Dacryodes spp.* (*D. igaganga, D. klaineana, D. pubescens*), *Diogoa zenkeri, Diospyros spp.* (*D. melocarpa, D. sanza-minika, D. suaveolens*), *Englerophytum letestui, Eriocoelum spp.* (*E. macrocarpum, E. microspermum*), *Gambeya spp.* (*G. africana, G. albida, G. subnuda, G. sp.*), *Garcinia spp.* (*G. lucida, G. mannii, G. sp.*), *Gluema ivorensis, Hoplestigma klaineanum* (vers Campo, cf. n° 232), *Hypodaphnis zenkeri, Isolona sp., Khaya ivorensis, Lecomtedoxa spp.* (*L. klaineana, L. sp.*), *Leplaea mayombensis, Letestua durissima, Magnistipula spp.* (*M. butayei* spp. *sargosii, M. tessmannii*), *Manilkara sp., Maranthes spp.* (*M. aubrevillei, M. gabunensis, M. sp.*), *Mareyopsis longifolia, Memecylon spp.* (*M. macrodendron, M. occultum*), *Neolemonniera sp., Newtonia spp.* (*N. duparquetiana, N. griffoniana, N. zenkeri, N. sp.*), *Oubangula alata* (mieux représenté dans le district atlantique littoral), *Pachypodanthium confine, Pausinystalia spp.* (*P. johimbe* qui se retrouve aussi dans la zone particulière du district congolais du Dja mentionnée au n° 186 ; cette espèce fait l'objet depuis longtemps d'une exploitation par abattage pour prélèvement d'une écorce médicamenteuse destinée à l'exportation ; la disparition de cette espèce est à présent manifeste), *P. talbotii, P. sp., Poga oleosa* (espèce qui se retrouve au voisinage du Dja), *Protomegabaria spp.* (*P. macrophylla, P. stapfiana, P. sp.*), *Pterocarpus osun, Rauvolfia macrophylla, Scheffierodendron adenopetalum, Scottellia sp., Scytopetalum klaineanum, Strombosia zenkeri, Strychnos spp.* (*S. gnetifolia, S. staudtii*), *Tapura africana, Terminalia ivorensis, Testulea gabonensis* (vers Campo, cf. n° 232), *Tieghemella africana, Treculia obovoidea, Vitex sp., Xylopia sp., Zeyherella letestui*, ...

B2) Arbustes : La liste ci-après comporte un nombre restreint d'espèces d'*Euphorbiaceae* et de *Rubiaceae* de sous-bois, ces familles n'ayant pas encore fait l'objet d'un inventaire systématique et écologique suffisant pour la forêt dense humide camerounaise. Mais certains genres et certaines espèces qu'elles comportent ne représentent pas des éléments spectaculaires du sous-bois ; beaucoup plus visibles par contre est ici l'importance prise par des espèces appartenant en particulier aux genres *Cola, Dichapetalum, Diospyros, Dracaena, Memecylon* (s.l.), *Piptostigma, Scaphopetalum*, ... tant par le port assez souvent (tiges monocaules), que par la diversité spécifique et l'abondance.

Acioa spp. (*A. cinerea, A. floribunda, A. staudtii*), *Afrostyrax kamerunensis, Aidia genipiflora, Allexis obanensis, Allophylus spp.* (*A. camptoneurus, A. grandifolius, A. longicuneatus, A. megaphyllus, A. zenkeri*), *Alsodeiopsis spp.* (*A. mannii, A. rubra, A. staudtii, A. weissenborniana*), *Angylocalyx spp.* (*A. oligophyllus, A. talbotii, A. vermeulenii*), *Anisophyllea purpurascens, Aporrhiza spp.* (*A. multijuga, A. urophylla*), *Ardisia spp.* (*A. letouzeyi, A. platyphylla, A. zenkeri*), *Aulacocalyx spp.* (*A. auriculata, A. talbotii*), *Balonga buchholzii, Baphia spp.* (*B. laurifolia* (mieux représenté dans le district atlantique littoral), *B. spathacea* ssp. *polyantha*), *Beilschmiedia spp.* (dans la mesure où ces espèces sont réellement valables : *B. crassipes, B. cuspidata, B. fructicosa, B. klainei, B. kostermansiana, B. membranifolia, B. myrciaefolia, B. nitida, B. sessilifolia, B. staudtii, B. wilczekii*), *Belonophora wernhamii, Bertiera spp.* (*B. laxa, B. retrofracta*), *Boutiquea platypetala, Buchholzia coriacea, Callichilia inaequalis, Calpocalyx sp., Campylospermum reticulatum* var. *reticulatum* (et sans doute d'autres *Ouratea* s.l.), *Carpolobia gossweileri, Chytranthus spp.* (*C. klaineanus, C. macrophyllus, C. talbotii*), *Cola spp.* (*C. brevipes, C. cauliflora, C. digitata, C. ficifolia, C. flaviflora, C. flavovelutina, C. letouzeyana, C. marsupium, C. nigerica, C. praeacuta, C. rostrata, C. semecarpophylla* et sans doute quelques autres espèces), *Combretum oyemense, Crotonogyne spp.* (*C. manniana, C. strigosa*), *Deinbollia spp.* (dans la mesure où ces espèces sont réellement valables : *D. cuneifolia, D. dasybotrys, D. macrantha, D. macroura, D. maxima, D. pycnophylla, D. saligna*), *Delpydora macrophylla, Desmostachys brevipes, Dichapetalum spp.* (souvent sarmen-

teux et lianescents ; *D. affine, D. bangii, D. barbatum, D. gabonense, D. heudelotii* var. *hispidum*, var. *longitubulosum* et var. *ndongense, D. insigne, D. integripetalum, D. libreville nse, D. melanocladum, D. oblongum, D. pulchrum, D. rudatisii, D. umbellatum*), *Dicranolepis spp.* (*D. disticha, D. glandulosa*), *Diospyros spp.* (*D. barteri, D. cinnabarina, D. dendo, D. gabunensis, D. obliquifolia, D. physocalycina, D. platanoides, D. preussii, D. viridicans, D. zenkeri*), *Dorstenia spp.* (*D. angusticornis, D. dorstenioides, D. involuta*), *Dracaena spp.* (*D. cerasifera, D. mannii, D. ovata, D. phrynioides, D. surculosa, D.* cf. *talbotii*, et vraisemblablement *D. bicolor, D. congoensis, D. goldieana, D. laxissima, ...*), *Drypetes sp., Ecpoma spp.* (*E. gigantistipula, E. sp.*), *Englerophytum stelecantha, Eriocoelum petiolare, Euadenia spp.* (*E. alimensis, E. trifoliolata*), *Eugenia sp., Ficus kimuenzensis, Garcinia sp., Glossocalyx brevipes* (mieux représenté dans le district atlantique littoral), *Grossera sp., Guarea sp., Heckeldora staudtii, Hemandradenia mannii, Hua gabonii, Ixora spp.* (*Ixora hippoperifera, I. talbotii, I. sp.*), *Jollydora duparquetiana, Laccodiscus ferrugineus, Lasianthera africana, Lasianthus batangensis, Leeuwenbergia spp.* (*L. africana, L. letestui*), *Leptaulus grandifolius, Leptonychia spp.* (*L. echinocarpa, L. pallida*), *Lijndenia barteri, Maesobotrya spp.* (*M. barteri, M. bipindensis, M. dusenii*), *Magnistipula glaberrima, Medusandra spp.* (*M. mpomiana, M. richardsiana*), *Momecylon* (s.s.) *spp.* (*M. aequidianum, M. afzelii* var. *mamfeanum, M. arcuato-marginatum* var. *simulans, M. engleranum, M. virescens, M. viride*), *Microdesmis camerunensis, Monanthotaxis spp.* (*M. cauliflora, M. foliosa*), *Mostuea neurocarpa, Myrianthus spp.* (*M. preussii, M. serratus* var. *letestui* et var. *serratus*), *Napoleonaea spp.* (*N. gabonensis, N. talbotii, N. vogelii*), *Octoknema spp.* (*O. dinklagei, O. genovefae*), *Octolepis decalepis, Octolobus zenkeri, Olax spp.* (*O. staudtii, O. triplinervia*), *Opilia congolana, Oricia trifoliolata, Oubanguia laurifolia, Oxyanthus laxiflorus, Pauridiantha viridiflora, Pavetta spp.* (*P.* cf. *mollisima, P. sp.*), *Pierrina zenkeri, Piptostigma spp.* (*P. calophyllum, P. giganteum, P. glabrescens, P. longepilosum, P. macranthum, P. multinervium, P. pilosum*), *Placodiscus spp.* (*P. angustifolius, P. cuneatus, P. glandulosus*), *Poecilocalyx schumannii, Polyceratocarpus parviflorus, Psychotria spp., Ptychopetalum petiolatum, Quassia spp.* (*Q. africana, Q. sp.*), *Rhabdophyllum arnoldianum* var. *staudtii* (et sans doute d'autres *Ouratea* s.l.), *Rhaphiostylis poggei, Rhaptopetalum spp.* (*R. pachyphyllum, R. sessilifolium*), *Rhopalopilia pallens, Rinorea spp.* (*R. ilicifolia, R.* cf. *kamerunensis, R. ledermannii, R. welwitschii*), *Ritchiea spp.* (*R. macrantha, R. simplicifolia* var. *caloneura* et var. *simplicifolia*), *Rytigynia sp., Salacia spp.* (*S. loloensis, S. preussii*), *Scaphopetalum spp.* (*S. blackii, S. longipedunculatum, S. macranthum, S. stipulosum, S. thonneri* qui se retrouve aussi dans la zone particulière du district congolais du Dja mentionnée au n° 186, *S. zenkeri*), *Scyphosyce manniana, Sorindeia sp., Soyauxia spp.* (*S. gabonensis, S. kamerunensis*), *Sphenocentrum jollyanum, Strychnos elaeocarpa, Synsepalum sp., Thecacoris spp.* (*T. annobonae, T. leptobotrya, T. stenopetala*), *Thomandersia laurifolia, Treculia acuminata, Turraeanthus mannii, Uvariastrum spp.* (*U. insculptum, U. zenkeri*), *Uvariodendron spp.* (*U. calophyllum* qui se retrouve aussi dans la zone particulière du district congolais du Dja mentionnée au n° 186, *U. connivens, U. giganteum, U. mirabile*), *Uvariopsis spp.* (*U. letestui, U. zenkeri*), *Voacanga psilocalyx, Warneckea spp.* (*W. pulcherrima, W. wildeana*), ...

C) — Alors que les arbres et les arbustes fournissent aisément de nombreuses caractéristiques du district atlantique biafréen, les *lianes* paraissent, dans l'ensemble, moins significatives. Même parmi les familles ou les genres riches en ces formes : *Apocynaceae, Combretum, Ficus* (étrangleurs), *Hippocrateaceae, Strychnos*, ... le nombre d'espèces en apparence biafréennes (dans l'état actuel des connaissances taxonomiques, *Apocynaceae* et *Connaraceae* étant en cours d'étude, ou relatives à leur distribution) paraît limité ; c'est-à-dire en définitive que beaucoup d'espèces de ces familles et genres ont des distributions dépassant largement le district en cause même si elles sont ici présentes. On peut constater aussi que certaines familles avec lianes se localisent ici de préférence au bord des cours d'eau ou sur terrains marécageux, ainsi en va-t-il des *Papilionaceae*, et que d'autres, souvent de petite taille, fréquentent surtout les formations dégradées, ainsi pour les *Connaraceae* et les *Menispermaceae*, les grandes lianes de forêt sur sol ferme n'étant ici que des exceptions.

Délaissant en principe les sites particuliers (ripicoles, palustres, dégradés, voire saxicoles) et soulignant que si les lianes ci-après atteignent parfois de grandes dimensions, elles peuvent aussi, ainsi que d'autres moins élevées, n'être parfois signalées comme ne dépassant guère quelques mètres de hauteur lorsqu'elles se rencontrent surtout dans des formations clairiérées : *Acridocarpus spp.* (*A. longifolius, A. staudtii*), *Agelaea pseudobliqua, Alafia spp.* (*A. conica, A. schumannii, A. whytei*), *Ancistrocladus spp.* (*A. guineensis, A. letestui*), *Anthoclitandra robustior, Aphanostylis spp.* (*A. flavidiflora, A. leptantha*), *Atroxima liberica, Calycobolus spp.* (*C. campanulatus* spp. *oddonii, C. gilgianus, C. micranthus*), *Chlamydocarya thomsoniana, Cnestis spp.* (*C. congolana, C. grisea, C. zenkeri*), *Combretum spp.* (*C. bipindense, C. cuspidatum, C. mannii, C. scandens*), *Craterosiphon scandens, Dichapetalum spp.* (parfois sarmenteux et lianescents ; *D. altescandens, D. tetrastachyum, D. witianum*), *Dictyophleba spp.* (*D. ochracea, D. stipulosa*), *Friesodielsia spp.* (*F. dielsiana, F. discostigma, F. gracilipes, F. hirsuta*), *Griffonia spp.* (*G. physocarpa, G. spe-*

ciosa), *Hugonia gabunensis*, *Landolphia spp.* (*L. dulcis* var. *barteri*, *L. maxima*), *Lavigeria macrocarpa*, *Leptoderris tomentella*, *Monanthotaxis diclina*, *Orthopichonia spp.* (*O. batesii*, *O. nigeriana*), *Pararistolochia spp.* (*P. preussii*, *P. triactina*, *P. zenkeri*), *Polycephalium lobatum*, *Pycnobotrya nitida*, *Pyrenacantha spp.* (*P. grandifolia*, *P. vogeliana*), *Rhaphiostylis preussii*, *Salacia spp.* (à noter que les autres genres d'*Hippocrateaceae*, à fruits non charnus, sont pratiquement absents du district atlantique biafréen ; *S. alata*, *S. cornifolia*, *S. dusenii*, *S. gabunensis*, *S. lucida*, *S. nitida* ?, *S. regeliana*, *S. volubilis*, *S. whytei* var. *vermoeseniana*), *Spiropetalum heterophyllum* (s.l.), *Stachyanthus zenkeri*, *Strophanthus spp.* (souvent de petite taille ; *S. bullenianus*, *S. congoensis*, *S. gracilis*), *Strychnos spp.* (*S. canthioides*, *S. chrysophylla*, *S. mimfiensis*, *S. zenkeri*), *Tetracarpidium conophorum*, *Tetracera sp.*, *Uvaria bipindensis*, ...

Parfois d'importantes tornades, abattant la forêt biafréenne sur plusieurs hectares (en particulier dans les zones accidentées situées entre le Mont Cameroun et Mamfe), favorisent l'installation, provisoire semble-t-il, de rotins (*Ancistrophyllum*, *Eremospatha*, ...).

D) — En ce qui concerne les *plantes herbacées* de sous-bois, il est encore possible de trouver, pour le district atlantique biafréen, d'excellentes caractéristiques, soit au niveau du genre (ainsi certaines *Cyperaceae* : *Mapania spp.*, ainsi certaines *Gramineae* : *Guaduella spp.*, *Microcalamus spp.*, *Puelia spp.*, ainsi certaines *Zingiberaceae* : *Afrocalathea* (*A. rhizantha*), *Aulotandra* (*A. kamerunensis*), *Thaumatococcus* (*T. daniellii*), ou encore *Cyanastrum* (*C. cordifolium*) parmi les *Tecophyllaeaceae*, ...), soit au niveau des espèces, parmi les genres *Begonia* (avec encore de nombreuses incertitudes taxonomiques concernant ce genre), *Dorstenia*, ... ou parmi des espèces d'*Araceae*, de *Commelinaceae*, de *Marantaceae*, de *Zingiberaceae*, ...

Ici encore sont exclues en principe les sites particuliers : bords de rivières, bas-fonds de ruisseaux ou terrains marécageux et surtout zones défrichées, dégradées ou très clairiérées. Une remarque particulière est à faire concernant la famille des *Acanthaceae* : alors que cette famille est très représentative dans les sous-bois sur sol ferme de la forêt semi-caducifoliée (cf. n° 160), d'autres *Acanthaceae* sont présentes, pas toujours exclusivement, dans le district atlantique biafréen ; mais ici elles se localisent aux sous-bois sur sols humides voire marécageux (*Adhatoda*, *Dischistocalyx*, *Rungia*, *Staurogyne*, ...), de rares espèces s'écartant un peu de ces sites (*Physacanthus batanganus* et *P. talbotii*, *Ruellia primuloides*, ...), d'autres espèces, aussi plus ou moins biafréennes, recherchant uniquement les terrains cultivés, les bords de chemin : *Graptophyllum glandulosum*, *Lankesteria elegans*, *Schaueria populifolia*, ...

Quelques saprophytes : *Afrothismia winkleri*, *Gymnosiphon longistylus* (± palustre), *Sciaphila ledermannii*, ... paraissent localisées en sous-bois de forêt atlantique biafréenne. Les Fougères terrestres caractéristiques sont ici en nombre limité : *Afropteris repens*; *Anisosorus occidentalis*, *Gleichenia linearis*, *Humata repens*, *Lonchitis mannii*, *Pteris barombiensis*, *Selaginella leoneensis* et *S. vogelii*, *Tectaria barteri* et *T. varians*, ... ces espèces voisinant en fait avec des espèces à plus large distribution.

Il en est de même de toutes les plantes suivantes, liste certainement non exhaustive des espèces atlantiques biafréennes pouvant être considérées comme caractéristiques, dans l'état actuel des connaissances : *Acanthonema spp.* (*A. diandrum* et *A. strigosum*, le plus souvent sur rochers ombragés), *Acroceras gabunense*, *Afrocalathea rhizantha*, *Amorphophallus spp.* (*A. staudtii*, *A. zenkeri*), *Amphiblemma spp.* (*A. amoenum*, *A. molle*), *Anubias hastifolia* (palustre), *Aulotandra kamerunensis*, *Begonia spp.* (genre en cours d'études ; *B. cilio-bracteata*, *B. polygonoides*, *B. quadrialata*, *B. salisburyana*, *B. sciaphila*, *B. sessilifolia*, *B. squamulosa*, *B. staudtii*, *B. sp.*), *Cercestis spp.* (*C. ivorensis*, *C. kamerunianus*), *Commelina longicapsa*, *Costus spp.* (*C. letestui*, *C. phaeotrichus*), *Culcasia spp.* (*C. mannii*, *C. obliquifolia*, *C. striolata*, *C. sp.*), *Cyanastrum cordifolium*, *Dorstenia spp.* (*D. barteri* var. *paucinervis*, *D. dinklagei* var. *dinklagei*, *D. elliptica*, *D. lujae* var. *batesii* et var. *lujae*, *D. mannii* var. *alternans*, *humilis*, *mannii* et *mungensis*, *D. picta*, *D. poinsettiifolia* var. *angusta*, *poinsettiifolia* et *staudtii*, *D. prorepens*, *D. tenera* var. *obtusibracteata*, *D. yambuyaensis* vers Campo cf. n° 232), *Geophila spp.* (*G. afzelii*, *G. obvallata*, *G. repens*, *G. sp.*), *Guaduella spp.* (*G. densiflora*, *G. humilis*, *G. macrostachys*, *G. marantifolia* var. *duparquetii* vers Campo cf. n° 232, *G. oblonga*), *Habenaria physuriformis*, *Hetaeria stammleri*, *Hymenocoleus spp.* (*H. nervopilosus*, *H. rotundifolius*, *H. thollonii*), *Hypolytrum* (*H. scaberrimum* ± biafréen, *H. secans*), *Maniella gustavii*, *Mapania spp.* (qui paraissent mieux représentées vers le Sud que vers le Nord du district atlantique biafréen ; *M. africana* var. *africana*, *M. africana* var. *filipes* vers Campo cf. n° 232, *M. amplivaginata*, *M. macrantha*, *M. mannii* spp. *mannii* s'étendant vers l'Est, *M. pubisquama*, *M. soyauxii* s'étendant aussi vers l'Est), *Marantochloa spp.* (*M. cuspidata* ? et peut-être *M. holostachya* ou espèce voisine), *Microcalamus spp.* (*M. aspidistrula*, *M. barbinodis*, *M. convallarioides*), *Nephthytis spp.* (*N. gravenreuthii*, *N. poissonii* var. *constricta*, *N. swainei*), *Palisota spp.* (*P. barteri*, *P. lagopus*, *P. satabiei*, *P. sp.*), *Puelia spp.* (*P. ciliata* et *P. schumanniana* qui s'étendent aussi vers l'Est, *P. sp.*), *Renealmia cabrae*, *Stanfieldiella axillaris*, *Stylochiton zenkeri*, *Thaumatococcus daniellii*, ...

E) — Comme pour les lianes, il paraît difficile de mettre en évidence de nombreux *épiphytes* caractéristiques du district atlantique biafréen ; ceux que l'on y rencontre — même abondants dans l'ensemble — ont

des aires de distribution souvent plus étendues. Une place à part peut cependant être faite, comme caractéristiques, aux épiphytes vivant sous ombrage, en particulier aux *Hymenophyllaceae* des bases et troncs d'arbres : *Hymenophyllum spp.* (*H. kuhnii, H. splendidum, H. triangulare*) et *Trichomanes spp.* (*T. africanum, T. ballardianum, T. crispiforme, T. cupressoides, T. guineense, T. liberiense*) ; à ces Fougères peuvent être ajoutés les *Culcasia spp.* grimpants (*C. annetii, C. bosii, C. parviflora*). En dehors de ces espèces assez-strictement biafréennes, peuvent être relevées, parmi les Fougères : *Antrophyum annetii, Asplenium spp.* (*A. staudtii, A. vagans*), *Elaphoglossum isabelense, Lycopodium staudtii, Oleandra annetii,* ... et parmi les *Orchidaceae : Aërangis gracillima, Ancistrorhynchus straussii, Angraecum spp.* (*A. angustipetalum, A. egertonii, A. pungens*), *Bulbophyllum spp.* (*B. bibundiense, B. calamarium, B. calyptratum, B. colubrinum* vers Campo cf. n° 232, *B. distans, B. fuscum* spp. *fuscum, B. pipio, B. porphyroglossum*), *Chamaeangis ichneumonea* (surtout saxicole), *Polystachya spp.* (*P. laxiflora, P. victoriae*), *Tridactyle lagosensis, Vanilla spp.* (*V. crenulata, V. cucullata*), ... familles auxquelles on peut ajouter quelques plantes diverses : *Impatiens palpebrata, Peperomia spp.* (*P. fernandopoiana, P. hygrophila*), *Preussiella kamerunensis*, ... les connaissances taxonomiques et sur la distribution des espèces étant encore insuffisantes.

En ce qui concerne les Bryophytes épiphytes, on ne dispose que des relevés établis par RICHARDS (1963) et par AUGIER (1978) pour la forêt de Bakundu au Sud de Kumba. Celle-ci se situant à la limite des districts atlantiques biafréen et littoral (et ayant de plus été perturbée par l'occupation humaine), ces relevés ne sont sans doute pas caractéristiques, d'autant plus que plusieurs Bryophytes citées ont une aire de distribution dépassant ces deux districts et sont souvent des espèces tolérantes pour la sécheresse et la lumière assez forte. Par contre AUGIER (comm. pers.) considère que les espèces suivantes pourraient être des caractéristiques préférantes des forêts atlantiques biafréennes : *Aerobryopsis trachyptera, Entodon geminidens* et *Macromitrium scleropodium* pour les Mousses, *Frullania spongiosa, Plagiochila terebrans* (aussi submont.) et *Porella subdentata* pour les Hépatiques.

A l'issue de cette étude floristique des espèces considérées comme caractéristiques du district atlantique biafréen et à la vue de la distribution connue de nombreuses espèces, on pourrait être tenté de subdiviser ce district en deux par une droite Douala-Ndikiniméki. Cette conception pourra être revue ultérieurement, lorsque des aires de distribution beaucoup plus complètes et pour de très nombreuses espèces auront été établies. Il n'est pas certain que cette subdivision phytogéographique puisse avoir grande valeur.

ANNEX V

DESCRIPTION OF CAMPO WILDLIFE RESERVE
(Extract from "Conservation of Cameroon's Ecosystems",
by Steve Gortlan, cited in Bibliography)

RESERVE DE FAUNE DE CAMPO

COORDONNEES GEOGRAPHIQUES 2° 09' - 2° 53'N, 9° 48' - 10° 25'E.

DELIMITATION PHYSIQUE DU SITE La Réserve de faune de Campo est limitée au nord par la rivire Lobé; aux extrêmes nord-ouest et nord-est, la réserve se prolonge dans l'arrondissement de Kribi. Au Sud par la rivière Ntem, à l'Ouest par l'océan Atlantique, à l'Est par le Ntem jusqu'aux chutes de Memve'elé où elle se poursuit par une limite artificielle en ligne droite (25°) jusqu'à la Lobe. Où les limites naturelles n'existent pas, il n'y a pas de bornes marquées sur le terrain. Les limites sont bien marquées sur la carte de la région (NA-32-XVII; 1:200'000). Il existe aussi une couverture aérienne complète au 1:50'000 (1960-61).

STATUT ADMINISTRATIF

STATUT JURIDIQUE La Réserve de faune de Campo fut créée par arrêté le 19 novembre, 1932. Entre 1932 et 1982 la gestion de la Réserve de faune de Campo était confiée au Service des Eaux et Forêts. En 1982 elle était transférée à la Délégation générale au Tourisme, qui devenait en 1985 le Secrétariat d'Etat au Tourisme. En 1966 une convention fut signée entre la Société forestière de Campo et le Gouvernement camerounais. Ladite convention concède en exploitation 158'217 ha en 1966. Une seconde convention pour 25 ans renouvelable est signée en 1968 et érige la concession à 249'090 ha en 1978. Cette concession, en grande partie dans la Réserve de faune de Campo, contrevient aux dispositions du décret 83/170 portant réglementation de la faune, et de la loi 81/13 portant régime des forêts, de la faune et de la pêche: les licences d'exploitation sont accordées pour une période de cinq ans: la superficie totale accordée à un exploitant ne peut excéder 200'000 ha.

TENURE FONCIERE La Réserve de faune de Campo est une forêt domaniale faisant partie du domaine privé de l'Etat.

AUTORITE RESPONSABLE La Réserve de faune de Campo est placée sous l'égide de la Conservation de faune de Campo, Service de la Direction générale au Tourisme. Elle se trouve dans la province administrative du Sud.

MILIEU ABIOTIQUE

DESCRIPTION PHYSIQUE

CLIMAT La Réserve de faune de Campo a un climat typiquement équatorial à quatre saisons; une grande saison sèche de novembre à février, une petite saison des pluies entre mars et mai, une petite saison sèche de juin à mi-août, une grande saison des pluies de mi-août à novembre. La pluviosité annuelle moyenne s'élève à 2817 mm. La température moyenne annuelle est égale à 26,8°C.

GEOMORPHOLOGIE La Réserve de faune de Campo est située sur des formations du précambrien inférieur. Elle a un relief varié formé de plaines, de vallées et de montagnes. A l'Ouest s'étend une zone de basse altitude au relief relativement plat et à faible pente, le plus haut sommet est le massif des Mamelles culminant à 323 m d'altitude. L'Est est plus montagneux, l'altitude y varie entre 400 m et 1 000 m. Le mont Nkolenengué (969 m) en est le point le plus haut.

GEOLOGIE ET PEDOLOGIE Les roches de la réserve sont des micaschistes à deux micas, des gneiss supérieurs et inférieurs et des gneiss indifférenciés. Il y a essentiellement deux types de sols: les sols ferralitiques typiques et des sols hydromorphes. Les sols ferralitiques sont jaunes et sont dérivés des roches métamorphiques caractéristiques de la zone côtière. Les sols hydromorphes se sont développés là où le niveau de la nappe est proche de la surface du sol. Ils occupent les zones facilement inondables.

REPARTITION DES TYPES D'HABITATS

MILIEU BIOTIQUE

TYPE PRINCIPAL DE VEGETATION La Réserve de faune de Campo appartient au domaine de la forêt dense, humide, sempervirente guinéo-congolaise, secteur forestier toujours vert camerouno-congolais, district atlantique biafréen.

HABITATS TERRESTRES Les principales formations végétales sont:

- Forêt atlantique biafréenne à Caesalpiniaceae encore abondantes, avec *Saccoglottis gabonensis* et autres indices littoraux.
  Les espèces caractéristiques sont *Anthonotha lamprophylla, Coula edulis, Glossocalyx brevipes, Lophira alata* et *Scyphocephalium mannii*. Cette formation se trouve au centre de la réserve.
- Forêt atlantique biafréenne à Caesalpiniaceae encore abondantes, avec *Calpocalyx hietzii* et *Saccoglottis gabonensis*.
  Cette formation se caractérise avant tout par l'abondance de *Calpocalyx heitzii*. Autres espèces sont *Dialium tessmannii, Guibourtia ehie* et *Hoplestigma klaineanum*. La formation se trouve au sud-ouest de la réserve.
- Forêt atlantique littorale à Caesalpiniaceae relativement rare, avec *Saccoglottis gabonensis*.
  Cette formation représente un passage entre le district biafréen et le district littoral; elle se situe au nord de la réserve.
- Forêt atlantique biafréenne à Caesalpiniaceae
  Cette formation se caractérise par la présence et l'abondance de nombreuses espèces de Caesalpiniaceae souvent grégaires. Elle se trouve au sud-est de la réserve.
- Forêt secondaire
  Les forêts secondaires dérivent de la transformation des forêts sempervirentes par l'homme. Ces zones sont par endroits colonisées par un recrû dont les essences

principales sont *Musanga cecropioides, Trema orientalis, Lophira alata* et *Anthocleista* sp.

- Forêt marécageuse
  Les forêts marécageuses sont abondantes en raison de l'important réseau hydrographique de la région. Elles sont occupées par *Mitragyna stipulosa* et par des Marantaceae et des Zingiberaceae.

FAUNE La Réserve de faune de Campo protège des espèces menacées (bien qu'ayant une répartition étendue) de la forêt équatoriale: *Loxodonta africana cyclotis, Panthera pardus, Felis aurata, Cephalophus silvicultor,* et *Pan troglodytes.* D'autres, moins menacées, sont aussi présentes: *Dendrohyrax arboreus, Tragelaphus euryceros, Tragelaphus spekei, Tragelaphus scriptus, Syncerus caffer,* et *Potamochoerus porcus.* La réserve protège aussi des espèces à distribution plus limitée comme *Mandrillus sphinx, Colobus satanas, Gorilla gorilla* et *Cercocebus torquatus.* Parmi les oiseaux on peut noter *Stephanoetus coronatus, Urotriorchis macrourus,* et *Agelastes niger.*

LISTE DE LA FAUNE ET DE LA FLORE ENDEMIQUE/MENACEES

Manis gigantea	Pangolin géant
Panthera pardus	Léopard
Mandrillus sphinx	Mandrill
Cercocebus torquatus	Cercocèbe à collier blanc
Colobus satanas	Colobe noir
Gorilla gorilla	Gorille occidental
Uratriorchis macrourus	Autour à longue queue
Agelastes niger	Pintade noire
Crocodylus cataphractus	Faux gavial
Conrauana goliath	Grenouille géante
Aucoumea klaineana	(Burseraceae) Okoumé
Copaifera religiosa	(Caesalpiniaceae) Anzem
Dialium bipindense	(Caesalpiniaceae)
Didelotia unifoliata	(Caesalpiniaceae)
Gilletiodendron pierreanum	(Caesalpiniaceae) Mbambandi
Monopetalanthus letestui	(Caesalpiniaceae) Andoung
Toubaouate brevipaniculata	(Caesalpiniaceae) Zing
Librevillea klaineana	(Caesalpiniaceae)
Octhocosmus calothyrsus	(Ixonanthaceae) Moka
Testulea gabonensis	(Luxembourgiaceae) Izombe
Calpocalyx heitzii	(Mimosaceae) Miama
Oubanguia laurifolia	(Scytopetalaceae) Meniuminsi
Kantou guereensis	(Sapotaceae) Mbele
Gluema ivorensis	(Sapotaceae) Djimbo

PEUPLEMENT HUMAIN

POPULATION La densité de la population de la Réserve de Campo est égale à environ 1 habitant au Km2. La ville de Campo se trouve à l'intérieur de la réserve. Les ethnies principales sont les Mvuyes, les Yassas, les Batangas, et les pygmées Bagelli. Les Mvayes sont les habitants les plus nombreux. Ils se trouvent presqu'entièrement sur la route Kribi-Mnini par Campo. Les Yassas sont des côtiers vivant essentiellement de la pêche maritime. Une large partie de la population Batanga occupe la réserve de faune. Elle occupe toute la côte de la partie nord-ouest située dans l'arrondissement de Kribi. Les pygmées Bagelli se rencontrent sur l'île de Dipikar et dans les zones de forêts non exploitées. Ces Pygmées vivent surtout de la chasse. Les travailleurs des sociétés agro-industrielles situées au nord de la réserve et celles de la société d'exploitation forestière interne à la réserve y font la chasse.

ACTIVITES ET MOYENS DE COMMUNICATIONS Il y a une route secondaire non-goudronnée entre Kribi et Campo (70km) et entre Campo et Nko'elen (30km). A l'intérieur de la réserve la société d'exploitation forestière a installé pistes et chantiers. Les chasseurs et villageois ont aussi tracé leurs propres pistes. Il est possible d'utiliser les pirogues le long de la côte.

PRINCIPAUX POINTS D'INTERETS DU SITE

BIOLOGIQUES

FLORE La Réserve de faune de Campo présente un très bon échantillon de la diversité biologique de la forêt atlantique biafréenne; de plus, elle se situe à la limite nord des aires de répartition de quelques espèces de provenance gabonaise.

FAUNE La réserve protège la faune de la forêt atlantique biafréenne du secteur sud de la rivière Sanaga - une barrière faunistique très importante.

ECOLOGIQUES La Réserve de faune de Campo joue un rôle dans la régularisation des fleuves Lobo et Ntem et dans celle du climat de la région. Elle protège aussi le terrain grâce à la couverture végétale présente.

SCIENTIFIQUES Le potentiel scientifique du site tient à la présence des riches flore et faune des forêts atlantiques littorales. Cependant, comme une grande partie de la forêt a déjà été détruite, le non renouvellement de la licence d'exploitation forestière donnerait l'occasion de mener une étude sur la régénération de la forêt sur une longue période. Les pistes et les chantiers de la société d'exploitation forestière constitueraient ainsi une infrastructure de base à entretenir.

ECONOMIQUES La réserve joue déjà un important rôle dans l'approvisionnement illégal de viande de chasse des villages et des villes de la région. Environ 100 000 m3 de grumes en sont extraites chaque année.

Si la réserve est bien gérée, elle peut devenir un grand pôle d'activité touristique: les plages

de la région ont à l'heure actuelle un important attrait touristique; la mer offre de plus la possibilité de pratiquer la pêche sportive, et pour compléter le tout, il y a des chutes du Ntem et en particulier celles de Menve'elé.

L'achèvement de la route nationale Kribi-Edéa sera salutaire au développement économique de la région. En tant que ressource génétique, la réserve a une valeur économique. Elle pourrait être négativement affectée par la construction de la route Kribi-Yokadouma (tronçon de la Transafricaine) si certaines précautions ne sont pas prises. Il en est de même avec la construction de la voie ferrée Kribi-Ebolowa. Dans le même ordre d'idées, la réalisation d'un port en eau profonde et l'exploitation du gisement de fer des Mamelles, au coeur de la réserve, peuvent avoir des effets néfastes sur celle-ci.

GESTION ET AMENAGEMENT

GESTION DU SITE La Réserve de faune de Campo est sous la tutelle du Ministère du Tourisme. Elle est gérée par un conservateur assisté de trois gardes-chasses. Les activités de conservation consistent à organiser des patrouilles. Elles ne sont cependant pas très fréquentes à cause du manque de moyens. Administrativement, la réserve se trouve dans la province du Sud.

PRESSION HUMAINE Une forte pression humaine s'exerce sur la réserve. Une société d'exploitation forestière y travaille, dont ses chantiers constituent des foyers de braconnage. Il faut ajouter à cela la présence de deux agro-industries juste au nord de la réserve, Hévecam et Socapalm, qui produisent respectivement du latex et de l'huile de palme. Elles emploient environ 4000 ouvriers qui tirent directement leur ration de protéines animales de la réserve.

PLAN D'AMENAGEMENT Il n'y a pas de plan d'aménagement de la réserve.

ACTIONS PRIORITAIRES POUR ASSURER LA CONSERVATION DU SITE

1) Quand il sera question en 1993 de renouveler la licence de 25 ans accordée à la Société forestière de Campo, il conviendra de ne pas le faire. Les infrastructures et les routes déjà construites doivent être confiées aux responsables de la réserve.

2) Un plan d'aménagement doit être mis en place; il doit comprendre une étude scientifique sur la régénération et la possibilité d'exploiter l'héritage forestier et mettre l'accent sur la valeur économique du processus de régénération.

3) Il faudrait mener une étude économique sur les projets d'extension des plantations d'hévéa et des palmeraies au nord de la réserve. Les plantations devraient bénéficier d'une assistance technique pour permettre aux ouvriers de s'adonner aux cultures vivrières, à l'élevage du petit bétail et de la volaille, et réduire ainsi la pression exercée sur la réserve.

4) Un plan cadastral d'aménagement du Département de l'Océan doit voir le jour. Il devra accorder, dans ses grands projets d'aménagement, une place de choix à la conservation.

5) La possibilité de déclasser la forêt dégradée du secteur ouest, et de classer des aires nouvelles dans le secteur est, doit être étudiée.

6) Des zones tampons doivent être créées autour de la réserve. Les limites de celles-ci doivent être démarquées et entretenues.

7) Il est nécessaire de fournir des ressources humaines et matérielles adéquates à la réserve. Le conservateur ne dispose pas de véhicule et cela dure depuis plusieurs années déjà. La quantité et la qualité du personnel en place sont à revoir.

8) Des programmes extensifs d'éducation sur la conservation de l'environnement doivent être mis sur pied autour de la réserve.

9) Le développement du tourisme doit être prioritaire dans la région.

ANNEX VI

STATISTIC TABLES AND DETAILED INFORMATION ON THE SOCIO-ECONOMIC INFLUENCE ZONE CLOSE TO THE PROJECT