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ETUDES D'AMÉNAGEMENT DE LA ROUTE BATCHENGA – NTUI – YOKO – TIBATI – NGAOUNDERE

RAPPORT DE L'ÉTUDE D'IMPACT ENVIRONNEMENTAL ET SOCIAL



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GROUPEMENT



Sommaire

Liste des figures	5
Liste des tableaux	5
Liste des abréviations	7
SUMMARY	8
RESUME NON TECHNIQUE	14
1 INTRODUCTION	21
1.1 Presentation of the works contractor	21
1.2 Context and justification of the project	21
1.3 Structures/facilities and related projects	24
1.4 Methodological approach used	24
1.4.1 Literature review	25
1.4.2 Field mission	25
1.4.3 Data analysis	26
1.4.4 Difficulties encountered	26
2. DESCRIPTION OF THE PROJECT	27
2.1 Project localization zone	27
2.2 Project data and current condition of the road and bridges	28
2.2.1 Condition of the road	28
2.2.2 State of hydraulic and drainage systems	29
2.3 GENERAL DESIGN PRINCIPLES	30
2.3.1 General characteristics of the main road	30
2.3.2 Definition of road type	31
2.3.3 Definition of road category	31
2.4 Description of the Project	32
2.4.1 Cross-section profile	32
2.4.2 Horizontal alignment, longitudinal profile	35
2.4.3 Barriers and safety equipment	38
2.4.4 Vertical and horizontal signage	39
2.4.5 Specific restructuring	39
2.5 Realization of the project	43
2.5.1 Planned bridges	43
2.5.2 Urban roadways	43
2.5.3 Connected routes	44
2.5.4 Allocation of the road project	46
2.5.5 Cost of work	54
2.5.6 The resources to be used	56
2.5.7 Water requirements for the construction site	58
2.5.8 Fuel supply	58
2.5.9 Labor requirements	58
2.6 Pollution and potential disturbance directly connected to the project	58
3 THE LEGAL AND INSTITUTIONAL CONTEXT OF THE ESIA	60
3.1 Legal framework	60
3.1.1 National legislation and regulations	60
3.1.2 International and regional treaties connected to this study	64
3.1.3 Regional treaties	66
3.2 Institutional framework	66
3.2.1 The Ministry for the Environment and the Protection of Nature and Sustainable Development (MINEPDED)	66
3.2.2 The Ministry for Public Works (MINTP)	67
3.2.3 The Ministry for Industry, Mines and Technological Development (MINIMIDT)	67

3.2.4	The Ministry for Forestry and Fauna (MINFOF).....	67
3.2.5	The Ministry of State Property and Land Affairs (MINDCAF).....	68
3.2.6	The Ministry for Agriculture and Rural Development (MINADER).....	68
3.2.7	The Ministry for Social Affairs (MINAS)	68
3.2.8	The Ministry for Housing and Urban Development (MINHDU)	68
3.2.9	The Ministry of Labor and Social Security	69
3.2.10	The Ministry for Water and Energy (MINEE)	69
3.2.11	The Ministry for Public Health.....	70
3.2.12	The Interministerial Committee on the Environment.....	70
3.2.13	Local and traditional authorities	70
3.2.14	The not-for-profit sector and cooperative bodies	70
3.2.15	Institutional difficulties.....	71
3.3	National legislation specific to the ESIA.....	71
3.3.1	The basic law on the impact assessment process.....	71
3.3.2	Other institutions involved in the Environmental Impact Assessment process	73
3.3.3	The main texts which govern ESIA in Cameroon.....	74
3.4	Standards	76
3.4.1	Administrative procedures for conducting an EIE.....	76
3.5	The African Development Bank's Environmental Procedures	78
4	DESCRIPTION OF THE INITIAL STATE OF THE ENVIRONMENT	81
4.1	Demarcation of the study zone.....	81
4.1.1	Direct impact zone.....	81
4.1.2	Indirect impact zone	81
4.2	Description of the relevant environmental components.....	82
4.2.1	The natural environment.....	82
4.2.2	Physical context.....	86
4.2.3	Biological context.....	93
4.2.5	Community forests.....	108
4.2.6	Brush fires	108
4.3	The Protected Areas affected by the Project.....	108
4.3.1	The National Park of Mbam and Djerem	109
4.3.2	Mpem and Djim National Park (MDNP).....	119
4.4	Human and Socioeconomic Environment.....	124
4.4.1	Socioeconomic surveys.....	124
4.4.2	Economic activities along the route	132
4.4.3	Living environment and socio-collective infrastructures.....	144
5	ANALYSIS OF ALTERNATIVE SOLUTIONS	150
5.1	Option adopted and justification	150
5.2	“No-project” alternative.....	150
5.3	Positive effects of the project	151
6	CONSULTING AND INFORMING THE PUBLIC	152
6.1	Methodology for public consultations	152
6.2	Results of public consultations	154
7	IDENTIFICATION AND ANALYSIS OF THE POTENTIAL IMPACT OF THE PROJECT ON THE ENVIRONMENT	155
7.1	Identification methodology of the impacts of the project.....	155
7.1.1	Impacts characterization and assessment.....	156
7.2	Impacts sources from the project	158
7.2.1	Project activities and tasks typology.....	158
7.2.2	Building site facilities setting.....	158
7.2.3	Materials transportation/machines traffic	158
7.2.4	Operations related to the road construction.....	158

7.3	Inventory of the expropriated properties	159
7.3.1	Inventory of the properties for housing use	159
7.3.2	Inventory of the social facilities and public infrastructures expropriated	161
7.3.3	Inventory of the trees and crops expropriated	162
7.4	Affected population	167
7.4.1	Population affected per town	167
7.4.2	Farmers affected per town	167
7.4.3	Businesses affected per town	167
7.4.4	Estimation of the overall population affected by all the expropriation types.....	167
7.5	Detail of the compensation cost	167
7.6	Impacts of the project during the construction phase	168
7.6.1	Impacts on the physical environment	168
7.6.2	Impacts on the soil (compaction, erosion, loss of the soil fertility) and reorganization of the profile in the borrow areas:	170
7.6.3	Impacts on the soils: Physical and chemical pollution	171
7.6.4	Effects on the water resources	172
7.6.5	Impacts on wildlife: habitat fragmentation and poaching	173
7.6.6	Impacts on the plant life and pressure on the NTFPs	174
7.6.7	Quality of life.....	176
7.6.8	Visual and landscape impacts	177
7.6.9	Impacts on the human health: workers and residents exposure to STIs/HIV AIDS and endemic diseases (onchocerciasis, waterborne and respiratory diseases)	178
7.6.10	Impacts on human security: risks of accidents (traffic accidents and occupational accidents) ...	179
7.6.11	Impact on the urban mobility.....	180
7.6.12	Impacts on road safety	180
7.6.13	Impacts on incomes.....	181
7.6.14	Risks of conflicts between the construction works staffs and the local populations.....	182
7.6.15	Risk of upsurge of criminal activities.....	182
7.7	Identification of the impacts related to the implementation of the road operations ... 183	
7.7.1	Impacts on wildlife	183
7.7.2	Impacts on the plant life.....	184
7.7.3	Impacts on the biodiversity, specific case of the National Parks	185
7.7.4	Impacts on the water resources.....	185
7.7.5	Impacts on the soils.....	188
7.7.6	Impacts of noise and vibrations	189
7.7.7	Impact on the air quality	189
7.7.8	Impacts on mobility.....	190
7.7.9	Impacts on human security.....	191
7.7.10	Impacts on human health	192
7.7.11	Economical impacts.....	193
7.7.12	Impacts on populations migration	194
7.7.13	Impacts cultural, archaeological and historical heritage	195
7.8	Impacts related to maintenance activities	196
7.9	Cumulative impacts	198
7.9.1	The Chad-Cameroon oil-pipeline project — in progress	198
7.9.2	The construction project of the Lom Pangar hydroelectric dam — in progress	198
7.9.3	The construction project of the Nachtigal dam, agreement signed in November 2013.....	199
7.9.4	The project of bauxite extraction in N'gaoundal — in progress	199
7.9.5	Consequences of these projects on the road	199
7.10	Residual impacts	200
7.11	Attenuating negative impacts and enhancing positive impacts	200
7.11.1	Attenuating measures related to the nuisances of project footprint: compensation of the expropriated	200
7.11.2	Accompanying measures during construction phase	201
7.11.3	Selection and engagement of contractors	201
7.11.4	Measures regarding the organization, conduct and supervision of the work	204
7.11.5	Environmental preservation measures during the construction phase	211
7.11.6	Environment conservation measures during the operation phase.....	232

7.12	Operating and maintenance program	240
7.12.1.	Costs of general contractual measures	241
7.12.2	Costs of specific measures.....	241
8	ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN	242
8.1	Objectives of the ESMP	242
8.2	Plan for implementing the proposed steps	242
8.2.1	Integration of the environmental clauses into the Contractor project	242
8.2.2	Texts of applicable laws	243
8.2.3	Application of priorities to the steps	244
8.2.4	Persons responsible for implementing the steps	244
8.2.5	Phasing the implementation of environmental steps	245
8.3	Surveillance and environmental monitoring	245
8.3.1	Objectives of environmental surveillance	245
8.3.2	Surveillance actors and responsibilities.....	246
8.3.3	Tools and criteria for environmental surveillance	247
8.3.4	Surveillance reports.....	248
8.3.5	List of elements requiring environmental surveillance and a surveillance program	249
8.3.6	Cost of surveillance	254
8.4	Plan for environmental monitoring	254
8.4.1	Objectives of the environmental monitoring.....	254
8.4.2	Monitoring activities	254
8.4.3	Procedures to be followed by the Project owner.....	254
8.4.4	Institutional provisions	256
8.4.5	Monitoring indicators	256
8.4.6	Estimating the cost of the ESMP	257
8.4.7	Summary table of the ESMP	258
8.5	THE ENVIRONMENTAL ITINERYPLAN	263
8.6	MANAGEMENT OF IMPACTS NOT IDENTIFIED DURING THE STUDY.....	263
8.7	PUBLIC PARTICIPATION.....	263
8.7.1	In implementing the ESMP.....	263
8.7.2	Cooperation plan and dialog accompanying the PAR.....	264
9	Conclusion	268
10	ANNEXES.....	269

Annexe 1 : Tdrs approuvés de l'étude

Annexe 2 : Agrément du bureau d'étude

Annexe 3 : Les listes de présence aux consultations publiques

Annexe 4 : Les procès verbaux des réunions avec les différentes parties prenantes

Annexe 5 : Questionnaires villages et ménages

Annexe 6 : Coordonnées villages et informations supplémentaires par village

Annexe 7 : Bibliographie

Annexe 8 : Localisation des gites et carrières

Annexe 9 : PGES

Annexe 10 : Liste des espèces protégées

Annexe 11 : Plan de Gestion Environnementale et Sociale (format BAD)

LISTE DES FIGURES

Figure 1: Location of the road.....	27
Figure 2: Parking areas in crossing agglomerations	40
Figure 3: Protection in front of schools	41
Figure 4: Constructions at water points	41
Figure 5: Truck stop.....	42
Figure 6: Climatic regions of Cameroon	83
Figure 7: Precipitation along the road axis.....	85
Figure 8: Temperatures along the road axis	85
Figure 9: Geology along the axis of road.....	88
Figure 10: Main geomorphological elements	90
Figure 11: Climate zones	94
Figure 12: Area showing distribution of elephants in the center and south of Cameroon (in Blanc et al., 2007)	97
Figure 13: Spatial distribution of elephants.....	98
Figure 14: Vegetation coverage.....	106
Figure 15: Occupation of the land in terms of forests and protected zones	107
Figure 16: National Park of Mbam and Djerem.....	111
Figure 17: Mpem and Djim National Park.....	121
Figure 18: Map of surveyed villages	125
Figure 19: Demographic weight of villages	128
Figure 20: Agroecological zones and crops in the study area.....	135
Figure 21: Forest exploitations in Cameroon	140
Figure 22: The Mankim-head palm tree.....	142
Figure 23: Industrial activities in the study area.....	143
Figure 24: Map of villages where the public consultations were held.....	153

LISTE DES TABLEAUX

Table 1: Deterioration indices for the paved sections.....	29
Table 2: Technical restructuring standards to be applied	30
Table 3: Characteristics of main roads.....	31
Table 4: Characteristics of the planned pavement	32
Table 5: Minimum geometric characteristics	35
Table 6: Choice and costs of the 250 km of roadway connections.....	45
Table 7: Allocation	47
Table 8: Main geotechnical characteristics of the solid rock quarries.....	57
Table 9: Summary of the main activities and tasks connected to the road building projects	59
Table 10: Ecological characteristics, physical and rainfall data for the natural environment within the study zone.....	84
Table 11: Average monthly temperatures in the project zone.....	85
Table 12: Air humidity: monthly averages in the project zone	85
Table 13: Annual rainfall	86
Table 14: Monthly rainfall.....	86
Table 15: Fauna.....	95
Table 16: List of the freshwater fishes in the basin of the Sanaga River	101
Table 17: General family distribution pattern in the various habitats and ecological niches of the forest rivers	102
Table 18: Flora.....	103
Table 19: Meteorological data for the Mbam and Djerem region.....	112
Table 20: Main agricultural activities per community	134
Table 21: Provincial distribution of the country's various types of livestock.....	137
Table 22: Public consultation	152
Table 23: Qualifications and symbolism of the different characterization parameters	157
Table 24: Combination key of the different criteria	157
Table 25: Distribution of the expropriated houses per town	159
Table 26: Distribution of the buildings to expropriate per village for Batchenga town.....	160
Table 27: Distribution of the buildings to expropriate per village for Ntui town	160
Table 28: Distribution of the buildings to expropriate per village for Yoko town	160
Table 29: Distribution of the buildings to expropriate per village for Tibati town	161
Table 30: Distribution of the buildings to expropriate per village for Ngaoundal town.....	161
Table 31: Distribution of the buildings to expropriate per village for Martap town.....	161
Table 32: Inventory of the social services and public infrastructures expropriated per town	161

Table 33: Trees and crops expropriated (per town).....	163
Table 34: Trees and crops expropriated (per village)	163
Table 35: Estimation of the relocated population per town	167
Table 36: Estimation of the number of farmers relocated per town	167
Table 37: Estimation of the number of farmers relocated per town	167
Table 38: Overall cost of the compensations and the implementation of PAR.....	168
Table 39: Impacts of the construction operations on the generation of dust.....	169
Table 40: Impacts on the air quality: sources of dust	169
Table 41: Impacts on the air quality: gas sources	170
Table 42: Impacts on the soil (compaction, erosion, loss of the soil fertility) and reorganization of the profile in the borrow areas:	171
Table 43: Impacts on the soil resources: Physical and chemical pollution	172
Table 44: Impacts on the water resources:	173
Table 45: Impacts on the wildlife.....	174
Table 46: Impacts on the plant life and the NTFPs	175
Table 47: Impact on the quality of life	176
Table 48: Identified laterite gravel materials shelters	177
Table 49: Assessment of the landscape impact depending on the quarry type	178
Table 50: Visual and landscape impacts	178
Table 51: Impacts on health.....	179
Table 52: Impacts on security	180
Table 53: Impacts on mobility and traffic.....	180
Table 54: Impacts on road safety.....	181
Table 55: Impact on employment.....	181
Table 56: Impact on the risk of conflicts	182
Table 57: Impact on criminal activities	183
Table 58: Impacts on the wildlife.....	184
Table 59: Impacts on the plant life and the NTFPs	184
Table 60: Impacts on the biodiversity.....	185
Table 61: Concentrations of polluting matters in the dust deposits on the roads.....	186
Table 62: Impacts on the water resources	188
Table 63: Impacts on the soils	188
Table 64: Impacts on the noise and the vibrations	189
Table 65: Evolution of atmospheric emissions for a speed change from 41 to 74 km/h	190
Table 66: Impacts on the air quality	190
Table 67: Impacts on mobility	191
Table 68: Impacts on human security	192
Table 69: Impacts on human health.....	193
Table 70: Economical impacts	194
Table 71: Impacts on population migration	195
Table 72: Impact on the cultural and religious heritage	195
Table 73: Synthesis of the impacts of the road maintenance	197
Table 74: Cumulative impacts.....	199
Table 75: Environmental and Social Surveillance Program for the Workplaces and Work	250
Table 76: Total cost of the basis and two-layer solutions of the project and estimation of the environmental and social steps.....	258

LISTE DES ABRÉVIATIONS

APD : Avant-Projet Détaillé
APS: Avant-Projet Sommaire
CBD: Convention sur la Diversité Biologique
CEMAC : Communauté Economique et Monétaire de l'Afrique Centrale
CGES: Gestion Environnementale et sociale du chantier
CIE: Comité Interministériel de l'Environnement
DAO : Dossier d'appel d'Offres
DIPPER: Division de la Protection du Patrimoine et de l'Environnement Routier
EIE: Etude d'Impact sur l'Environnement
EIES : Etude d'impact Environnemental et Social
HIMO Haute intensité de main d'œuvre
MINADER : Le Ministère de l'Agriculture et du Développement rural
MINAS: Le Ministère des Affaires Sociales
MINDHU: Le Ministère de l'Habitat et du Développement urbain
MINEPED: Le Ministère de l'Environnement et de la Protection de la Nature et du Développement Durable
MINFOF: Le Ministère des Forêts et de la Faune
MINTP: Le Ministère des Travaux Publics
MNIDCAF: Le Ministère des Domaines et des Affaires Foncières
MST: Maladies Sexuellement Transmissibles
OH: Ouvrages hydrauliques transversaux
PAQ: Plan d'assurance qualité
PAR: Plan de relocalisation des populations
PDR: Plan Directeur Routier
PEES: Procédures d'évaluation environnementale et sociale
PIB: Produit Intérieur Brut
PNGE: Plan National de Gestion de l'Environnement
PPES: Plan de Protection de l'Environnement des Sites
SME: Système de Management Environnemental
STI: STUDI International
UNCCC: Nations Unies sur les Changements Climatiques
WHC: World Héritage Convention

SUMMARY

The purpose of the study is to develop a road project adapted to the conditions of the site, meeting the objectives of an optimum comfort and safety road and integrated into its natural environment and socio-economic features with an appropriate set of environmental measures and related facilities.

The construction of the road project aims to enhance the quantity and quality of transport infrastructure, in particular the classified road network in order to meet the needs of the country and regional integration in the Central Africa sub-region.

The aim of the mission is to have a detailed study of the appropriate technical solution and socio-economic development of the optimal road Batchenga - Ntui - Yoko - Tibati – N'gaoundéré.

The main components of the project include:

- ✓ The construction of the main road (594 km): Batchenga - Ntui - Yoko - Tibati - Ngaoundéré, in a modern road asphalt;
- ✓ The construction of a new bridge on Sanaga river (400 m)
- ✓ The construction of 250km of secondary roads;
- ✓ The construction of 15km of roads spread over three cities Ntui, Yoko and Tibati;

The main road project

The main road project involves the construction of 594 km of road. The provisional estimate of the work of this study phase preliminary design has been prepared by considering three main sections:

- Section 1: Batchenga - Ntui - Yoko (200.1 km);
- Section 2: Yoko - Tibati (180.1 km);
- Section 3: Tibati - N'Gaoundéré (213.8 km);

Each of the three main sections is divided into eight sub-sections considering the conditions of the natural landscape, soil and categories of the proposed road.

The estimate of the work is established at:

- section 1 : 194.4 Billion FCFA
- section 2 : 116.6 Billion FCFA
- section 3 : 137.8 Billion FCFA

Urban roads

In accordance with the Terms of Reference, fifteen (15) kilometers of roads are going to be studied in the following cities NTUI, YOKO and TIBATI, with a distribution of 5km by city.

Related facilities

Secondary roads: Using a multicriteria analysis 250 km of roads were selected 7 in Ntui , 2 in and Yoko and Tibati and 3 in N'Gaoundéré with a total cost estimated at 30 billion FCFA.

In addition, the consultant will propose several related developments as the construction of schools, Health Centers, health and safety campaigns of sensibilization, training of women's groups, distribution of agricultural material, training of administration managerial staff; transhumance measures and environmental protection and building capacity.

Laws and regulations

The most important laws are described below:

- Law No. 96/12 of 5 August 1996 framework law on environmental management from the National Environmental Management 1996, this law establishes the legal framework for environmental management in Cameroon. It is based on six fundamental principles (principle of "precautionary" action preventive and corrective, polluter pays, responsibility, participation and subsidiary).
- Decree n ° 2005/577 of 23 February 2005 laying down the procedures EIA process;
- MINEP of 8 March 2005 laying down the different categories of operations whose implementation is subject to the EIA.

Decree No. 2013/0171/PM of February 14, 2013. This new decree sets among others, the procedure for carrying out studies, accrued expenses, the methods of carrying out consultations and public hearings (Articles 11-15) . It also clarifies the role of the administration in the process of monitoring and environmental monitoring projects.

- Law n ° 98/015 of 14 July 1998 relating to establishments classified as dangerous, unhealthy or
- Law No. 94/01 of 20 January 1994: forestry, wildlife and fisheries
- Law n ° 98/005 of 14 April 1998 on the water regime
- Ordinance No. 74-1 of 6 July 1974 on land management in Cameroon
- Law n ° 1985-09 of 4 July 1985 on the expropriation for public purposes and compensation arrangements
- Law n ° 86/016 of 6 December 1986 on the reorganization of civil protection.
- Law n ° 91/008 of 31 July 1991 on the protection of cultural and natural heritage of the nation-
- Law n ° 92/007 of 14 August 1992 establishing the Labour Code

Regional conventions

- Agreement of cooperation and consultation between the Central African States on the conservation of wildlife (Libreville, 1983)
- Convention on cooperation for the protection and enhancement of the marine environment and coastal areas of West Africa and Central Africa (Abidjan, 1981)
- International conventions ratified by Cameroon
- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971)
- Convention on the Protection of Cultural and Natural Heritage (Paris, 1972)
- Convention on International Trade in Endangered Species of Fauna and Flora (CITES) (Washington, 1973)
- Bonn Convention on Migratory Species of Wild Animals (Bonn, 1979)
- Vienna Convention on the Protection of the Ozone Layer (Vienna, 1985)
- Convention on Climate Change (Rio de Janeiro 1992)
- Convention on Biological Diversity (Rio de Janeiro 1992)
- Kyoto Protocol on greenhouse gas emissions (Kyoto, 1997)
- Conventions of the International Labour Organization (ILO)

Project environment

The project starts in Batchenga then crosses the city of Ntui, Yoko, Tibati and then reach the capital of the region of Adamaoua the City of N'gaoundéré. This road project (594 km) crosses two regions which is the Center and the Adamaoua region which includes two major climatic zones related to a specific type of vegetation:

- The equatorial climate zone Transition Centre (sections: Batchenga-Ntui-Yoko and Yoko-section part of Tibati) where dominates the forest ecosystem

• The altitude tropical climate zone type Sudanese Adamaoua (sections: Yoko-Tibati - N'gaoundéré) where dominates the savannah ecosystem

In addition of the climatic diversity, the ethnic composition of the area is very rich and diverse. In the Central area its is the region of the Bantu (the Vutés the Mboums the Baveucks the Etongs the Baya, the Bassas, the Bafias the Boulous, Fulbe, Haoussa etc.). In the Adamaoua region the majority of the inhabitants are the Fulani Muslims, known as Fulani and Bororo.

The population is predominantly Christian (Catholic, Protestant, Evangelical Lutheran Church, Seventh-day Adventist Church, Gallican Church, and Jehovah's Witnesses) from Batchenga up to Tibati . From Tibati, the Muslims are in the majority, such as Hausa, the Fulani Bororo.

A socioeconomic survey has been conducted and focused on a sample of 87 villages directly on the edge of the road. People living in the immediate vicinity of the road are estimated by different administrative censuses data at approximately 345,637 inhabitants.

More than half of this population lives in the major semi-urban centers (Ntui, 20 000, 3 830 inhabitants and Yoko Tibati 28,318 inhabitants), in the city of N'Gaoundéré (189 080 inhabitants) and the rest in the villages population is ranging from a few hundred to a few thousand people.

For the expanded scope of the study (including the population of nearby municipalities and departments), the population affected by the project would be:

- 414,603 people in Adamaoua: 89,255 for the department and Djerem 325,348 for the Department of Vina,
- 46 992 people in the Central region (31 722 to the town Ntui of 15,270 people for Yoko) Yoko)

Thus, the total population affected by the project is estimated at just over 500,000 people. This data is confirmed by field surveys conducted by the Consultant in February 2012.

Moreover, the results of the public consultations held in the 87 villages revealed that people in the area of direct impact of the project are victims a secluded life as they see as the main obstacle to the development of their communities:

- (i) difficulties access to schools,
- (ii) difficulty to evacuate agricultural produce to major shopping centers,
- (iii) difficulty evacuating cases of seriously ill patients to the major hospitals in Yaoundé or N'gaoundéré,
- (iv) Staff desertion of public services (schools, health centers) due to the high cost and insecurity of transport current difficulties of water and energy.

Impacts of the project

Construction phase ; negative impacts are impacts on the air (Middle and temporary) on land degradation (Low and temporary) and borrow areas (Middle and temporary), chemical pollution of soils (strong and development), the quantity of water resources for groundwater (Middle and temporary) for surface waters (Middle and durable), wildlife such as poaching (strong and durable) and disturbance of wildlife (slight and temporary), flora and pressure on NWFP (strong and durable), the quality of life with noise (small and temporary) and mobility (Middle and temporary) on the landscape for careers (Middle and sustainable) for sandpits (weak sustainability) for massive rock careers (Middle and sustainable) human health (major and sustainable) human security (strong and temporary) on Urban Mobility (medium and temporary), the risk of conflict between site personnel and the local population (average and temporary) and finally the upsurge in banditry (medium and temporary).

The positive impacts are primarily the effects on local livelihoods, through the recruitment of workers and small businesses and city services that customers receive additional and therefore higher incomes (and very temporary).

In the operation phase, the negative impacts on wildlife are: Accidents (medium and long-lasting) poaching (strong and durable), disturbance of wildlife (and sustainable way) flora (and sustainable way), water resources pollution (low and sustainable) accidental pollution (medium and long-lasting), soil (medium and temporary), noise and vibration (and sustainable way), air quality (low and temporary), Human Security: accidents (strong and durable), migration (and sustainable way). Positive impacts relate to mobility (major and lasting), safety of road users (and sustainable way), on health with improved patient evacuation (strong and durable), the reduction of dust (medium and development), cultural heritage and traditional leaders on economic activities (strong and durable).

Environmental measures

In order to ensure a smooth integration of the project in its environment, mitigation and compensation measures are proposed for each identified negative impact First of all, several provisions are to be taken for the undertaking concerned to:

- To manage the project and its impacts on the environment (water, soil, waste, security, etc.).
- Rigor in the writing of specifications and carry out the work;
- Secure the services of a responsible awareness of environmental issues and site constraints.

The main steps in the construction phase include:

- Capacity building:

Recruitment of an engineer environment throughout the duration of the project;

Organization of training sessions 4 to 5 days for designated staff;

For ranger's equipment to outfit 20 guards such as tents, camping kits;

10 more guards will be affected throughout the duration of the project to strengthen surveillance. It will also provide three all-terrain vehicles for water services and Forest City Ntui, Yoko and Tibati;

- Measures to preserve the soundscape: limitation of construction noise
- The limitation of emissions: the site equipment maintenance and preparation areas tar should be away from residential
- Limitation of sludge and dust: the dump trucks must be covered by tarpaulins.
- Soil protection, revegetation measures
- Protection of waters specific location for the decantation tanks and septic tanks and prohibition of pollutant discharge
- Modification of natural flow: installation of the sites outside the floodplain, avoid discharge into rivers, open areas for depositing materials at a distance of at least 100 m from the river
- Fauna and flora: A NGOs will be recruited to raise awareness about the preservation of flora and fauna and awareness materials will be distributed. In addition, signs indicating the wildlife crossings around Yoko and Tibati be placed.
- Human Health: A NGOs will be recruited to raise awareness about STDs, a clinic will be set up in each life base, condoms are available and regular screening will be organized.
- Women and agriculture: training will be provided as well as a distribution of agricultural equipment
- Human Security: signaling, access control, awareness, equipment and construction workers fences schools

- Contribution to Education Project: Construction of a building with two rooms and a room for the teacher of each school
- Contribution of the project to improving health: Equipping the existing health center
- Against Banditry: 3 cars will be allocated to law enforcement for the cities of Ntui, Yoko and Tibati
- Measures transhumance: In view of the importance of transhumance in the study area it is important to implement a rest every 50 km on the road and a cattle trough.
The main measures in the operation phase include
 - Wildlife: awareness signs and notifying a potential wildlife corridors, installation of guardrails, trees crossings primates should be kept
 - Flora: establishment of a nursery for replanting trees
 - Water and Soil slides sustainable facilities anti erosion, vegetation, cleaning of rivers
 - Air and soundscape: speed limit, control of technical inspection engines ect.
 - Human health: awareness signs coupled with an NGO actions on land
 - Urban Safety: Sidewalks of 2 m width, widening shoulders to 2 m, parking lanes at all villages, construction of stairs to the difficult access to some homes located in vertical drop from the road , installation of pedestrian crossings on the right gutters of homes and local development of parking areas for logging trucks., development of protection by the law schools in fencing, netting, appropriate signage and installation of speed humps / alarm installation signs of awareness against the dangers of the road, rails and safety equipment, vertical and horizontal signaling
 - Quality of life: construction of stairs or ramps for difficult access to some homes located vertical drop compared to the road layout for crosswalks dalettes gutters on the right houses and premises side cut; development of rest areas and parking to the right of the Rocky Mountain Fouy from pk162 Park and Mbam and Djerem from pk250 to offer tourists visiting these areas a better framework, the creation of stairs for access to water points are generally located at bridges and high flows.

Conclusion

The main conclusions emerging from this environmental and Impact assessment study are:

- The population is very favorable to start the project and the results of consultations highlighted several points that should be integrated as security, and employment of the local population.
- The negative impacts of the construction period can be considerably reduced by the inclusion in the specifications of companies safeguards the environment and recommended the establishment of management structures and monitoring environmental work.
- The forest that will be degraded for the ROW must be replanted strict monitoring undertaken
- Risks to the health and safety of residents and workers during construction are major measures and should be applied and strictly monitored
- The organization of projects and monitoring of minimum standards of environmental protection during construction will ensure tolerable impacts by the natural and human environment
- Measures for the population as the support of women, improvement of education and health infrastructure is essential to the successful integration of the project by the people, an upgrade farming practices is essential to enable them to cope with the new pressures they will experience in the face of market opening.

- The first consequence of the development and construction of the road is the strengthening of the corridor between the country and the increase in traffic between the region and the Centre Adamaoua and improved travel conditions, particularly in terms of safety and comfort
- the Construction of the road is very important for improving traffic conditions that will result in an overall positive impact on the quality of life of the villagers (opening a secure and permanent service during the rainy season, easier access to services social, etc..) and the regional and national economy (boosting rural development, reducing the cost of transport, strengthening of national communications, etc.).
- This project is very important for the local population and if environmental measures are strictly adhered to it is considered feasible and important

RESUME NON TECHNIQUE

Description du projet

La problématique de l'étude consiste à concevoir un projet routier adapté aux conditions du site, répondant aux objectifs de confort et de sécurité optimales, intégré dans son environnement naturel et socio-économique par un ensemble de mesures environnementales et d'aménagements connexes répondant à certains besoins des populations vivant dans la zone d'influence, tout en assurant une rentabilité économique acceptable.

Sur le plan sectoriel, l'étude vise à renforcer quantitativement et qualitativement les infrastructures de transport, en particulier le réseau routier classé, pour répondre aux besoins du pays et de l'intégration régionale dans la sous région Afrique centrale. Sur le plan spécifique, la mission vise à disposer de l'étude détaillée de la solution technique et socioéconomique optimale d'aménagement de la route Batchenga – Ntui – Yoko – Tibati – Ngaoundéré, en vue de faciliter la recherche de financement pour les travaux.

Les principales composantes du projet concernent :

- L'aménagement de la route principale (594 km) reliant Batchenga – Ntui – Yoko – Tibati – Ngaoundéré, en une route moderne bitumée ;
- La construction d'un pont sur la Sanaga (400m de longueur) ;
- L'aménagement de 250 km de pistes connexes;
- L'aménagement de 15km de voiries réparties sur les trois villes de Ntui, Yoko et Tibati ;

Le projet routier

Le projet consiste en l'aménagement de 594 Km de route. L'estimation prévisionnelle des travaux de la présente phase d'études a été préparée en considérant les trois principales sections suivantes :

- Section 1: Batchenga – Ntui - Yoko : (200,1km) ;
- Section 2 : Yoko - Tibati : (180,1km) ;
- Section 3 : Tibati - N'Gaoundéré : (213,8km) ;

Chacune des trois Sections principales est décomposée en huit Sous-sections homogènes entre les principaux villages traversés, en considérant les conditions de relief, de sol et les catégories de route projetée.

Le coût des travaux est estimé à :

- section 1 : 194,4 Milliards FCFA
- section 2 : 116,6 Milliards FCFA
- section 3 : 137,8 Milliards FCFA

Voiries urbaines

Pour les voiries conformément aux Termes de Référence, quinze (15) kilomètres de voiries sont à étudier dans les villes de NTUI, YOKO et TIBATI, à raison de 5km par ville. 8 pistes ont été sélectionnées à Ntui, 9 à Yoko, et 7 à Ngaoundéré.

Aménagements connexes

Pistes rurales : A l'aide d'une analyse multicritères 250 Km de piste ont été sélectionnés, 7 à Ntui, 2 à Yoko et à Tibati et 3 à Ngaoundéré avec un coût total estimé à 30 000 000 000 FCFA.

Par ailleurs, le consultant proposera plusieurs aménagements connexes qui accompagneront le projet tel que la construction de gares, marchés; d'écoles ou encore des Centres de Santé.

Textes législatifs et réglementaires

Les textes législatifs les plus importants sont décrits ci-dessous :

- La loi n° 96/12 du 5 août 1996 portant loi cadre relative à la gestion de l'environnement Découlant du Plan national de gestion de l'environnement de 1996, cette loi fixe le cadre juridique général de la gestion de l'environnement au Cameroun. Elle repose sur six principes fondamentaux (principe dit « de précaution », d'action préventive et de correction, pollueur-payeur, responsabilité, participation et subsidiarité).
- Le décret n° 2005/577 du 23 février 2005 fixant les modalités de réalisation des EIE ;
- L'arrêté du MINEP du 8 mars 2005 fixant les différentes catégories d'opérations dont la réalisation est soumise à l'EIE.
- Le décret N°2013/0171/PM du 14 Février 2013 .Ce nouveau décret fixe entre autres, la procédure de réalisation des études, les frais à payer, les modalités de réalisation des consultations et des audiences publiques (articles 11 à 15). Il précise également le rôle de l'administration dans la procédure de surveillance et de suivi environnemental des projets.

L'EIES, fournit la matière et le processus requis en application de l'ensemble des lois, décrets et arrêtés référencés ci-dessus et intègre également des considérations plus larges portées par plusieurs autres textes juridiques, environnementaux, sociaux ou techniques, nationaux et internationaux dont une liste est fournie ci-dessous :

- La loi n°98/015 du 14 juillet 1998 relative aux établissements classés dangereux, insalubres ou incommodes
- La loi n° 94/01 du 20 janvier 1994 portant régime des forêts, de la faune et de la pêche
- La loi n° 98/005 du 14 avril 1998 portant régime de l'eau
- L'Ordonnance n° 74-1 du 6 juillet 1974 sur la gestion foncière au Cameroun
- Loi n° 1985-09 du 4 juillet 1985 relative à l'expropriation pour cause d'utilité publique et aux modalités d'indemnisation ainsi que et son décret d'application, le N° 87/1872 du 18 décembre 1987. Ces textes stipulent que l'expropriation ouvre droit à une indemnisation préalable. Les indemnisations pour expropriation sont à la charge de la personne morale bénéficiaire de la mesure. Elles portent sur les terrains nus, les cultures, les constructions, toutes autres mises en valeur, quelle qu'en soit la nature, dûment constatées par une commission dite Commission des Constat et d'Evaluation. L'indemnisation peut être faite en numéraire ou en nature, à condition que le terrain attribué en compensation soit situé dans la même commune que le terrain exproprié
- Loi n° 86/016 du 6 décembre 1986 portant réorganisation de la protection civile.
- Loi n° 91/008 du 31 juillet 1991 portant sur la protection du patrimoine culturel et naturel de la nation
- Loi n° 92/007 du 14 août 1992 portant Code du travail

Conventions régionales :

- Accord de coopération et de concertation entre les Etats d'Afrique centrale sur la conservation de la faune sauvage (Libreville, 1983)
- Convention relative à la coopération en matière de protection et de mise en valeur du milieu marin et des zones côtières de l'Afrique de l'Ouest et du Centre (Abidjan, 1981)

- Conventions internationales ratifiées par le Cameroun :
- Convention relative aux zones humides d'importance internationale, particulièrement comme habitats des oiseaux d'eau (Ramsar, 1971)
- Convention sur la protection du patrimoine culturel et naturel (Paris, 1972)
- Convention sur le commerce international des espèces de faune et de flore menacées d'extinction (CITES) (Washington, 1973)
- Convention de Bonn sur les espèces migratoires appartenant à la faune sauvage (Bonn, 1979)
- Convention de Vienne sur la protection de la couche d'ozone (Vienne, 1985)
- Convention sur les changements climatiques (Rio de Janeiro 1992)
- Convention sur la diversité biologique (Rio de Janeiro 1992)
- Protocole de Kyoto sur les gaz à effet de serre (Kyoto, 1997)
- Conventions de l'Organisation internationale du travail (OIT)

Environnement du projet

Le projet débute à 3 km avant la ville de Batchenga (au niveau de l'intersection entre la route nationale n° 1 et celle n° 15, objet du présent projet. La route va franchir la Sanga, puis traverse la ville de Ntui, Yoko, Tibati jusqu'au chef lieu de la région de l'Adamaoua : la ville de Ngaoundéré. Ce projet routier de 594 Km traverse deux régions le Centre et l'Adamaoua qui regroupent deux grandes zones climatiques liées à un type de végétation spécifique :

- La zone climatique équatoriale de transition dans le Centre (tronçons : Batchenga-Ntui-Yoko et une partie du tronçon Yoko-Tibati) ou domine l'écosystème forêt
- La zone climatique tropicale d'altitude du type soudanais dans l'Adamaoua (tronçons : Yoko- Tibati - Ngaoundéré) ou domine l'écosystème savane

Les ethnies locutrices de langues de l'Adamaoua constituent le second groupe ethnolinguistique. Les quatre ethnies principales sont : les Kutins, les Kalis, les Mboums, les Diis.

Langues

- Langues de l'Oubangui
Un seul groupe ethnique peut être classé dans cette division : les Gbayas.
- Langues sénégalaises :
Une seule ethnie peut être classée dans ce groupe, les Fulbés, aussi appelés Peuls ou Fulanis ou Bororos. Ils représentent un fort pourcentage de la population de la région.
On peut les diviser en deux sous-groupes : les sédentaires, les nomades (aussi appelés Bororo).

De l'autre côté la multitude de peuples autochtones est le fait de sa situation géographique en sa qualité de carrefour de cultures et de traditions. On y trouve notamment : Les Peuhls (foulbés), Mboums, Gbayas, DOURO US(Dii), Koutinés, Baboutés, Nyem-Nyem, Tikar etc. Auxquelles se mélangent les peuples qui ont migrés des autres régions (Bamilékés, Kaka, Bassa, Toupouri, Béti, Failli, et bien d'autres) qui font de l'Adamaoua un lieu de brassage culturel par excellence.

Cette population est majoritairement chrétienne (Catholiques, Protestants, Eglise Evangélique Luthérienne, Église Adventiste du septième jour, Église Gallicane, et les Témoins de Jéhovah, mission du plein évangile) de Batchenga jusqu'à Tibati, mais à partir de Tibati, ce sont les musulmans qui sont en majorité tels que les haoussas, les bororos et les foulbés.

Une enquête socioéconomique a été menée et a porté sur un échantillon de 87 villages directement aux abords de la route. La population vivant dans le voisinage immédiat de la route est estimée, par les différents recensements administratifs, à environ 345 637 habitants. Plus de la moitié de cette population habite dans les principaux centres semi-urbains (Ntui, 20 000 habitants, Yoko 3 830 habitants et Tibati 28 318 habitants), dans la ville de N'Gaoundéré (189 080 habitants) et le reste dans des villages à population variant de quelques centaines à quelques milliers d'habitants.

Pour le périmètre élargi de l'étude (en incluant la population totale des départements et Communes avoisinantes), la population touchée par le projet, selon les chiffres de 2012, serait de :

- 414 603 personnes dans l'Adamaoua : 89 255 pour le département de Djerem et 325 348 pour le département de la Vina,
- 46 992 personnes de la région du Centre (31 722 pour la commune de Ntui et 15 270 personnes pour celle de Yoko),

Ainsi, la population totale concernée par le projet serait estimée à un peu plus de 500 000 personnes. Ce chiffre est confirmé par les enquêtes de terrain menées par le Consultant en février 2012.

Les résultats des consultations publiques tenues dans les 87 villages révèlent que les populations de la zone d'impact direct du projet sont victimes de l'enclavement avec ses maux multiples qu'elles considèrent comme principal frein au développement de leurs localités : (i) difficultés d'accès aux établissements scolaires, (ii) difficulté d'évacuer les productions agricoles vers les grands centres commerciaux, (iii) difficulté d'évacuer les cas de malades graves vers les grands centres hospitaliers de Yaoundé ou de N'gaoundéré, (iv) désertion du personnel des services publics (écoles, centres de santé) liée au coût élevé et à l'insécurité des moyens de transport actuels, aux difficultés d'approvisionnement en eau et en énergie.

Impacts du projet

En Phase chantier ; les impacts négatifs sont les impacts sur l'air (Moyen et temporaire) , sur la dégradation des sols (Faible et temporaire) et des zones d'emprunt (Moyen et temporaire), la pollution chimique des sols (fort et durable) , sur la quantité des ressources en eau : pour les eaux souterraines(Moyen et temporaire), pour les eaux superficielle (Moyen et durable) , sur la faune tel que le braconnage (fort et durable) et la perturbation de la faune (faible et temporaire), sur la flore et des pressions sur les PFNL(fort et durable), sur la qualité de vie avec les nuisances sonores (faible et temporaire) et la mobilité (Moyen et temporaire), sur le paysage : pour les carrières en latérite (Moyen et durable) pour les carrières de sable (faible et durable) , pour les carrières de roche massive (Moyen et durable) sur la santé humaine (majeur et durable) , sur la sécurité humaine (fort et temporaire), sur la mobilité urbaine (moyen et temporaire), les risques de conflits entre le personnel du chantier et les population locales (moyen et temporaire) et enfin sur la recrudescence du grand banditisme (moyen et temporaire).

Les impacts positifs sont principalement les effets sur les revenus des populations locales, via le recrutement des ouvriers et des petits commerces et services de la ville qui recevront une clientèle supplémentaire et donc des revenus plus importants (fort et temporaire).

En phase exploitation, les impacts négatifs portent sur la faune : Accidents (moyen et durable) ; braconnage (fort et durable), perturbation de la faune (moyen et durable) , flore (moyen et durable), biodiversité (moyen et durable), ressources en eau : pollution (faible et durable), pollution accidentelle (moyen et durable), sols (moyen et temporaire) , bruit et

vibration (moyen et durable), qualité de l'air (faible et temporaire), sécurité humaine : accidents (fort et durable), migration (moyen et durable). Les impacts positifs concernent la mobilité (majeur et durable), la sécurité des usagers de la route (moyen et durable), sur la santé avec une amélioration de l'évacuation des malades (fort et durable), la diminution des poussières (moyen et durable), sur le patrimoine culturel des chefs traditionnel et sur les activités économiques (fort et durable) .

Mesures environnementales

Les mesures environnementales sont essentielles afin de réagir correctement aux impacts induits en phase chantier et exploitation du projet. Tout d'abord plusieurs dispositions sont à prendre par l'entreprise concernée afin de :

- mieux gérer le chantier et ses impacts sur l'environnement (eau, sol, déchets, sécurité, etc.) ;
- faire preuve de rigueur dans la rédaction des cahiers des charges et la réalisation des travaux ;
- s'assurer les services d'un responsable sensibilisé aux problèmes d'environnement et aux contraintes de chantier.

Les principales mesures en phase chantier portent sur :

- le renforcement de capacité :

Recrutement de 4 ingénieurs environnement pendant toute la durée du chantier, responsables de chaque lot dans les différentes communes.

Organisation de 4 sessions de formation de 5 jours pour le personnel désigné ;

Pour les gardes forestiers : du matériel pour équiper 20 gardes tel que des tentes et des kits de campings.

De plus 10 gardes seront affectés pendant toute la durée du chantier pour renforcer la surveillance. Il sera également fourni trois véhicules tout terrain pour les services des eaux et forêts de la ville de Ntui, Yoko et Tibati ;

- des mesures de préservation de l'ambiance sonore : limitation des bruits du chantier
- la limitation des émissions atmosphériques : l'entretien du matériel du chantier et les lieux de préparation du goudron doivent être éloignés des habitations
- Limitation des boues et poussières : les bennes des camions doivent être couvertes par des bâches.
- Protection des sols : mesures de végétalisation
- Protection des eaux : emplacement spécifique pour les bassins de décantations et des fosses septique et interdiction de tout rejet polluant
- Modification des écoulements naturels : choix des sites d'installation en dehors de la zone inondable, éviter tout rejet dans les cours d'eau, ouvrir les zones de dépôt de matériaux à une distance d'au moins 100 m des cours d'eau
- Faune et flore: Une ONG sera recrutée afin de sensibiliser les populations à la préservation de la faune et la flore ; De plus du matériel de sensibilisation sera distribué. Par ailleurs, des panneaux signalant les passages de la faune aux environs de Yoko et Tibati seront placés.
- Santé humaine : une ONG sera recrutée afin de sensibiliser la population sur les MST, un dispensaire sera mis en place dans chaque base vie, des préservatifs seront disponibles et des dépistages réguliers seront organisés.
- Femmes : une formation en agriculture sera dispensée ainsi que une distribution de matériel agricole

- Sécurité humaine : signalisation, contrôle d'accès, sensibilisation, équipement des ouvriers et construction des clôtures des écoles
- Contribution du projet à l'éducation : construction d'un bâtiment de deux salles et un logement professeur pour chaque école sur le tracé et équipement.
- Contribution du projet à l'amélioration de la santé : Equipement des CSI existants
- Contre le banditisme : 3 voitures seront alloués aux forces de l'ordre pour les villes de Ntui, Yoko et Tibati
- Mesures pour la transhumance : Au vue de l'importance de la transhumance dans la zone d'étude il serait important de mettre en place une aire de repos tous les 50 km sur la route et un abreuvoir pour le bétail.

Les principales mesures en phase exploitation portent sur :

- La faune : panneaux de sensibilisation et notifiant un éventuel passage de la faune, installation de glissières de sécurité, des arbres passages pour les primates doivent être conservés surtout de Yoko à Tibati
- La flore : mise en place d'une pépinière d'essences arboricoles locales pour replanter les arbres arrachés
- Eaux et sols : dispositifs durables d'aménagements anti-érosifs, végétalisation,
- Air et ambiance sonore : limitation de vitesse, contrôle de la visite technique des moteurs etc.
- Santé humaine : panneaux de sensibilisation couplée aux actions d'une ONG sur terrain
- Plantations
- Sécurité urbaine : aménagement de trottoirs de largeur 2 m, élargissement des accotements à 2 m, aménagement de voies de stationnement au niveau de tous les villages, aménagement d'escaliers pour les accès difficiles de certaines habitations situées en dénivelée par rapport à la route, aménagement de passages piétons sur caniveaux au droit des habitations et locaux, aménagement d'aires de stationnement pour grumiers, aménagement de protections au droit des écoles par l'aménagement de clôtures en grillages, signalisation adéquate et aménagement de ralentisseurs/avertisseurs, installation de panneaux de sensibilisation contre les dangers de la route, glissières et équipements de sécurité , signalisation verticale et horizontale
- Cadre de vie : aménagement d'escaliers ou de rampes pour les accès difficiles de certaines habitations situées en dénivelée par rapport à la route ; aménagement de dalettes pour passages piétons sur caniveaux au droit des habitations et locaux situés du côté déblai ; aménagement d'aires de repos et de stationnement au droit de la montagne rocheuse de Fouy à partir du pk162 et du parc Mbam et Djérem à partir du pk250 afin d'offrir aux touristes fréquentant ces zones un meilleur cadre ; création d'escaliers pour les accès aux points d'eau situés généralement au niveau des ponts et grands écoulements.

Conclusion

Les principales conclusions qui se dégagent de cette étude d'impact environnemental et social sont :

- La population est très favorable au démarrage du projet et le résultat des séances de consultation ont mis en avant plusieurs points qui devront être intégrés tel que la sécurité et l'emploi de la population locale.
- La première conséquence de l'aménagement et de la construction de la route est le renforcement du corridor centre entre le Cameroun et les pays voisins (Tchad et RCA notamment) et l'augmentation du trafic entre la région Centre et de l'Adamaoua, avec l'amélioration des conditions de déplacement, notamment en termes de sécurité et de confort.
- La construction de la route, facteur important de l'amélioration des conditions de circulation, se traduira par un impact globalement positif sur le cadre de vie des villageois (désenclavement par une desserte sûre et permanente en période des pluies, accès plus facile aux services sociaux, etc.) et sur l'économie régionale et nationale (dynamisation du développement rural, réduction des coûts de transport, renforcement des communications nationales, etc.).
- Ce projet jugé très important pour la population locale ne présentera que des impacts positifs globaux si les mesures environnementales sont strictement respectées : il est considéré comme faisable et de grande importance.
- Les nuisances au cours de la période de chantier peuvent être considérablement réduites par l'inscription au cahier des charges des entreprises des mesures de protection de l'environnement préconisées et la mise en place des structures de gestion et de suivi environnementaux des travaux.
- L'équivalent en superficie forestière détruite devra être replanté (au moins) et un strict suivi engagé
- Les carrières devront être remises en état
- Les risques pour la santé et la sécurité des habitants et ouvriers pendant la période de chantier étant grands, les mesures citées doivent être appliquées
- L'organisation des chantiers et le suivi des règles minimales de respect de l'environnement pendant les travaux permettront de garantir des impacts tolérables par l'environnement naturel et humain
 - Les mesures pour la population tel que le soutien aux femmes, aux personnes vulnérables pendant les réinstallations, l'amélioration de l'infrastructure scolaire et sanitaire sont indispensables à la bonne intégration du projet et son acceptation par les populations. Une remise à niveau des pratiques agricoles et de l'encadrement de l'activité agricole, pastorale, touristique et de l'exploitation forestière sont essentiels afin de leur permettre de faire face aux nouvelles pressions qu'ils vont subir face à l'ouverture du marché.

1 INTRODUCTION

As part of its strategy to strengthen sub-regional integration and intra-regional balance, the Ministry of Public Works, with the assistance of the ADF (African Development Fund) has undertaken to produce preliminary and final design studies on the construction of the BATCHENGA – NTUI – YOKO – TIBATI – NGAOUNDERE road for the Government of Cameroon. This road represents one of the links in the communication and integration routes not only within the regions of Cameroon, but also between Cameroon, Chad, and the Central African Republic. This road, which will cross agricultural, forestry, piscicultural, and pastoral zones would moreover have an important role in spatial structuration. This is because its future development will make it possible to open up a region characterized by strong population densities and great agricultural potentiality, and it would further inter-regional trade and trade with neighboring countries.

The administration and coordination of the assessment will be under the responsibility of the African Development Bank/World Bank Road Projects Monitoring and Implementation Unit (CSEPR/BAD-BM) of the Ministry of Public Works. The corresponding contract no. 250, signed between the Ministry of Public Works and the STUDI INTERNATIONAL/ECTA BTP group, came into force on the date of signing: June 14, 2011.

1.1 Presentation of the works contractor

The ECTA BTP and STUI INTERNATIONAL group is responsible for all the assessments and for preparing the Bidding Document and in particular the Environmental and Social Impact Assessment (ESIA), in accordance with the national legislation in force. As the implementation of major infrastructure projects such as road construction always generates modifications to the natural environment and to the life of neighboring communities, it is important to carry out this type of project with environmental and social sustainability in mind, so as to optimize the beneficial effects and guarantee that the roadwork construction respects the environment. It is within this framework that Law no. 96/12 of August 5, 1996—establishing a framework law relative to environmental management in Cameroon—and its regulations make it mandatory to carry out an ESIA prior to the implementation of this category of operations. **According to the laws and regulations in force, in particular Article 4 of Order no. 0070/MINEP of April 22, 2005, roadwork projects fall within the category of projects for which implementation is subject to the carrying out of a detailed Environmental Impact Assessment. This is thus the purpose of our mission. The Terms of Reference were validated by MINEPDED in accordance with Decree no. 2005/0577/PM Article 7 and are presented in Annex 1.**

Furthermore, in accordance with Decree no. 00004/MINEP of July 3, 2007, the Environmental and Social Impact Assessment was carried out by an approved firm (Annex 2).

1.2 Context and justification of the project

The transport sector plays a fundamental role in the country's economy. It represents 15% of GDP and is very certainly one of the "motors" of development. This can be explained by the

considerable distances separating the current or potential production areas from the areas of consumption or exportation. Even though the Government of Cameroon seems to share this opinion, the route “receives” resources for its maintenance and development that are greatly inferior to those that it “gives” to the state and the national community.

Results of different assessments in this sphere show that public investment (which includes road infrastructure) is very low in relation to Cameroon’s GNP. The two sources do not use the same indicators exactly, but they do make it possible (the CEMAC ones in particular) to compare Cameroon to other sub-Saharan African countries.

A series of reforms aiming to improve the sector’s situation has been developed and partly implemented. We thus find ourselves in a dynamic phase in which the sector’s frame of reference changes often.

Development of the Batchenga – Ntui – Yoko – Tibati – N’gaoundéré road falls within the framework of the strategy for modernization and upgrading of sectors that support economic development. This strategy, which has been adopted by the Cameroonian Government, seeks the setting up of a transport system that can reduce transport costs and enable the development of trade and integration among regional economies.

The project to modernize the road thus makes up for the inadequacies of the Cameroonian road network that were noted by several documents dealing with the strategy for transport development and planning: the “Cameroon Road Master Plan, 2004” and the “Transport Sectoral Strategy, 2009.” These documents underscored the following main elements:

- i. the limited road network coverage, which is a cause of the marked isolation of several regions;
- ii. the low rate of asphaltting, representing only 15% of the total length of the network;
- iii. the generally bad to very bad state of the axial road, which is both a big handicap for developing the economic potentiality of several regions and an obstacle to raising the income of their inhabitants.

The Road Master Plan (RMP) has adopted a strategy of catching up in terms of network construction and of increasing the budgetary resources for the road fund over the coming 20 years. A new road classification has been introduced within this framework, based on prioritizing axial roads according to socio-economic and environmental criteria. The RMP also has the objective of achieving an asphalt rate of 34% by 2025.

The Batchenga – Ntui – Yoko – Tibati – N’gaoundéré road is an important North-South trade route, linking the capital Yaoundé and the Centre and South regions with the Adamawa, North and Far North regions, while serving several towns, localities and villages either directly or indirectly through a network of feeder roads connected to the project road.

In addition to this national feeder road role, the project’s route also makes up one of the Cameroonian links in facilitation of transport between countries in Central Africa, as it provides a new transit alternative from/to Chad, and to a lesser degree to the Central African Republic: two landlocked countries of the region that are supplied mainly via the Autonomous Port of Douala (PAD). The Batchenga – Ntui – Yoko – Tibati – N’gaoundéré road is a natural extension of the national corridors from Nigeria (Yaoundé – Bamenda – Enugu) or from

Gabon/Equatorial Guinea (Yaoundé – Ebolowa – Ambam-Eking or Ambam – Kye Ossi). It further represents the shortest route (200 to 300 km less) joining the southern and northern parts of Cameroon, thereby improving connections with Chad and Central Africa.

The construction of this road will reduce the length of the corridor and should thereby help reinforce the competitiveness of the Cameroonian route compared to the other alternatives used by the two countries to reach isolated areas. It will consolidate the country's transit function, the international reputation of its transport infrastructures, and its position as a hub of trade exchanges in Central Africa.

In this context, the Batchenga – Ntui – Yoko – Tibati section remains the missing link in achieving the Douala – Yaoundé – N'djaména international connection, by using the shortest route.

The various participating parties below are going to join their efforts to carry out the construction to a successful conclusion and to operate the new road:

- the Cameroonian state, via its Ministry of Public Works;
- the African Development Fund, which financed the detailed assessments;
- STUDI International and ECTA BTP, which are in charge of the technical, economic, and environmental feasibility studies at the preliminary design stage, as well as of the final draft studies and the BDs;
- the donor that will finance the execution of the work;
- the companies that will be in charge of the work and their subcontractors: these will be named following an invitation to tender;
- the local communities, made up of local authorities that represent the population concerned by the project.

Furthermore, the main institution in charge of environmental management in Cameroon is the Ministry of Environment and Nature Protection (MINEPDED). This ministerial department has a Sub-division of Environmental Assessments and an environmental impact assessment service whose tasks are to supervise environmental assessments.

The Environmental and Social Impact Assessment (ESIA) is an important instrument in development planning and in the use of resources and land. It seeks to take into account environmental concerns at all phases of the project, from design to actual operations, and it helps the initiator design a project that takes into consideration all the components of the biophysical and human environments likely to be affected by the project. Furthermore, it makes it possible to analyze and interpret the relations and interactions among the factors having impacts on the ecosystems, resources, and quality of life of individuals and communities. The main expected results, according to the terms of reference, concern:

- the description and analysis of the initial state of the site and its environment (physical, biological, socio-economic, and human);
- the description and analysis of all of the natural and socio-economic aspects and resources likely to be affected by the work;

- the description of the project and the reasons for the choice of technologies used;
- identification of the environmental issues, such as protection and good management of forest ecosystems, protection of agricultural spaces and landscapes, risk of deforestation, etc.;
- the description of the impacts and their cumulative effect; the holding of meetings to dialogue with and inform the local populations, NGOs, and other organized groups concerned.

Another expected result is the proposing of realistic measures as much on the technical as financial level, in order to mitigate and, if need be, compensate for the negative impacts identified. The present report examines all these themes. The final result of the assessment is an Environmental and Social Management Plan (ESMP) that covers the actions to implement, the estimation of their costs, the implementation schedule, the needs in personnel and organization for the implementation, and the monitoring of mitigation or compensation measures proposed. Most of the measures adopted by the Contracting Authority and approved by the MINEPDED during the validation of the present report will then be taken up for inclusion in the form of environmental clauses in the tender documents, which will have to be implemented by the successful bidder for the work.

1.3 Structures/facilities and related projects

In the assessment area, and specifically at the beginning of the project, a new project for bridge construction is underway. This is because the crossing of the Sanaga River in Nachtigal is currently made with a ferry that remained non-operational for several years. During the 2012 field visit, dugouts were the sole crossing method used by local people to get from one side to the other.

1.4 Methodological approach used

Production of an ESIA brings together field information and information drawn from the documents collected.

The objective of the field visit is to obtain as in-depth knowledge as possible about the environment of the project, of existing data and studies, and to confirm the current field conditions, such as:

- identifying the sources of pollution;
- establishing the list of villages served;
- examining the current occupation of land;
- identifying the population that risks being displaced by this layout;
- identifying the natural flows and rivers that the layout crosses;
- identifying the zones of ecological interest crossed by or near the layout;
- identifying the sites and monuments around the layout that are part of cultural heritage, etc.

Furthermore, the identification of environmental issues is combined with research on available literature, interpretation of aerial photographs on the section of the road, and sufficient field investigation so as to assess:

- the main environmental and social constraints to take into account when the choice of the layout of the road is made;
- the criteria that should guide the choice of road structure, with minimal impact in terms of environment;
- the preliminaries needed for the public consultations to be held in good conditions;
- the possible needs for altering the assessment's methodological approach.

1.4.1 Literature review

Reviewing existing literature has made it possible to gather a maximum of information related to the assessment area (geographical and hydrogeological situation, plant life, wildlife, socio-economic context, populations, landscape, etc.), and to the environmental legislation in force in Cameroon. The list of essential documents consulted is shown in Annex (Appendix) 7, in the bibliography section.

This phase has also made it possible to design data-collection sheets and theme-based maps of the project area, and to prepare administrative correspondences to facilitate the meeting of the assessment team with the local organizations and populations.

1.4.2 Field mission

Two field missions have been carried out for this project:

- in October 2012: a reconnaissance visit with all the experts of the technical assessment team (environment expert, civil engineering expert, hydrologist, engineering structure expert, socio-economist), the representatives of the Contracting Authority and the Ministry of the Environment;
- from February 9 to March 7, 2012: an on-site survey and inventory mission made it possible to take stock of the situation along National Road 15.

During this mission, several sections of forests were walked through in order to identify the species of ecological and commercial importance present. The collaboration with representatives from the MINEPDED, MINFOF services and the MINTP and DIPPER were of great help during these investigations.

Furthermore, eighty-seven (87) public consultation meetings were held with the villagers. The aim of these meetings was to explain the project and its positive outcomes, and to explain the dangers of the road on health and safety, by encouraging villagers to begin prevention activities from that time. The minutes of the meetings are appended to the present report.

This mission also enabled the assessment team to consult the local administrations and announce them the start of the study, this with the goal of taking into account their possible concerns about the project well enough in advance.

1.4.3 Data analysis

All the data collected were analyzed so as to highlight the main characteristics of the natural environment and the issues associated with it. The order of priority given to the environmental issues identified takes into account aspects of conservation (natural resources) and of improvement of the inhabitants' living conditions.

The results of the meetings with the resource persons focused on the advantages of the project for the target populations and the consequences in the event of non-implementation.

Furthermore, the populations' grievances collected during the consultation meetings were analyzed so as to be formulated as accompanying measures for the project. It should be noted that the socio-economic impacts and the gender report were developed more in the socio-economic assessment, which has been drawn up separately.

1.4.4 Difficulties encountered

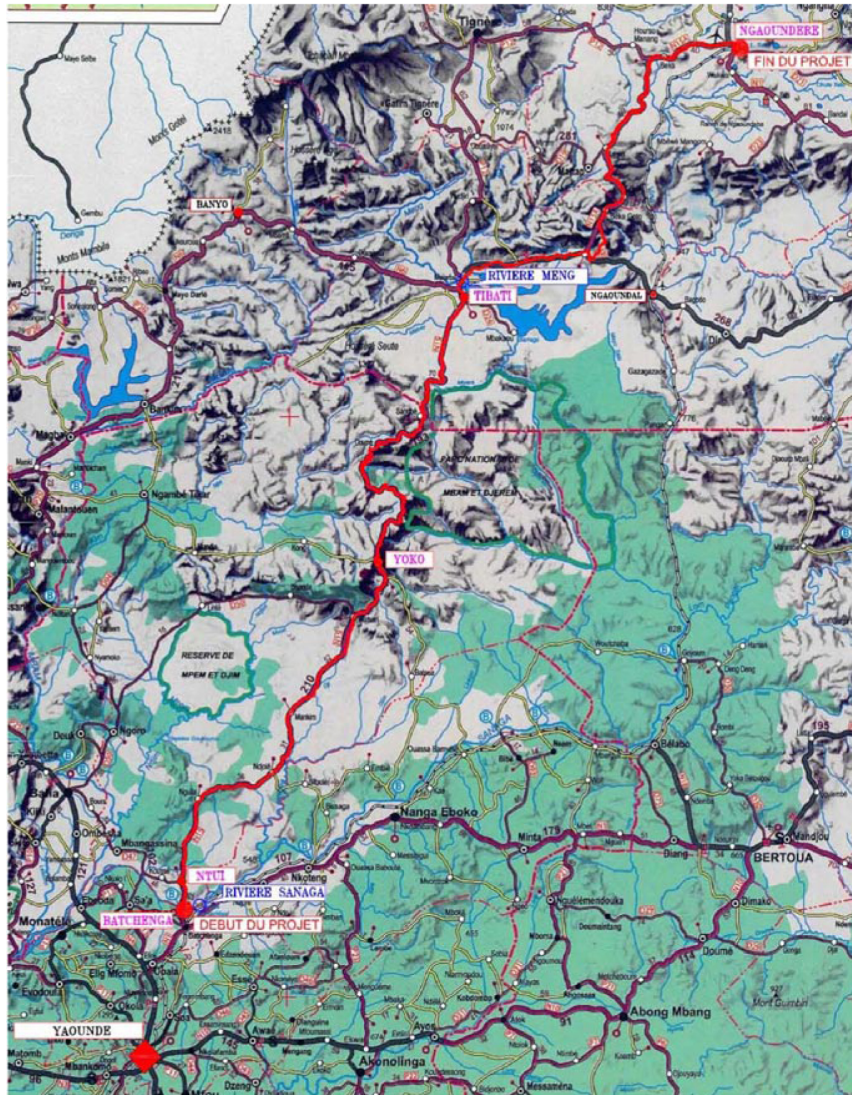
The fact that there was practically no databank in the various services consulted created limits for the gathering of updated information around the project area. Most of the information obtained deals only with personal opinions and documents going back several years.

Finally, the distance and the highly degraded state of road infrastructure along the project layout hindered both on-site mobilization and participation in the project by representatives of some services and associations.

2. DESCRIPTION OF THE PROJECT

2.1 Project localization zone

Located in the Center and Adamaoua Regions, straddling the Ntui and Tibati Departments, the Batchenga-Ntui-Yoko-Tibati-N'gaoundéré road is part of the RN15 national road, the RN6 between Tibati and Mambal and the provincial road 15A between Mambal and Lewa. Almost the entire length is currently a dirt road between 5 and 7 meters wide, making it very difficult for two vehicles to pass each other. The road crosses regions of varying topography and the climate is humid and tropical. The Sanaga river has to be crossed between Batchenga and Ntui and the ferry is often out of service. A study, separate from this project, has already been launched to build a bridge, 350 meters in length, over the river Sanaga at Ntui. The beginning of the project is situated at the level of the road junction at the access ramp north of the planned bridge for crossing the river Sanaga at Nachtigal. The end of the project will be where the RN15 intersects with the RN1 at the northern entrance to N'gaoundéré (Figure 1).



Source: Ordinance survey map modified according to STUDI international, 2012

Figure 1: Location of the road

2.2 Project data and current condition of the road and bridges

2.2.1 Condition of the road

The characteristics of the existing pavement and the conditions of the road vary section by section. The width of the pavement, usually adapted to the contours of the land, is reduced to a width of between 5 and 7 meters. Reduced visibility and safety conditions are aggravated by the vegetation that has encroached on the pavement in several places.

The existing cross-section is generally of an excavated terrain with embankments sometimes more than 15 meters high at the most rugged points. Flat to hilly in relief, the cross-section follows the natural terrain allowing the necessary rectifications and improvements. Between Yoko and Tibati, the road, along most of its length, follows a line along the crest of the hills, forming a generally rolling to rugged relief. Only the Tibati to Mambal section presents a wide cross-section corresponding to that of a paved road.

The existing road layout offers acceptable geometric characteristics that can be adapted to the conditions of the R80 or T100 categories, with certain rectifications and improvements on a flat to rolling relief.

Other more rugged sections are winding with several dangerous bends and reduced visibility, requiring their rectification to meet the requirements of a category R60 or R80.

Only the section between Tibati and Mambal presents the geometric characteristics of a category T100 road.

The existing road layout also has a number of steep gradients and high crests with reduced visibility requiring their rectification to meet the road categories targeted. The road surface of several sunken sections will need to be waterproofed, in particular in the low-lying areas that may be subject to flooding.

The planned renovation of this road connection must necessarily include elimination of the most dangerous points and improvement of comfort and visibility.

In order to correctly define the renovation work needed to improve and rectify the plane and longitudinal geometry, a fine analysis by homogenous section has been made on the basis of preliminary topographical plans, aerial photos and satellite images.

Survey of deterioration of the existing road:

A detailed reconnaissance was made to identify all the areas of deterioration on the existing road surface, which is mainly dirt except for the Tibati-Mambal (69.2 km) section for which a visual survey of the deterioration was made by 100-meter bands using the VIZIR method. The table below summarizes the global deterioration index of each section of the pavement:

Table 1: Deterioration indices for the paved sections

Section No.	Section of road	Overall deterioration index(Is)
1	From PK391 + 000 to PK396 + 200	3
2	From PK396 + 200 to PK401 + 300	5
3	From PK401 + 300 to PK406 + 400	5
4	From PK406 + 400 to PK410 + 800	3
5	From PK410 + 800 to PK414 + 600	3
6	From PK414 + 600 to PK426 + 300	1

Indices from 1 to 7 refer to a scale from good condition (1) to very bad condition (5 to 7).

The unpaved sections include all deterioration of the dirt roads, with a predominance of potholes, ruts and sloughs on the first section between Batchenga and Yoko and a predominance of ravines and catheads between Yoko and N'gaoundéré.

2.2.2 State of hydraulic and drainage systems

Most of the transversal hydraulic drainage system (OH) found on the existing road consists in simple or multiple circular corrugated iron metal culverts. They serve to drain off small and medium runoff, evacuate drainage water from the pavement (discharge work) and sometimes maintain equilibrium (areas with stagnant water).

The functional and structural state of the existing system is generally bad, with problems of blockage, corrosion and age, insufficient width and dimensions and a type of metal work unsuitable for the level of service required by this project.

Their total reconstruction is envisaged.

All of hydraulic drainage installations were identified number (162) for Section 1, (29) for Section 2 and (125) for Section 3. The second section between Yoko and Tibati, running along the crest, only has one hydraulic drainage installation every 10 km on average.

Nevertheless, on the road section between Tibati and Mambal, some of the installations can be maintained. They are in a good operational state and are of sufficient length for the planned road. These are large metal multi-cell culverts with diameters of 2500, 3000 and 4000 mm. The longitudinal drainage system, consisting of earth ditches, is no longer operational due to a lack of maintenance. The ditches are generally blocked by deposits and/or covered in dense vegetation.

The inventory of the characteristics and state of existing bridges:

A detailed reconnaissance has shown one (1) operational bridge (over the river MENG), two (2) bridges that have just been made operational (over the rivers MAYO MBONG and MAYO DARSO) and several bridges of different characteristics.

The types of structures found are as follows:

- Metal bridge: Metallic structure with metal deck - P. MET
- Combination bridge 1: Metal structure with wooden deck - P. MIX 1
- Combination bridge 2: Metal structure and apron in reinforced concrete - P. MIX 2

- Wooden bridge: Wooden structure and wooden deck - P. BOIS
- Bridge in reinforced concrete: Structure and slab in reinforced concrete - P.BA

The bridges counted were as follows: (15) for Section 1, (7) for Section 2 and (13) for Section 3. They will be replaced by complete bridges in reinforced concrete, with two lanes of traffic, except for the two bridges mentioned previously.

Inventory of special points (steep slopes, marshes, ravines, etc.):

In general, the current itinerary does not present any phenomena of significant instability except for certain ravines between Likok and N'gaoundéré and some rockslides from high slopes in the sections with rugged reliefs.

2.3 GENERAL DESIGN PRINCIPLES

2.3.1 General characteristics of the main road

The first design step in a road project consists in the choice of general characteristics that establish the rules and characteristics to be adopted, in particular the choice of:

- Road type**, that sets the rules for intersections and interchange and access points;
- Road category** (for each type), setting the principle characteristics of the road layout;
- Cross-section profile** (in particular the width of the lanes and shoulders).

The works to be studied are made up of major elements such as the bridges but also other important elements such as lateral and adjacent roadways, access ramps, intersections, etc.

Several types and categories of road may thus involve a single work and the technical restructuring/construction standards are proposed according to the following main references:

- ARP: Restructuring of main roads - technical recommendations for the general design and geometry of the road - SETRA - August 1994;
- VU: Urban roadways - general guide to urban roadways - Design, restructuring/construction, operation - CETUR;
- CG: Traffic circles - plans for traffic circles on inter-city roadways - SETRA.

The following table gives a summary of the standards proposed for each of the sections to be restructured:

Table 2: Technical restructuring standards to be applied

Name	ARP - restructuring/ construction of main roads	VU - urban roadways	CG - traffic circles
Main thoroughfare	×		×
Bypass of agglomerations	×		
Infrastructures for agglomerations bypassed by the project		×	×
Infrastructures for agglomerations crossed by the project	×	×	×

2.3.2 Definition of road type

A road type is defined by a set of constraints that mainly ensure consistency between the interfaces of the road with its environment on the one hand and its main characteristics on the other.

The choice of road type is aimed at ensuring suitability of the road for the functions it must serve or offer as a priority.

In an inter-city context, there are three types of main roads:

- Type L** roads, the main connector roads or “**highways**”;
- Type T** roads prioritizing the smooth flow of traffic in transit over medium to great distances; these are the “**Express single-lane roads**”;
- Type R** roads form the main road networks in the countryside; these are multi-functional and are the “**Intercity arteries**” and “**Roads**”.

The characteristics by road type are summarized in the table below:

Table 3: Characteristics of main roads

ROAD TYPES	R (multi-functional roads)		T (transit)	L (liaison)
	Roads	Inter-city arteries	Express roads (single lane)	Highways
Number of lanes	1 lane (1)	2 lanes	One lane (1)	2 lanes
Intersections (3)	Ordinary planes or traffic circles	Traffic circles or straight planes without crossing or TPC	Difference in level	Difference in level
Access	Without access or with possible access, depending on the case	If access, no TPC	Without access to residents	Without access to residents
Speed limit outside agglomeration	90 km/hr	110 km/hr (2) or 90 km/hr	90 km/hr	130 km/hr or 110 km/hr ()
Road crossing agglomeration	Yes, possibly		No	No
Possible categories	R60 () or R80		T80 or T100	L100 or L120 (L80)
Field of use (indicative)	Function of connection over short or medium distance and taking into account environmental uses		Function of connection over medium to great distances prioritized	Function of connection over medium to great distances prioritized
Short-term traffic	Moderate traffic (1 lane)	Heavy traffic (2 lanes)	Moderate traffic	Heavy traffic
Types of “Road and street safety”	Main roads in rural areas		Roads isolated from their environment	

With regard to the data detailed in the table above, the environment crossed and the characteristics of the Batchenga - Ntui - Tibati - N’gaoundéré road means that it matches the characteristics of Type R (Inter-city roads). This does not exclude adoption of certain superior characteristics corresponding to a “Speed of Reference” of 100 km/hr.

2.3.3 Definition of road category

Inside each road type, there are several categories (or sub-categories) between which there are differences essentially concerning the minimum technical characteristics of the flat plane and longitudinal profile. These differences mostly concern aspects of dynamic comfort on the main thoroughfare.

For the Type T roads, the following categories can be distinguished:

- Category **T80** that, in rolling relief, is generally well suited, taking into account the objectives of comfort attached to this type of road and the cost constraints;
- Category **T100** that is generally well suited when constraints of relief are minimal.

For the Type R roads, the following categories can be distinguished:

- Category **R60** that, in rolling relief, allows a good compromise between cost and safety;
- Category **R80** that is generally well suited when constraints of relief are minimal.

The minimum geometric characteristics of each category are presented above.

Thus, category **R80** is well suited when constraints of relief are minimal while category **R60**, with rolling relief, affords a good compromise between cost and safety. The category of mountain roads is not applicable to this Project.

The characteristics of the superior category, corresponding to a speed of reference of 100 km/hr, will be systematically retained in flat to slightly rolling relief and when the topography of the sites crossed permits.

Moreover, a change of category within a same road type may occur when there is a perceptible modification of the topography and the environment. Respecting the conditions for a chain of continuity in the layout will allow a smooth transition.

However, each homogenous section must be at least 10 km long in order to avoid a succession of sections with different characteristics.

2.4 Description of the Project

2.4.1 Cross-section profile

The **width of the roads** is normally **3.5 m** when newly built.

Table 4: Characteristics of the planned pavement

Available width	Maximum width of lane	Minimum width of hard shoulders
8.0 m	6.0 m Dual carriageway	2 × 1.00 m
8.5 m	6.0 m	2 × 1.25 m
9.0 m	6.0 m	2 × 1.50 m
9.5 m	6.5 m	2 × 1.50 m
10.0 m	7.0 m	2 × 1.50 m
10.5 m	7.0 m	2 × 1.75 m
11.0 m	7.0 m	2 × 2.00 m
14.5 m	10.5 m 3-lane carriageway	2 × 2.00 m

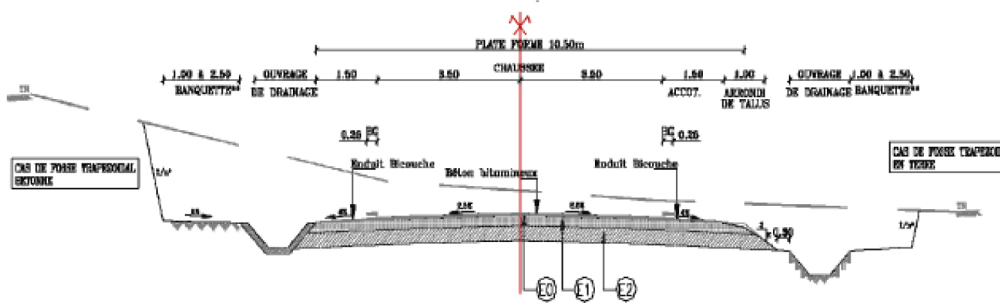
Source: Planning of major roads (ARP) - SETRA - August 1994

Based on the Terms of Reference, the environment of the project, the prevailing regulations “Planning of Major Roads - SETRA 1994” and economic considerations, the characteristics of the recommended cross-section profile for main thoroughfares are as follows:

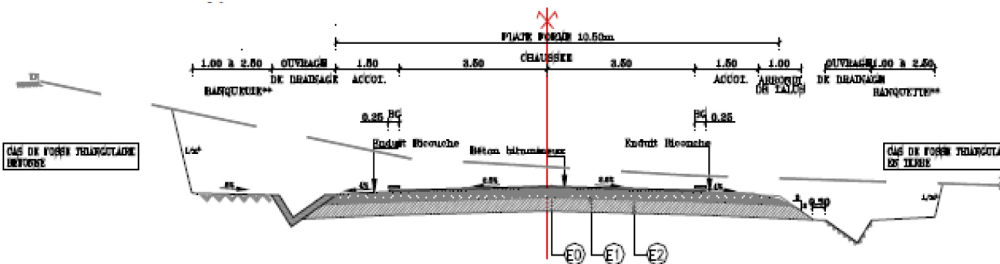
For main thoroughfares:

- Width of pavement: 10.5 m
- Width of lane: 7 m (dual carriageway, each lane 3.5 m)
- Width of shoulder: 1.5 m (including shoulder berth 0.25 m wide)
- Berm: 0.75 m at the level of high landfills and ravines and in zones with earth retention structures
- Curved slopes: 1 m on both sides in the case of landfill

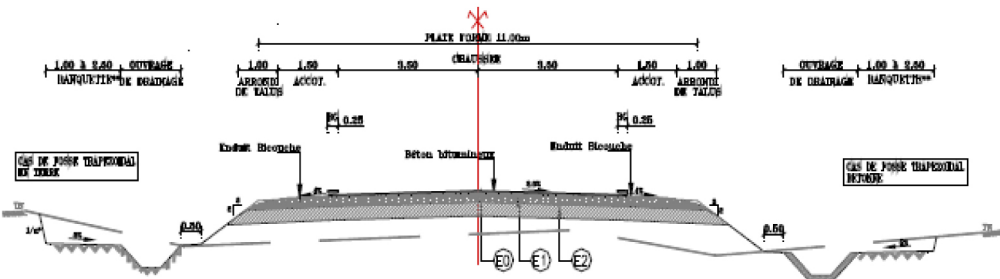
- Standard cross-section profile of main thoroughfare (excavated profile with trapezoidal ditches):



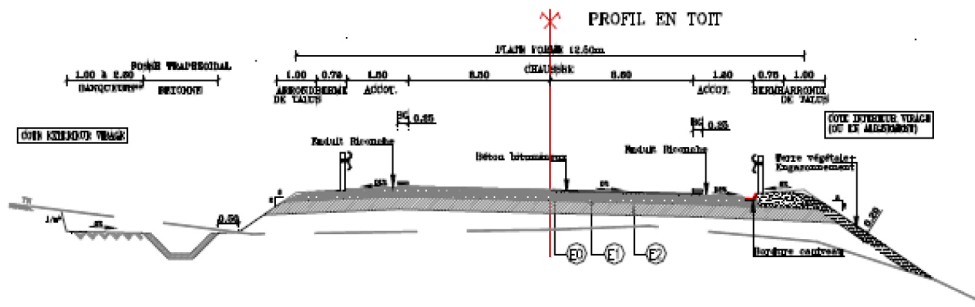
- Standard cross-section profile of main thoroughfare (excavated profile with triangular ditches):



- Example of landfill



□ Example of high landfill

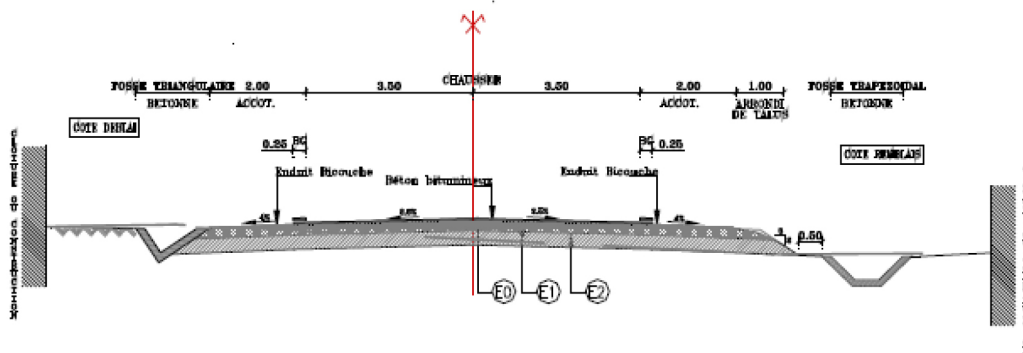


Crossing of agglomerations

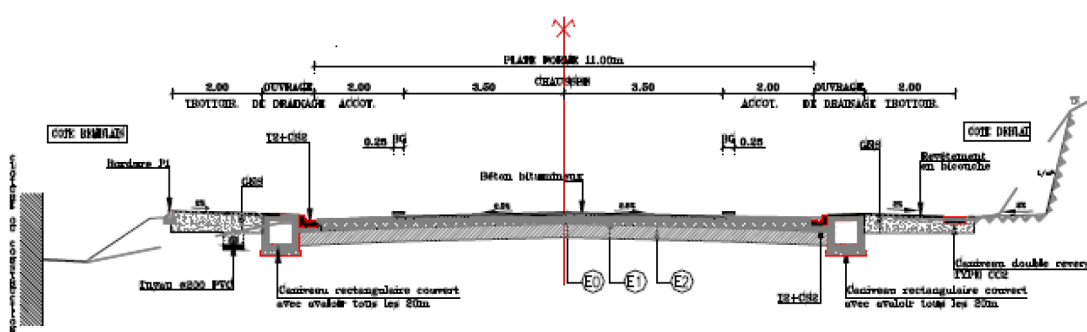
In roads crossing agglomerations, the shoulders will be widened to 2 m, allowing additional space for the safety of pedestrians. For large villages, pavements 2 m wide will be built on either side of the road surface:

□ Cross-section profile of roads crossing agglomerations:

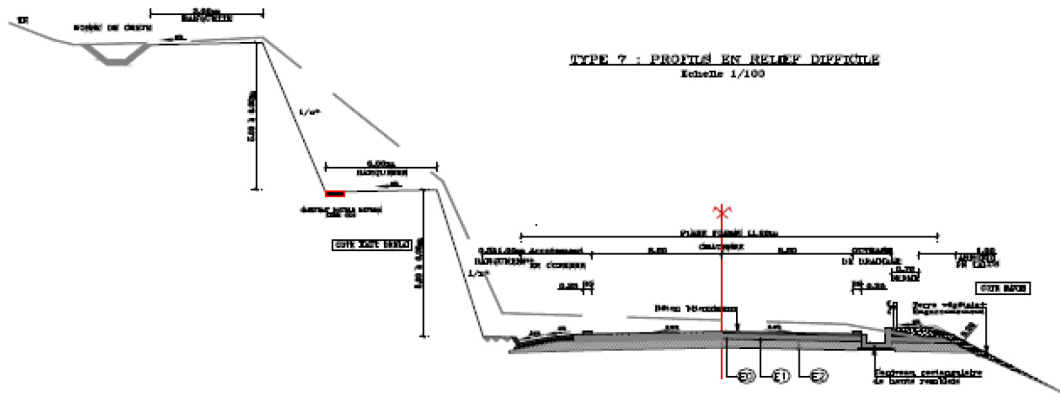
Road crossing a village (shoulder 2 m)



Road crossing a dense urban area (pavement 2 m)



□ Profile in areas of rugged relief



2.4.2 Horizontal alignment, longitudinal profile

The rules for the dimensions of the horizontal alignment and longitudinal profile are aimed at ensuring homogeneous conditions of comfort suitable for all road categories and guaranteeing good safety conditions. These objectives of comfort and safety are basically reflected in the minimum geometric characteristics to be respected and by the principles of a chain of continuity of the elements in the alignment and the conditions of visibility.

2.4.2.1 Minimum geometric characteristics

For each category planned for the Batchenga-Ntui-Yoko-Tibati-N'gaoundéré road, the threshold values of the horizontal and longitudinal characteristics to meet the comfort and safety objectives are as follows:

Table 5: Minimum geometric characteristics

Characteristics		Category R60	Category T80/R80	Category T100
Speed of reference (km/hr)x		60	80	100
Horizontal alignment	Minimum radius: Rm	120	240	425
	Radius at the minimum camber (Rdm)	450	650	900
	Radius not cambered	600	900	1300
Camber	Maximum camber	7%	7%	7%
	Minimum camber (%)	2.5%	2.5%	2.5%
Longitudinal profile	Maximum declivity (%)	7%	6%	5%
	Minimum radius with an angle pointing outwards (m)	1500	3000	6000
	Minimum radius with an angle pointing inwards (m)	1500	2200	3000

The frequent use of large curve radiuses may turn out to have negative results, encouraging users to drive at continually high speeds detrimental to safety, particularly at certain points.

2.4.2.2 Rules for a chain of continuity of the alignment

For the restructuring of existing roads, as is the case in this project, and also of the threshold values and conditions for the alignment to guarantee conditions of comfort and safety, certain

additional conditions of the chain of continuity need to be verified and exceptions made to the rules when necessary.

However, a frequent use of wide curve radiuses may be negative since they would encourage users to drive at continually high speeds that would be detrimental to safety, particularly at certain points.

□ **Categories R60 and R80:**

In the case of the restructuring of existing roads:

1. **Rule 1:** Avoid curve radiuses < 300 m at the end of long straight sections ($L > 1$ km) for all road categories.
2. **Rule 2:** When 2 curves follow one another, respect the following condition concerning their R1 and R2 radiuses: $R1/R2$ must be between $2/3$ and $3/2$ unless if R1 and R2 are greater than 500 m.
3. **Rule 3:** Exclude scalloped curves, in a C and at a summit, but so-called "S" curves can be used.
4. **Rule 4:** If the minimum values of the radiuses are not taken into account, the chaining of conditions 1 and 2 will apply but must be completed by an indication: if a bend with a low radius follows a straight section less than 500 m in length (L), it should be checked that $R > L/4$ wherever possible.

2.4.2.3 Transversal gradients

On main thoroughfares, the transversal gradients of the various elements in the cross-section profile are as follows:

Landfill embankment: $3/2$ (H/V)

- Excavation embankments: depending on the nature of the terrain and the standard solution retained.
- Lane: 2.5% for concrete paving and 4% for unpaved connecting lanes
- Shoulders: 4%

At the level of the cambered curves, the "P" gradients of the stabilized bands "BD"7 will depend on the camber of the road "D":

- If $D < 4\%$, □ the shoulders have a 4% gradient towards the outside
- If $D > 4\%$, □ the shoulder inside the curve will have a gradient equal to the camber
- If ($P = D$), □ the shoulder on the outside of the curve will have a transversal gradient of 2.5% also directed towards the outside of the road.

2.4.2.4 Variation in the camber

For a two-way road, as is the case in this study, a change of roads is made around its axis. The variation of the camber varies in a linear manner as the connection progresses.

The radius curves equal to or over Rnd8 are not generally cambered towards the inside of the bend and maintain a roof-shaped profile.

The radius curves between Rnd and Rdm9 are cambered towards the inside of the bend, with a gradient of 2.5%.

Radius curves 'R' less than Rdm are cambered towards the inside of the bend with a transversal gradient whose value is set by linear interpolation depending on 1/R between 2.5% for Rdm and 7%10 for the minimum radius Rm.

The camber values depending on the horizontal radiuses for the various road categories are given in the following formulas:

- Category R60: $D = 0.86 + 736.4/R$
- Category R80: $D = -0.13 + 1712.2/R$
- Category T100: $D = -1.53 + 3623.7/R$

2.4.2.5 Visibility

Knowledge of the visibility distances required at any point on the road presupposes a knowledge of the speeds at which the users actually drive.

Speed

The speed driven is normally V85 with 85% of users driving at this speed. The speed V85 is evaluated according to the radius with the aid of the following formula:

- $V_{85} = \frac{120}{1 + (\frac{346}{R^{1.5}})}$ for a road with 2 × 2 lanes
- $V_{85} = \frac{102}{1 + (\frac{346}{R^{1.5}})}$ for a road with 2 or 3 lanes, 6 or 7 m in width
- $V_{85} = \frac{92}{1 + (\frac{346}{R^{1.5}})}$ for a road with 2 lanes, 5 m in width

The speed V85 is evaluated according to the ramp (>250 m) with the aid of the following formula:

- $V_{85} = 120 - 0.31.p^{1.5}$ for a road with 2 × 2 lanes
- $V_{85} = 102 - 0.31.p^{1.5}$ for a road with 2 or 3 lanes 6 or 7 m wide
- $V_{85} = 92 - 0.31.p^{1.5}$ for a road with 2 lanes 5 m wide

Stopping distance

The stopping distance **d** is the braking distance (V85 at 0) increased by the distance driven during the reaction time (2 seconds).

In curves, this braking distance is increased by 25%.

The stopping distance depending on the V85 speeds is indicated in the following table:

V85 in km/hr	20	30	40	50	60	70	80	90	100
d in m	15	25	35	50	65	85	105	130	160
d on a curve	15.5	26.5	40	55	72	95	121	151	187

- Observation point: height 1 m, situated at 2 m from the straight edge of the road
- Point observed: height 0.35 m situated on the axis of the traffic lane concerned
- Visibility on a bend**

The visibility distance on a bend corresponds to 3 seconds driven at a speed of V85 upstream of the bend, i.e. $3.V85$ (m/s).

- Observation point: height 1 m, situated at 2 m from the straight edge of the road
- Point observed: height 0 m, situated on the axis of the road, at the beginning of the circular part of the bend.

2.4.3 Barriers and safety equipment

Safety barriers are absolutely essential for any road project but they are relatively costly. The decision of whether to use barriers or not and the type of barrier selected (GS2 or GS4) for any given point must be taken flexibly.

According to prevailing regulations, sections where the difference in level between the road and the natural land is higher than 4 m, GS2 or GS4 safety barriers must be installed.

Safety barriers must be installed on a 1.75 m wide berm (including the rounded embankments).

These safety measures usually have a fairly high cost and therefore due thought should be given to whether the regulations should be applied systematically or whether exceptions should be made, limiting installation to dangerous points and particularly high embankments.

Within the context of this project, after an analysis of the safety conditions at the point concerned, the choice will be based on the following three parameters:

- Difference in level between the road and the natural terrain
- Horizontal geometry of the zone concerned (straight line or curve radius)
- Gradient of longitudinal profile preceding the section concerned

The following main principles were applied:

- for very high landfills or ravines, GS2 safety barriers should be adopted;
- for embankments higher than 4 m, GS4 safety barriers should be adopted.

If the zone presents restrictive geometric characteristics (reduced radius, steep hill, etc.), the GS2 safety barriers should be adopted.

- for landfills between 2 and 4 m high, safety barriers will only be adopted if the horizontal planes and longitudinal characteristics are restrictive. In this case, GS4 barriers should be adopted.

Besides the safety barriers, the project requires the following equipment:

- kilometer markers to be placed every five (5) kilometers at the corresponding PKs;
- bend markers on tight curves (minimum radiuses, particularly dangerous curves, etc.).

2.4.4 Vertical and horizontal signage

Apart from markings on paved roads as required by prevailing regulations, road signs are also required and must be positioned in such a way that they facilitate traffic circulation and enhance driver safety but also inform road users.

Constituting potential obstacles on shoulders, the signs are installed, not plentifully, in places where they can be seen easily by users from some distance away.

Within the framework of this project, vertical signage concerns:

- triangular or circular signs giving recommendations or compulsory orders regarding speed limits, approaching bends, high gradients and dangerous points;
- rectangular signs at the approach to and exit from agglomerations giving indications and location information and indicating major rivers;
- directional signs at major intersections.

In deciding which signs to use, an analysis based on the following criteria was performed:

- indication of rivers at the four existing bridges
- indication of approaches to and exits from all villages and agglomerations crossed;
- speed limits according to national regulations, at the approach to all villages crossed;
- indication of speed limits for homogeneous sections depending on the corresponding speeds of reference and reminder of these limits;
- signaling of special points such as tight bends, succession of curves and counter-curves, high gradients, etc.
- installation of STOP signs on secondary roads at intersections and junctions (Type 1, 2 and 3 intersections);
- directional signs indicating the two main directions at Type 2 and 3 intersections;
- directional signs indicating the three directions at Type 1 main intersections.

The horizontal views will show all of the recommended signs and where they are to be installed. The details of their positioning along the road and the sizes of the signs will be indicated in the standard signage and infrastructure plans.

2.4.5 Specific restructuring

Besides the road works on main thoroughfares, the project also includes certain specific restructuring work to allow improved integration of the project in its environment and to take into account the activities of certain residents. This specific restructuring work is detailed below.

2.4.5.1 Restructuring for the benefit of residents

- For roads crossing agglomerations

According to the characteristics of each agglomeration crossed and the available land space, which are:

- The platform in the full countryside measures: 2×3.25 (road) + 2×1.5 (shoulders on either side) = 9.5 m
- The platform for crossing villages and the town of Ntui (bi-directional road) = 11.5 m
- The platform for crossing Yoko and Tibati (2x2 lanes): 2×7 (road + 2.2 (pavement) + 3 m (TPC) = 21 m

The main restructuring work proposed is as follows:

- Widening of the shoulders to 2 m in all of the villages crossed unless there are particular land-use constraints. This will allow the space to be opened up and a safety margin left for pedestrians and cycles.
- Restructuring of the pavements to measure 2 m on either side of the shoulders in larger villages. These will be used by pedestrians and for trade in occasional widened spaces. The shoulders can be used for parking.
- Restructuring of the parking lanes at all villages, in particular where prolonged stops are expected. These will be organized in front of shops or public services (administrative offices, religious facilities, etc.) with their sizes calculated to take into account the possibility of truck parking.

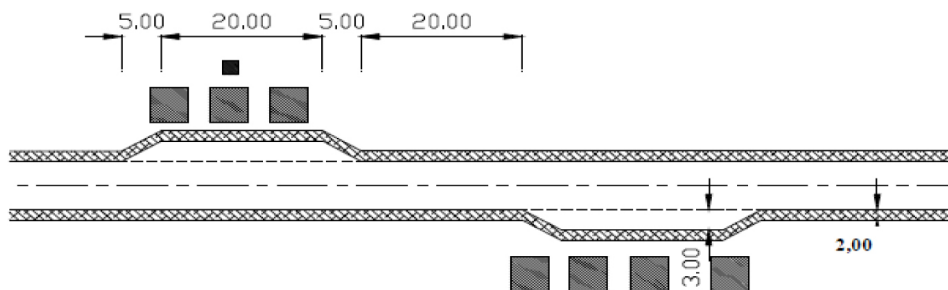


Figure 2: Parking areas in crossing agglomerations

Building of stairs where access to certain residences is made difficult because they are located at a different level to the road;

- Construction of pedestrian walkways over gutters directly opposite residences and premises located on the excavated side;
- Construction of protection next to schools by erection of metal fences with openings towards the direction of arrival of the traffic and construction of solid fences/walls when schools are too close to the road. Adequate signage and warning devices should be placed along the road.
- Construction of resting and parking areas next to the rocky mountain of FOUY from PK162 and the Parc Mbam and Djérem from PK250, to offer tourists frequenting these areas improved amenities.

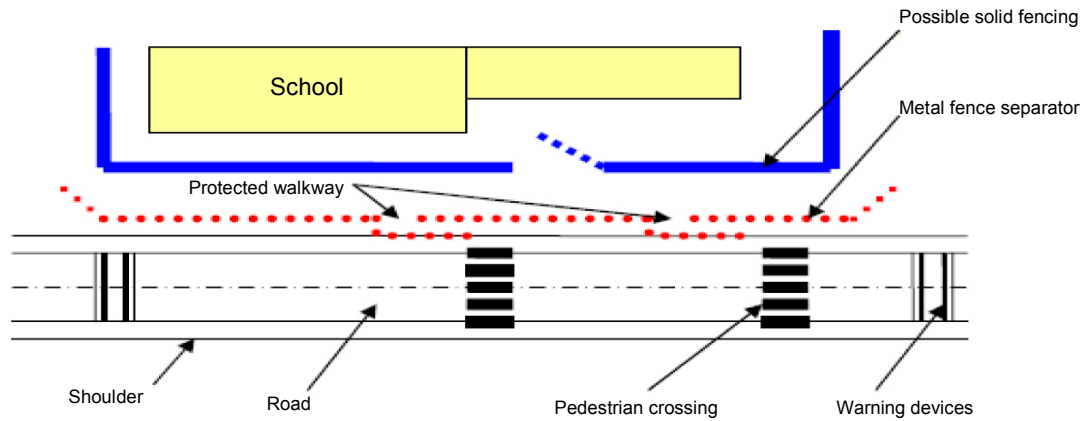


Figure 3: Protection in front of schools

- Outside of agglomerations

Construction for the benefit of residents outside urban areas concerns mainly:

The creation of stairs to access water points that are generally located at bridges and large areas containing running water. Masonry slabs must be built directly on the river banks to improve daily living conditions and facilitate certain household tasks. For each water point, these constructions must be made diagonally on each bank;

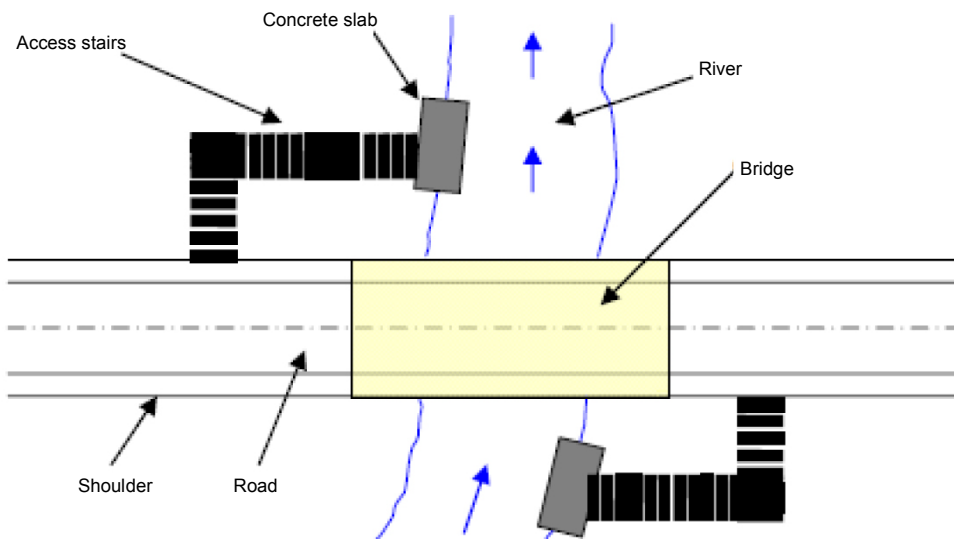


Figure 4: Constructions at water points

The waiting zones outside urban areas at certain road junctions will include bus stop areas on both sides of the road, shelters to protect users from bad weather and adequate signage.

2.4.5.2 Construction of parking areas for heavy vehicles

A reconnaissance of the road shows that there is significant traffic of logging trucks using this route, in addition to the safety constraint linked to the size and nature of this traffic. A need for resting places has been identified.

Depending on their location along the route, the drivers habitually stop in certain villages and places where they spend the night, eat and rest.

At the moment, in the absence of suitable shoulders, they stop directly on the road, causing much inconvenience to traffic and representing a significant safety hazard, in particular at night. It is therefore essential to make provision for suitable spaces to allow the logging trucks to park safely, either temporarily or on prolonged stops. Dedicated parking areas need to be built at specific places. In the follow-up to this study, the exact design of these constructions will be established depending on the topographical plans, availability of land/space, the logging truck characteristics (minimum turnaround space needed) and the number of spaces that will be required.

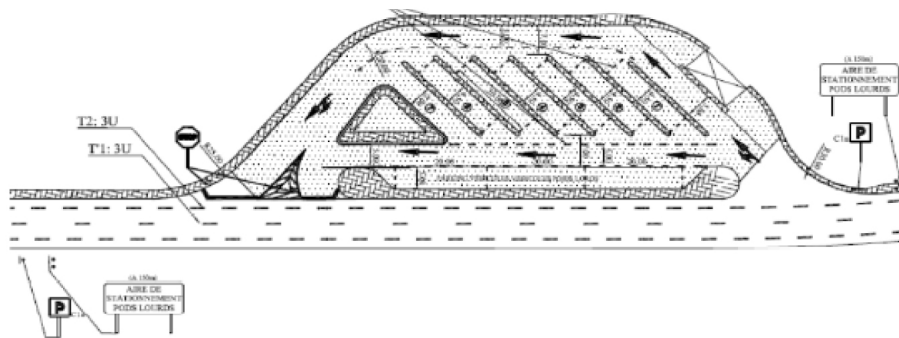


Figure 5: Truck stop

2.4.5.3 Weighing station

In order to control the loads carried by heavy vehicles and in particular the logging trucks, it is suggested that, within the context of this project, a weighing station be built whose construction and operating costs will be evaluated and integrated with the constructions cost and in the budget calculation. The group will study the possibility of installing a tollbooth combined with the weighing station.

The site chosen will be established in close cooperation with the local authorities and will depend on the topographical profile of the zones concerned.

The construction proposed will take into account the functional program that will include:

- A weighbridge to check loads
- An unloading area for overloaded vehicles
- Parking places for logging trucks
- Entry, exit, turning and storage space to ensure smooth operation

The different movements expected are as follows:

- Entry to the weighbridge will require a certain waiting area given that the vehicles arrive in convoy;
- Entry to the parking areas;
- Return in a loop for a new weighing, for the unloading area or for the parking area;

- Exit from the parking area and weighing area;
- The construction proposed will facilitate the various movements expected and will perfectly meet the requirements of the operational program for the weighing station.

2.5 Realization of the project

2.5.1 Planned bridges

The project includes (28) bridges including (3) bridges to undergo maintenance.

The construction of (25) bridges for a total length of 1004 m for the basic solution and 1024 m for the variant opposite bridge 23 is scheduled. These are broken down as follows:

- Section 1: Batchenga-Yoko: This section includes the construction of (14) bridges for a total length of 460 m, with PIPO structures (4 bridges for a total length of 80 m) and PSIBA (10 bridges for a total length of 380 m);
- Section 2: Yoko-Tibati: This section includes the construction of (5) bridges for a total length of 202 m, with PIPO structures (2 bridges for a total length of 40 m) and PSIBA (3 bridges for a total length of 180 m);
- Section 3: Tibati-N'gaoundéré: This section includes the construction of (6) bridges for a total length of 304 (324 m for the variant of bridge 23), with PIPO structures (4 bridges for a total length of 80 m) and PSIBA (1 bridge for a total length of 80 m) and VIPP (1 bridge with a total length of 144 m).

2.5.2 Urban roadways

2.5.2.1 Identification of the roads to be restructured

In accordance with the Terms of Reference, fifteen (15) kilometers of roadway are to be studied in the towns of NTUI, YOKO and TIBATI, with about 5 km of roadway per town. For this purpose, participative meetings were held with the local authorities in the presence of representatives from the police prefecture, mayors, government delegates (education, fishing, agriculture, health, etc.),

representatives of associations (women, young people, etc.) in the presence of a team from the group, consisting of a project leader, a road engineer, an environmentalist and a socio-economist. These participative meetings have permitted identification of the roadways within the towns based on criteria of choice and prioritization of the construction work.

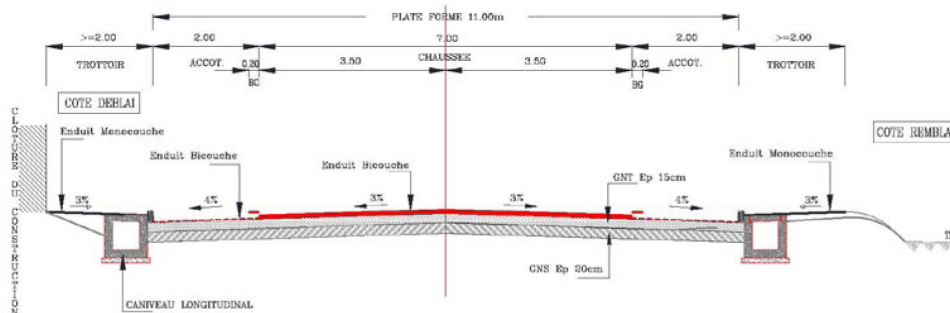
2.5.2.2 Scope of restructuring proposed

A participative approach allows the choice of a list of roadways to be restructured and the group has taken this up by presenting certain selection and prioritization criteria such as serving the administrative services, schools, religious facilities, high-density neighborhoods, social and collective centers, etc. while taking into account projects that are currently underway, being programmed or seeking financing.

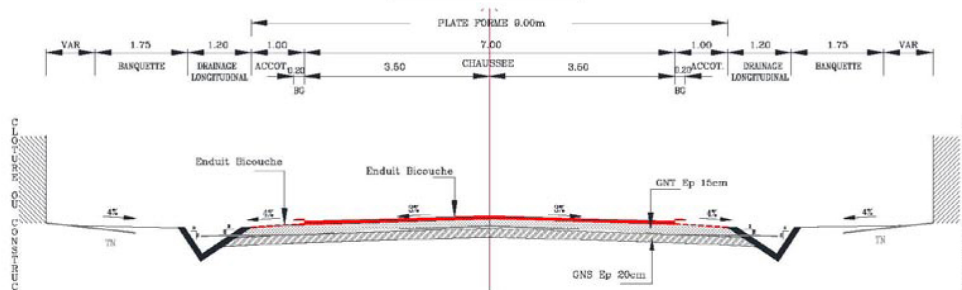
Application of these criteria should bring a choice of restructuring of the roadways ensuring prioritization of town services for the main administrative and socio-collective establishments.

Thus, certain roadways, currently paved, were not retained in the list and also some service roads that link up to the main road crossing the town, because of the risk of a multiplication of intersections and deterioration of traffic conditions.

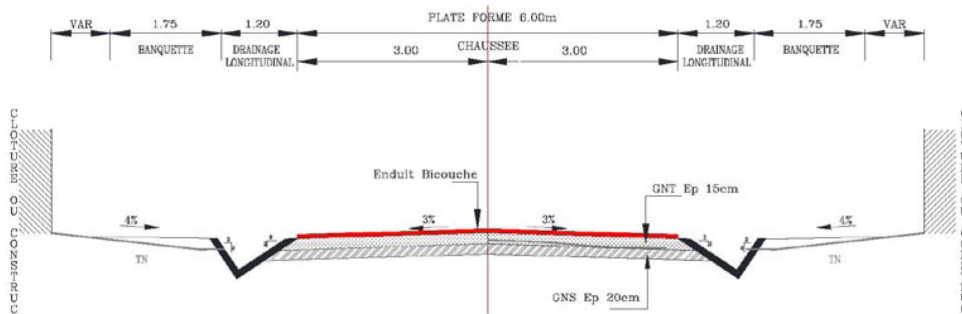
Main roads



Secondary roads



Service roads



2.5.3 Connected routes

2.5.3.1 Identification of connecting routes

This was done via surveys carried out by the consultant in 87 villages right along the length of the Batchenga-Ntui-Yoko-Tibati-N'gaoundéré route.

At the end of these interviews, 26 routes totaling 518.5 km were identified and are listed below. Through these surveys, for each of the 26 routes, data is available on the population as well as on the socio-collective installations: the number of schools and health centers, the relief, the traffic interruption time, the state of the route and the number of markets. These data have allowed a multi-criteria study to be set in place to select the routes.

2.5.3.2 Connecting routes to be constructed

In order to select the linear path required by the Terms of Reference (250 km), a multi-criteria analysis was carried out to orient the selection among the twenty-six (26) routes identified.

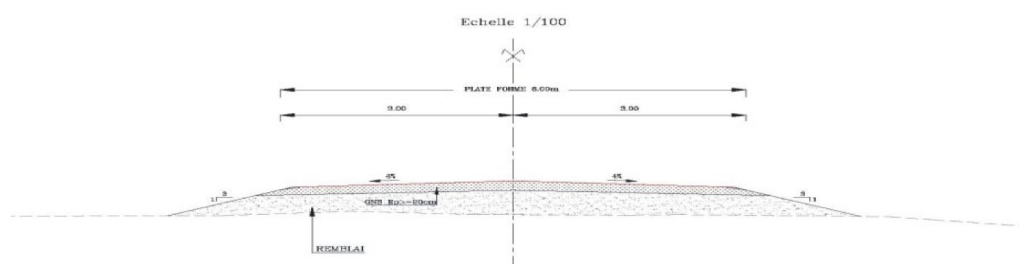
Several stages were necessary to arrive at this selection. First of all, it is possible to distinguish the choice of criteria, standardization, weighting, and finally the score attributed to each route.

To confirm the results of the multi-criteria analysis, a simulation of three scenarios for weighting the criteria was made with the objective of testing the sensitivity of the final result for one or another of the criteria. The outcome was that the list of priority routes remains unchanged.

2.5.3.3 Scope of restructuring proposed

The reconstruction of dirt roads consists in clearing the brush, re-profiling and compacting the surface, cleaning out and extending the ditches and soak away drains, localized cleanout systems and implementation of a surface layer through general reloading with lateritic gravel. It will also include realization of hydraulic works.

The corresponding cross-section profile consists of a roadway 8 m wide with two lanes of 3 m each. The transversal gradient is 4%.



2.5.3.4 List of roadways identified and cost of work

The following table summarizes, for each sub-prefecture and for the whole of the project, the costs retained for each roadway identified and the costs of the priority roadways proposed within the limits of a length of 250 km required by the terms of reference, following the procedure described above.

Table 6: Choice and costs of the 250 km of roadway connections

Sub-prefecture	No.	Name of town or village	Name of village on which the roadway identified depends	Length of roadway (km)	Relief	Kilometer cost	Amount per roadway (total roadways identified)	Amount of roadways selected	Length of roadways selected by sub-prefecture	Total amount of connected roadways selected (rounded out)
N'Gaoundéré	20	Likok	Wadjourou	20.0	0.75	110,000,000	2,200,000,000	2,200,000,000	79.0	11,000,000,000
	19	Likok	Mandourou	23.5	0.75	110,000,000	2,585,000,000	2,585,000,000		
	21	Beka Kotto	Djaiounde	35.5	0.5	150,000,000	5,325,000,000	5,325,000,000		
	25	Danfiu	Mbioka	35.0	1	80,000,000	2,800,000,000			
	27	Danfiu	Ubing	35.0	1	80,000,000	2,800,000,000			
	26	Danfiu	Tirboing	40.0	1	80,000,000	3,200,000,000			
	24	Bella Assom	Mambalé	15.0	1	80,000,000	1,200,000,000			
	23	Bella Assom	Mahor Goulou	35.0	0.5	150,000,000	5,250,000,000			
	22	Beka Kotto	Gabiskeje	25.0	0.5	150,000,000	3,750,000,000			
Total							29,110,000,000	10,110,000,000		

Ntui	6	Kombe Bengue	Bikong	6.0	1	80,000,000	480,000,000	480,000,000	74.5	9,000,000,000
	8	Nguila	Yakpca	7.0	0.75	110,000,000	770,000,000	770,000,000		
	1	Salakounou	Mbongue 1 and 2	4.5	0.5	150,000,000	675,000,000	675,000,000		
	2	Ossombe	Bianguélé	10.0	0.5	150,000,000	1,500,000,000	1,500,000,000		
	5	Yalongo	Menguere	15.5	0.75	110,000,000	1,705,000,000	1,705,000,000		
	3	Ndimi	Yandalena Meloke	19.5	0.75	110,000,000	2,145,000,000	2,145,000,000		
	7	Kombe Bengue	Meloko	12.0	1	80,000,000	960,000,000	960,000,000		
4	Biagnimi	Noena Biagnimi	12.0	0.75	110,000,000	1,320,000,000				
Total							9,555,000,000	8,235,000,000		
Tibati	12	Tibati	Mbakao	33.5	1	80,000,000	2,680,000,000	2,680,000,000	45.5	4,000,000,000
	18	N'gatt	Wandjock Bizor	12.0	1	80,000,000	960,000,000	960,000,000		
	13	Tibati	Djocnbi	40.0	0.75	110,000,000	4,400,000,000			
	14	Tibati	Nanaoa	11.0	0.75	110,000,000	1,210,000,000			
	15	Kandje	Ganlaga	5.0	0.75	110,000,000	550,000,000			
	17	Kandje	Mbiwairon Hadj Souaibou	3.0	0.75	110,000,000	330,000,000			
	16	Kandje	Li Pel Hadj Moussa	5.0	0.5	150,000,000	750,000,000			
Total							10,880,000,000	3,640,000,000		
Yoko	10	Issandja	Mimfoumbe	11.0	0.75	110,000,000	1,210,000,000	1,210,000,000	51.0	6,000,000,000
	9	Yoko	Intersection tsap tsap Megange-makei	40.0	0.75	110,000,000	4,400,000,000	4,400,000,000		
	11	Donga	Dounga Savana	20.0	0.75	110,000,000	2,200,000,000			
Total							7,810,000,000	5,610,000,000		
General total							57,355,000,000	27,595,000,000	25.0	30,000,000,000

2.5.4 Allocation of the road project

Allocation of the project was made taking into account the following main parameters:

- Amount of works and financial capacity of the Companies taking reasonable lead times into account
- Amount to be budgeted for the works
- Location of main agglomerations like limits of lots and/or points of site installation
- Availability of materials and solid rock quarries
- Possibilities of seeking financing
- Nature and homogenization of work

The procedure proposed reveals a set of lots with acceptable characteristics in linear terms and in volume of work, translating into amounts which are of course considerable, but that are acceptable within the possibilities of the Companies to select for this type of "Major Works."

The amounts of the lots, varying from 13 to 84 billion XAF, leaving some flexibility of identification for the key donors, or groups of donors, depending on the possibilities of financing or the interest in one or other of the lots.

The main difficulty in allocation concerned the possibilities of installing the work site. Outside of the towns of Ntui, Yoko, Tibati and N'gaoundéré and their vicinities, which offer suitable possibilities of access, lodgings and provisions for the Companies, the intermediate sections do not offer acceptable possibilities for installing worksite bases, in particular during the initial months of launching of the work.

The allocation proposed is as follows:

Table 7: Allocation

<u>3</u> Lot	Length (km)	Total amount (XAF)	<u>Kilometer cost 4 (XAF)</u>
Lot 1-A	<u>5</u> 21.3	<u>6</u> 13,382,450,000	<u>7</u> 1,801,149,624

<u>8</u>	<u>Lot 1-B</u>	<u>9</u>	<u>96.7 km</u>	<u>10</u>	<u>84,219,720,694</u>	<u>11</u>	<u>870,578,051</u>
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12	Lot 1-C	13	82.1 km	14	71,944,516,098	15	876,410,234
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16	Lot 2-A	17	78.2	18	56,341,626,000	19	720,942,111
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20	Lot 2-B	21	101.9	22	75,449,715,000	23	740,283,703
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24	Lot 3-A	25	68.3	26	45,571,306,000	27	667,694,714
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28	Lot 3-B	29	57.9	30	42,676,700,000	31	737,186,889
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32	Lot 3-C	33	87.7	34	59,124,274,000	35	674,457,279
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Source: STUDI International

2.5.5 Cost of work

The provisional estimate of the work for this phase of the Preliminary Summary Project was prepared considering the following three main sections:

- Section 1: Batchenga - Ntui - Yoko (200.1 km)
- Section 2: Yoko - Tibati (180.1 km)
- Section 3: Tibati - N'Gaoundéré (213.8 km)

Each of the three main sections can be broken down into eight homogeneous sub-sections between the main villages crossed, considering the conditions of relief, soil and the road categories planned.

Thus the estimate of work has been established for the following two main restructuring options:

- Basic solution: bituminous concrete driving surface and shoulder in bi-layer surface
- Variant: driving surface in surface bi-layer and shoulder in single-layer surface

The following tables summarize the estimates for APD work for each of the main sections and sub-sections and for the eight lots proposed for the whole network.

It should be noted that these estimates do not include:

- the costs of expropriation and compensation (only the cost of the demolition work on structures and walls/fencing is included);
- the costs of urban roadways, routes and connected restructuring, including the estimates presented in the corresponding reports;
- the costs of supervising the work and the follow-up teams for the project.

Section 1 - Batchenga - Ntui - Yoko: (200.1 km)

Name	Amounts (XAF excluding all taxes and customs duties)															Total Section 1
	Lot 1-A: Batchenga - Ntui - Ngoula (47.165 km)					Lot 1-B: Ngoula - Mankim - Mangat (90.20 km)					Lot 1-C: Mangai - Yoko (53.5 km)					
	Section 1-0 : Batchenga- Nathigale	Section 1- 1- Nathigale - Ntui	Parking area (Entrée Ntui - PK6+700)	Bus station of Ntui(PK11+00 0)	Total Lot 1-A	Section 1-2 Ntui- Ngoula	Section 1-3 : NGUILA NDJOLE	Section 1-4 : NDJOLE - MANKIM	Total Lot 1-B	Section 1-5 : MANKIM - MANGAI	Section 14 Mangai- MATSHARI	Section 1- 7- MATSHARI - METEING	Section 1-8 : METEING - Yoko	Parking area(Sortie Yoko - PK190+600)	Total Lot 1-C	
	9.3 km	12.0 km			21.3 km	35.1 km	34.0 km	27.7 km	96.7 km	29.0 km	21.2 km	10.7 km	21.3 km	0.0 km	82.1 km	200.1 km
Item 000 - Installation of worksite	350,000,000	600,000,000			950,000,000	1,600,000,000	1,550,000,000	1,300,000,000	4,450,000,000	1,150,000,000	900,000,000	500,000,000	1,050,000,000		3,600,000,000	9,000,000,000
Part A - Road	4,764,310,000	7,944,565,000	464,169,500	209,405,500	13,382,450,000	22,216,025,000	20,975,275,000	17,819,795,000	61,011,095,000	15,886,670,000	12,441,110,000	6,491,240,000	14,759,130,000	539,889,500	49,918,039,500	124,311,584,500
Part B - Bridges	18,972,511,428	0			18,972,511,428	2,103,350,000	928,140,000	3,575,275,000	6,606,765,000	3,885,210,000	1,749,075,000	637,430,000	2,335,390,000		8,607,105,000	34,186,381,428
Part C - Social and environmental measures	0	100,611,372			100,611,372	295,098,628	211,193,020	172,336,488	678,628,135	180,070,492	165,381,605	83,515,405	166,342,990		595,310,492	1,374,550,000
Overall total	24,096,821,428	8,645,176,372	464,169,500	209,405,500	33,405,672,800	26,214,473,628	23,664,608,020	22,867,406,488	72,746,488,135	20,901,950,492	15,255,566,605	7,712,185,405	18,310,862,990	539,889,500	62,720,454,992	168,872,515,928
Cost per kilometer	2,589,980,799	723,445,722			1,572,026,955	747,916,509	696,632,559	824,942,514	751,979,410	721,652,758	720,996,579	721,776,828	860,392,021		764,045,011	844,024,970
Cost of urban roadways	1,175,215,000	2,763,920,000			3,939,135,000	0	0	0	0	0	0	0	2,331,080,000		2,331,080,000	6,270,215,000
Cost of connected structures	0	256,146,705			256,146,705	751,292,220	512,476,926	418,188,413	1,681,957,559	436,955,599	315,314,347	169,229,349	317,147,310		1,228,646,606	3,166,750,870
Cost of connected items	0	0			0	8,685,895,000	1,105,380,000	0	9,791,275,000	0	0	0	5,124,445,000		5,124,445,000	14,915,720,000
Cost of special structures	0	0	464,169,500	209,405,500	673,575,000	0	0	0	0	0	0	0	0	539,889,500	539,889,500	1,213,464,500
Kilometer cost including connected structures	2,589,980,799	744,880,592			1,584,080,918	769,351,379	711,718,721	840,028,676	769,365,781	736,738,920	735,898,717	736,678,966	875,294,159		779,012,079	859,852,393
Kilometer cost including connected piste	2,589,980,799	723,445,722			1,584,080,918	995,730,917	729,172,447	824,942,514	769,365,781	721,652,758	720,996,579	721,776,828	1,101,179,776		779,012,079	859,852,393
Kilometer cost including urban roadways	2,716,348,003	954,736,098			1,757,398,014	747,916,509	696,632,559	824,942,514	751,979,410	721,652,758	720,996,579	721,776,828	969,924,960		792,441,649	875,363,509
Overall cost including piste and urban roadway	25,262,036,428	11,665,243,078			38,274,429,506	35,651,660,847	25,282,464,946	23,285,594,901	84,219,720,694	21,338,906,091	15,570,880,953	7,871,414,754	26,083,535,300		71,944,516,098	194,438,666,298
Kilometer cost including piste and urban roadways	2,716,348,003	976,170,969			1,801,149,624	1,017,167,787	744,258,609	840,028,676	870,578,051	736,738,920	735,898,717	736,678,966	1,225,614,853		876,410,234	971,804,610

Section 2 - Batchenga - Ntui - Yoko: (200.1 km)

Name	Amounts (XAF excluding all taxes and customs duties)											Total Section 2
	Lot 2-A: Yoko-Doumé (78.2 km)				Lot 2-B: Doumé-Tibati (101.9 km)							
	Section 2-1: Yoko-Ngoum	Section 2-2: Ngoum-Lena	Section 2-3: Lena-Doumé	Total Lot 2-A	Section 2-4: Doumé- Mba'am	Section 2-5: Mba'am-Sengbe	Section 2-6: Sengbe- Sabongari	Section 2-7: Sabongari- Mangle	Section 2-8: Mangle-Tibati	Weighing station (Tibati)	Total Lot 2-B	
	35.9 km	9.0 km	33.2 km	78.2 km	26.1 km	12.2 km	16.0 km	25.6 km	22.0 km		101.9 km	180.1 km
Item 000 - Installation of worksite	1,500,000,000	450,000,000	1,300,000,000	3,250,000,000	1,000,000,000	500,000,000	850,000,000	850,000,000	950,000,000	0	4,150,000,000	7,400,000,000
Part A: Road	20,043,680,000	5,372,890,000	18,036,285,000	43,452,855,000	14,161,160,000	6,550,130,000	11,607,750,000	11,411,220,000	12,597,180,000	842,269,000	57,169,709,000	100,622,564,000
Part B: Bridges	0	0	0	0	0	4,329,455,000	0	596,180,000	2,541,605,000	0	7,467,240,000	7,467,240,000
Part C: Social and environmental measures	226,624,418	56,593,041	209,622,541	492,840,000	154,370,690	72,322,600	94,833,882	151,783,934	129,988,893	0	603,300,000	1,096,140,000
Overall total	20,270,304,418	5,429,483,041	18,245,907,541	47,195,695,000	14,315,530,690	10,951,907,600	11,702,583,882	12,159,183,934	15,268,773,893	842,269,000	69,390,249,000	116,585,944,000
Cost per kilometer	564,066,797	605,023,740	548,914,186	603,911,644	548,929,433	896,374,824	730,452,773	474,190,154	695,299,358	0	680,830,544	647,447,904

Section 3: Tibati - Ngaoundéré (213.8 km)

Name	Amounts (XAF excluding all taxes and customs duties)													Total Section 3	
	Lot 3-A: Tibati - Febadji/Mambal (68.3 km)				Lot 3-B: Febadji - Mambal/LEWA (57.9 km)				Lot 3-C: LEWA - NGAOUNDERE (87.8 km)						
	Section 3-1: Tibati- Ngatt	Section 3-2: Ngatt-FeBAD ji/MAMBAL	Bus station Tibati	Parking area Tibati	Total Lot 3-A	Section 3-3: FeBADji... Beka Gotto (illegible)	Section 3-4: Beka Gotto - Tekel	Section 3-5: Tekel - Lewa	Total Lot 3-B	Section 3-6: Lewa - Louga	Section 3-7: Louga - Lkok	Section 3-8 : LIKOK - NGAOUNDERE	Parking area Ngaoundéré		Total Lot 3-C
	32.7 km	35.6 km			68.3 km	22.8 km	9.8 km	25.4 km	57.9 km	21.3 km	29.5 km	36.9 km		87.7 km	213.8 km
Item 000 - Installation of worksite	1,250,000,000	1,050,000,000	0	0	2,300,000,000	1,050,000,000	450,000,000	1,000,000,000	2,500,000,000	900,000,000	1,200,000,000	1,500,000,000	0	3,600,000,000	8,400,000,000
Part A - Road	17,007,960,000	14,796,075,000	209,750,500	477,827,500	32,491,613,000	14,698,270,000	5,072,590,000	13,801,035,000	33,571,895,000	12,339,215,000	15,917,170,000	20,642,460,000	464,142,500	49,362,987,500	115,426,495,500
Part B - Bridges	6,964,635,000	2,903,100,000	0	0	9,867,735,000	2,711,180,000	0	0	2,711,180,000	0	0	0	0	0	12,578,915,000
Part C - Social and environmental measures	216,294,792	235,765,208	0	0	452,060,000	156,478,842	67,122,376	174,248,782	397,850,000	136,762,300	189,137,714	236,349,986	0	562,250,000	1,412,160,000
Overall total	25,438,889,792	18,984,940,208	209,750,500	477,827,500	45,111,408,000	18,615,928,842	5,589,712,376	14,975,283,782	39,180,925,000	13,375,977,300	17,306,307,714	22,378,809,986	464,142,500	53,525,237,500	137,817,570,500
Cost per kilometer	778,994,936	533,349,708	0	0	660,956,451	817,589,343	572,305,967	590,624,484	676,801,726	627,302,786	586,873,333	607,294,708	0	610,586,543	644,594,703

2.5.6 The resources to be used

2.1.2.1 Mechanized equipment

A general idea of the equipment usually used on road construction sites is given below. There are vehicles for the transport of materials, graders, prefabrication equipment, equipment for handling the prefabricated elements, equipment for setting up ripraps and prefabricated elements, etc.

Here is a list of the equipment and materials necessary to the various project components:

- For the grading and sub grade:
 - Extractors of materials: bulldozers, refuse trucks, diggers, pneumatic drills, loaders, etc.
 - Transport vehicles: dump trucks, gondola cars, etc.
 - Spreading vehicles: graders
 - Watering vehicles: cisterns
 - Compacting vehicles.
- For preparing the road bed:
 - Vehicles/equipment for extracting material and exploiting quarries (drilling rigs, pneumatic drills, bulldozers, loaders, diggers, equipped crushing station, etc.)
 - Center for coating of bituminous materials
 - Transport equipment: dump trucks, gondola cars, etc.
 - Spreading equipment: graders, mixers, distillators, finishers, etc.
 - Compacting equipment.
- For building the bridges and hydraulic works:
 - Equipment for building the foundations (pile driving)
 - Cement mixer
 - Transport and use of cement: cement mixers, internal vibrators, etc.
 - Laboratory equipment for the tests: density, granulometry, Atterberg limits, proctor, CBR, trials on bitumens, trials on concrete, vehicles, etc.

2.1.2.2 Construction materials and their sourcing

Construction of the route will require various materials, i.e.:

- backfill materials or homogenous materials and good mechanical quality (laterite, gravel, etc.)
- crushed gravel, rubble stone, sand
- cement or bitumens, adjuvants

- reinforcing rods such as metal armatures for use in reinforced concrete or flat iron for construction shuttering or mechanical manufacturing
- wooden frames or deckings
- sheet iron for construction of offices

Implementation of the various materials will generate chutes or debris, waste or disturbances that will litter the landscape, making it ugly.

Several potential borrow sites and solid rock exist in the project area. Exploitation of local materials within the framework of the project will allow optimization of the direct economic spinoffs from the project on a national scale, both through payment of the withholding taxes and at the level of the suppliers but also in terms of the possibility of employing local labor.

2.1.2.3 Availability of rock material

Geotechnical investigations were made on 15 solid rock quarries along the route. The results of the Los Angeles and Micro Deval Humide trials are summarized in the table below.

The Los Angeles results on the granulates are high (between 40 and 50) thus preventing the use of these granulates in the body of the road. The quality of the granulates only improves from Sengbé. This is probably due to the alteration in the rock surface. The consultant will proceed with analyzing the rock in depth (by test cores) to confirm the availability of the granulates for their use as a base layer and/or surface layer.

Table 8: Main geotechnical characteristics of the solid rock quarries

Quarry No.	PK	Los Angeles Fraction		Micro Deval Humide	
		6-10	10-14	6-10	10-14
C1 (Bindalima I)	13 + 703	42.5	42.2	24.4	21.1
C2 (Nguila Haoussa)	42 + 830	46.3	43.6	28.7	21.8
C3 (Ndounga-Ecole)	60 + 723	*6	*	*	*
C4 (Ngouetou)	119 + 169	43.9	42.8	21.5	16.5
C5 (Fouy)	153 + 069	52.5	51.8	29.5	25
C6 (Meteing)	168 + 600	*	*	*	*
C7 (Mekouwori)	176 + 755	42.5	38.8	22.5	17.4
C8 (Léna)	243 + 800	46.7	43.3	31	23.5
C9 (Sengbé)	296 + 700	37.7	32.9	20.2	17.1
C10 (Mbanti-Bang)	308 + 104	*	*	*	*
C11 (Tella-Malarba II)	366 + 900	12.2	11.4	5	4
C12 (Tella)	370 + 930	15.6	14.6	8.5	6
C13 (Beka-Gotto)	432 + 000	29.7	29	14.9	9.4
C14	449 + 600	31.8	31.2	10.4	11.8
C15	546 + 300	43.1	40.7	19.5	17.2

Source: STUDI International

2.1.2.4 Availability of natural materials

The borrow materials, mainly lateritic gravel, are not evenly spread throughout the planned road. In fact, over the first 100 kilometers, the

exploitable quantities of lateritic gravel rarely reach 15000 m³. From MBA'AM, the power increases considerably.

The available materials explored during this phase, indicated in green, are insufficient for the needs of the project, indicated in blue. This is very noticeable in the first hundred kilometers of the project between Batchenga and Mankim.

The quantities (available material and project requirements) are almost aligned at Doumé. From this town, the project requirements are largely guaranteed.

The geological and geotechnical context does not suggest an abundance of lateritic gravel that can be used for the body of the road.

This situation leads to greater transport distances of the road materials for the first hundred kilometers than for the rest of the itinerary.

2.5.7 Water requirements for the construction site

The road construction work will need a great volume of water, in particular for making the concrete, controlling dust raised along the work corridor and during the various cleaning operations. The drinking water requirements will also be necessary for drinking at the site base (accommodation center) for the personnel of the companies in charge of the work.

Water for the work can be taken directly from the Sanaga river only at the beginning of the project. The absence of adduction of water from public services (CDE/CAMWATER) in the other zones will oblige the company to open a controlled borehole to supply its base.

2.5.8 Fuel supply

The construction site machinery and vehicles need fuel and lubricants (hydrocarbons) to operate. The villages around the project zone only have service stations at Ntui, Tibati and N'gaoundéré. Depending on the choice of location of the site bases, the company will certainly need to store large quantities of hydrocarbons there.

2.5.9 Labor requirements

The amount of personnel to mobilize for the construction site is not exactly known at this APS stage of the study and will depend on the company's internal organization. However, for a road construction site of this considerable size, we can estimate the number of laborers at around 1600 for all the construction lots.

2.6 Pollution and potential disturbance directly connected to the project

The nature of the waste material and disturbances resulting from realization of the project will depend strictly on the activities and inputs connected to the work, while the characteristics of the natural and social environment will determine the significance of the disturbance.

Table 9: Summary of the main activities and tasks connected to the road building projects

Periods		No.	Project activities that are sources of impact
Construction work	Pre-construction phase	1	Setup of the site (purchase of land, installation of the site and vie base, construction of the site access routes or provisional deviations, delivery of mechanized equipment)
		2	Recruitment of temporary laborers, transfer of qualified workers
		3	Purchase of construction equipment and material
		4	Clearing of land (clearing brush/removing weeds and bushes/cutting down trees)
	Construction phase	5	Grading of land (abutment embankments, excavations and cuts for rectification of the road layout)
		6	Recovery of the road platform at the level of the access points
		7	Water drainage system (digging of longitudinal ditches and outlets)
		9	Construction of the road
		11	Exploitation of land used and rock quarries (use of explosives, crushing, loading and transport of material)
		12	Transport and circulation connected to site activities (purchase of vehicles, purchase of fuel)
		13	Water supplies for the construction work (pumping of water from rivers or wells)
		14	Emptying, maintenance and washing of vehicles and work site machinery
		15	Management of waste water and drainage water
	Shutdown of construction site	17	Production of waste and contaminating products
		18	Clean-up of sites
		19	Storage of surplus materials (choice of sites)
	Exploitation	20	Close-down of site (cleanup, return to good condition)
		21	Physical presence of road
		22	Operation and use of infrastructures (transport and traffic)
		23	Maintenance work (replacement of damaged equipment: guardrails, signage, repainting of metal armatures, etc.)

3 THE LEGAL AND INSTITUTIONAL CONTEXT OF THE ESIA

This chapter highlights the legislative and regulatory instruments upon which Cameroon's ESIA is based, and the main institutional stakeholders likely to be involved in the project being studied.

In the wake of the United Nations Conference on Environment and Development which took place in Rio de Janeiro in Brazil in June 1992, Cameroon drafted a National Program for Environmental Management (PNGE), which set out policies for protecting the environment and for the rational management of natural resources. These policies relate to the following main areas:

- the rational management of land, ecosystems and resources;
- development of raw materials through industrial development and infrastructures, particularly through ecologically sustainable industrial development and ensuring that the environmental impact of infrastructures is acceptable;
- improvements to the quality of life in urban settings;
- establishing the conditions for developing human capacities, particularly through the integration of women into environmental programs and taking sufficient account of environmental concerns in the various sectors.

The environmental impact assessment would appear to be an indispensable and relevant tool to ensure the success of their implementation.

3.1 Legal framework

3.1.1 National legislation and regulations

Cameroon has a range of national legislative and regulatory texts which relate to protecting the environment. Some of these address the ways in which environmental impact assessments are conducted. They are supported by texts on the land ownership and tenure regime which relate to the definition of public and private domains, as well as the procedures governing expropriation, reinstatement and compensation. These are:

1. Law No. 96/12 of August 5, 1996 establishing the framework law on environmental management

This is the legislative foundation for addressing environmental issues when conducting projects in Cameroon. In Article 17, it states that “the promoter or contracting authority of any development, works, equipment or installation project which risks, due to its size or nature, having an environmental impact, is obliged to conduct, in line with the directions set out in the specifications document, an environmental impact assessment to assess the direct and indirect impacts of the said project on the ecological balance of the region in question, or of any other region, the context and quality of life of local populations, and the impact on the environment in general.” The construction project for the Batchenga - Ntui - Yoko - Tibati - Ngaoundéré road falls into this category.

Article 19(2) sets out the content for an environmental impact assessment (EIE). Article 20 states that an EIE leads to a reasoned decision being made by the relevant authority, after a preliminary opinion has been issued by the Interministerial Environment Committee (CIE).

The main implementing Decrees and Orders of the framework law on environmental management are:

- Decree No. 2013/0171/PM of February 14, 2013. Among other things, this new Decree establishes the procedure for conducting assessments, costs to be paid, ways of conducting consultations and target audiences (Articles 11 to 15). It also sets out the role of public authorities in the environmental supervision and monitoring of projects.
 - Order 0069/MINEP of March 8, 2005 sets the various categories of operations which are subject to an environmental impact assessment. This Order also distinguishes different levels of assessment (detailed or summary impact assessment), depending on the nature of the project, and sets out the corresponding content of EIE reports. This Order establishes that this project falls within the category of a detailed ESIA as the result of Article 4, Section IV on Economic Infrastructures (A. Transport - construction and renovation of roads and motorways).
 - *Order No. 00001/MINEP of February 3, 2007 defining the content of the terms of reference of environmental impact assessments.*
 - *Order No. 00004/MINEP of July 3, 2007 establishing the conditions for approving engineering consultancies to conduct impact assessments and environmental audits.* It sets the conditions to be met by engineering consultancies in order to obtain the approval of the Ministry responsible for the environment to conduct an environmental impact assessment or audit. In Article 11, it specifies that an EIE report or environmental audit will only be accepted by the Ministry responsible for the environment if it has been conducted by an engineering consultancy which has been approved under the conditions set by the relevant legislation in force. Ecta BTP Cameroun has been approved by MINEP.
2. Law No. 85/09 of July 4, 1985: national legislation on land ownership, public property, relocation and compensation

The land ownership, public property, expropriation for public use, relocation and compensation regimes are regulated in Cameroon by a wide range of legal provisions.

The Cameroon legislator has recognized the right to property in individual rights as far back as the founding law of 1972. It defines individual property as being the “*right to use, to enjoy and to dispose of goods guaranteed to everyone by the law. No-one may be deprived of this right with the exception of for public use, and under the condition of compensation being awarded.*”

In terms of property law, Cameroon uses both modern and traditional laws. Orders 74-1, 74-2 and 74-3 of July 6, 1974 are the basic laws defining private property, the scope of the State's public and private property, and State-owned property. It defines four statuses of land tenure: State-owned public property, State-owned private property, national property, and private lands.

Order No. 77-2 of January 10, 1977 establishes State-owned man-made public property: this consists of public land which is developed by an individual or the state, notably: motorways and a 100 m right of way on either side of the carriageway; national (RN), regional department roads and tracks with respective rights of way of 40, 25 and 10 m on either side of the carriageway (for national roads, this right of way is reduced to ten (10) meters from the external side of the sidewalk in built-up areas and five (5) meters in towns); tracks, ports, monuments and public buildings, concessions to traditional chiefdoms, etc.

Law No. 85-09 of July 4, 1985 on expropriation for reasons of public use and compensation mechanisms, and its implementation Decree, No. 87/1872 of December 18, 1987 governs this sector in Cameroon. These texts stipulate that expropriation opens rights to preliminary compensation. The legal person benefiting from the measure is responsible for paying compensation for expropriation. Compensation relates to bare land, agricultural land, constructions, any other developments regardless of their nature, duly recorded by a committee known as the Committee for Records and Assessments. Compensation may be in cash or in kind, on the condition that the land awarded in compensation is situated in the same commune as the expropriated land.

3. Law No. 98/005 of April 14, 1998 on the water regime

This law establishes the legal framework for water, as well as provisions relating to its conservation, management and the protection of public health. In Article 4, it prohibits any actions likely to alter the quality of ground water, underground water or seas, or to damage public health, or aquatic and underwater flora and fauna. Similarly, Article 6 of this law states that any natural or legal person who owns an installation likely to lead to water pollution must take measures to reduce or eliminate these effects.

The main implementing Decrees and Orders of the Law relating to the water regime are: (i) Decree No. 2001/216 of August 2, 2001 on the creation of a special allowance account to finance sustainable development projects relating to water and sanitation, (ii) Decree No. 2001/165/PM of May 8, 2001 establishing measures to protect ground and underground water against pollution, (iii) Decree No. 2001/164/PM of May 8, 2001 specifying the methods and conditions under which ground or underground water can be drawn for industrial or commercial purposes and (iv) Decree No. 2001/163/PM of May 8, 2001 regulating the protective perimeters around channeling, treatment and storage points for drinking water.

4. Law No. 94/01 of January 20, 1994 on the forestry, fauna and fishing regime

This law sets out the framework for integrated, sustainable and supported management of forestry, animal and fishery resources. In environmental terms, it specifies in Article 16, paragraph 2 that "implementation of any development project which is likely to disrupt a forestry or aquatic environment is subject to a prior environmental impact assessment."

In addition, Decree No. 95/466/PM of July 20, 1995, establishing the implementation methods for the fauna regime, defines the various types of protected areas in Cameroon, including National Parks and Buffer Zones, which are protected areas on the outskirts of each national park, natural reserve or animal reserve, marking a transition between these areas and areas where game, agricultural and other activities can be freely conducted.

However, some human activities can be regulated in keeping with a development plan, which is a technical document drafted by the authority responsible for fauna or any natural or legal person appointed by them and which states the time, place, nature and timing of applicable assessments to be conducted in protected areas, duly approved by the Minister responsible for fauna. The law which created the protected area defines the limits of its buffer zone.

5. Law No. 96/67 of April 8, 1996 on the protection of the national road infrastructure

This text contributes to the protection of the environment by defining road checks to detect defective vehicles which may contribute to damaging the road infrastructure and the environment. Exceeding a vehicle's load capacity plays a direct role in damaging the road structure, while unroadworthy vehicles have an indirect detrimental impact upon the condition of the road.

Chapter 1, Article 3 of this law also specifies the consistency of the road infrastructure, i.e. the right of way of the road as defined by land ownership legislation and including notably:

- a) the carriageway;
- b) ditches and drainage systems;
- c) sidewalks and verges;
- d) areas along the roadside cleared for daylighting;
- e) embankments.

II – road equipment consists in particular of:

- a) road and sanitation structures;
- b) security mechanisms, including horizontal and vertical signage;
- c) communication, electrification and hydraulic installations;
- d) truck scales;
- e) toll booths;
- f) rain barriers; and
- g) other barriers.

6. Law No. 001 of April 16, 2001 on the mining code

The aim of this law is to regulate mining activities, and it applies to the research and exploitation of mineral resources, including quarriable substances. Article 85 states that all mining activities must comply with the legislation and regulations on protecting and managing the environment.

Article 87 establishes the general rules which authorized mining and quarrying companies must observe to ensure that mineral resources are rationally exploited while protecting the environment. These rules are, notably: (i) the prevention or minimization of any spillages in the natural environment; (ii) protection of flora and fauna; (iii) restoring disturbed sites to safe and stable conditions, with levels of productivity and visual impact which are deemed to be acceptable by the authorities responsible for Mines and the Environment.

7. Circular No. 00908/MINTP/DR on the “Directives for taking account to environmental impacts in road maintenance”

This text follows on from a survey on limiting the environmental impacts of road maintenance drafted in 1997 by the MINTP. It defines the environmental standards and practices to be followed both during road construction and when servicing surfaced and dirt roads.

Among other things, it defines the methods for exploiting and opening quarries on public and private land. It sets out standard environmental clauses which are applicable to all MINTP projects.

The other legislative and regulatory texts which are relevant to this environmental impact assessment are:

- Law No. 92/007 of August 14, 1992 on the Labor Code;
- Decree No. 95/466/PM of July 2, 1995 setting the conditions for the wildlife management regime;
- Decree No. 95/531/PM of August 23, 1995 setting the conditions for implementation of the forestry regime;
- Decree No. 2001/546/PM of July 30, 2001, modifying and completing certain provisions of Decree No. 95/413/PM of June 20, 1995, setting the conditions for implementation of the fisheries regime;
- Decree No. 2005/577/PM of February 23, 2005 setting the conditions for conducting environmental impact assessments;
- Order No. 0069/MINEP of March 8, 2005 setting the various categories of operations which are covered by environmental impact assessments;
- The Order categorizing species by class of protection and the Order on regulating hunting activities, particularly in terms of annual authorized hunting quotas as well as exceptional culls by hunting permit;
- Orders setting the standards for wildlife inventories in the savannah and forestry settings.

3.1.2 International and regional treaties connected to this study

Several treaties have been signed by the Republic of Cameroon, such as:

- The Washington Convention (1973) on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- The Convention on Biological Diversity (CBD) signed in 1992 and ratified in 1994, which focuses on conservation, the sustainable use of biological resources and equitable distribution of profits;
- The United Nations Framework Convention on Climate Change (UNCCC), signed by Cameroon in 1992 and ratified in 1994;
- The United Nations Convention to Combat Desertification (CCD) in 1994;

- The World Heritage Convention (WHC) also known as the Convention Concerning the Protection of the World Cultural and Natural Heritage, adopted in Paris in 1972 and ratified in 1982;
- The Bonn Convention on the Conservation of Migratory Species of Wild Animals, adopted and ratified in 1993;
- The Algiers Convention of 1968 on the African Conservation of Nature and Natural Resources;
- The Ramsar Convention on Wetlands signed in 1971 and ratified in 2006;
- The Rotterdam convention on PICs and the Stockholm Convention on POPs (v) the Geneva Agreement on Tropical Timber;
- The African Convention on the Conservation of Nature and Natural Resources of Maputo in 2003, to ensure the sustainable development of African economies;
- The Agreement for Cooperation and Consultation between the Central African States for the Conservation of Wild Fauna and the creation of a special fund for the conservation of wild animals.

Some of these conventions, particularly the convention on biological diversity and the convention on climate change, provide for, among other things, the adoption by signatory countries of mechanisms for assessing environmental impacts.

Cameroon recognizes the binding nature of a wide range of ratified international treaties. As such, Article 14(2) of the Framework Law on Environmental Management (Law No. 96/12 of 5/8/96) states that “the authority responsible for the environment must ensure that Cameroon’s international commitments relating to the environment are introduced into national law and policy on the subject.”

For example, after the United Nations Conference on the Environment and the Rio Summit in Brazil in 1992, in 1994 Cameroon ratified the United Nations Framework Convention on Climate Change (UNCCC), which binds signatories to stabilize concentrations of greenhouse gases in the atmosphere to levels which would prevent dangerous anthropogenic interference with the global climate system. In this context, Cameroon was chosen to conduct a pilot study aiming to apply the methodology of the Intergovernmental Panel on Climate Change (IPCC) in 1990, in order to assess the impact of climate change and the necessary measures to be taken. In 1997, new financial assistance from the Global Environment Fund (GEF) enabled Cameroon to prepare its first National Communication to conduct inventories of greenhouse gas emissions in the energy, industry, agriculture, forestry, land use and waste sectors, using 1994 as the benchmark year. This enabled Cameroon to conduct impact and adaptation assessments in Sudan-Sahel and coastal areas characterized by a fragile ecology, and also to conduct inventories and studies on mitigation in the forestry and land use, agriculture and animal breeding, energy, industry and waste sectors. In further work against climate change, Cameroon was represented at the 14th session of the Conference of the Parties in Poznań in 2008. Cameroon focused on its commitment to reducing emissions from deforestation and damage to forests in developing

countries as well as highlighting the role of conservation, sustainable forestry management and improving carbon stocks.

In 2009, in the context of implementing the country's commitments, Cameroon prepared its second National Communication on Climate Change and also formalized the Decree on the creation of the National Observatory for Climate Change (ONACC) in 2009. The aim of the observatory is to monitor and assess the socio-economic and environmental impacts of climate change and to suggest measures to prevent, reduce and adjust the negative effects of these changes. In particular, the observatory should collect benchmark information on climate change in Cameroon, provide this information to decision makers, suggest ways of reducing greenhouse gases, and cooperate with other regional and international observatories. In addition, a National Plan for Adapting to Climate Change (PNACC) was officially launched by the Cameroon Minister for the Environment, the Protection of Nature and Sustainable Development in 2012.

Several other initiatives are also underway with the support of the private sector, such as the fight against desertification and intensification of reforestation operations (including the "Green Heart, Rosy Future" project and the "Operation Green Sahara" project). A support program to establish the REDD+ and a specialized agency in forestry development has been launched, as well as projects to reserve resources in the flood plains of Logone.

3.1.3 Regional treaties

On the sub-regional scale, Cameroon's policy on biodiversity has led to the establishment of a Convergence Plan, in keeping with the declaration of the heads of Central African States, known as the Declaration of Yaoundé (1999), and the Treaty of Brazzaville (February 2005) adopted at the Summits of the Heads of Central African States on the conservation and sustainable management of Central African Forestry Ecosystems. The Declaration of Yaoundé set out significant actions to be taken (such as the creation of protected areas) by each country and collectively by the countries concerned for cross-border protected areas. The Commission for Central African Forests (COMIFAC) is responsible for monitoring implementation of the Convergence Plan which defines priority actions such as the Dja-Odzala-Minkébé Tri-National Agreement (TRIDOM) and the Sangha Tri-National Agreement (TNS).

3.2 Institutional framework

Several institutions are involved in protecting the environment in Cameroon, including Ministerial departments, non-governmental organizations (NGOs) and not-for-profit organizations. The Ministerial departments responsible for implementing environmental policy in relation to road infrastructures are:

3.2.1 The Ministry for the Environment and the Protection of Nature and Sustainable Development (MINEPDED)

The main institution responsible for managing the environment in Cameroon is MINEPDED. This Ministerial department has a Sub-Department for Environmental Assessments and an

Environmental Impact Assessments Department whose role it is to supervise environmental assessments.

MINEPDED also has a central administrative unit and decentralized departments. In particular, it includes the Department for Monitoring Conservation and the Protection of Natural Resources (DSCPR) which includes the Ecological Monitoring and Supervision Unit and departmental and regional Delegations.

Because the project is located in the Central and Adamaoua regions, MINEPDED's decentralized departments in the relevant locations are responsible for examining the environmental management of the project. These are the departmental delegations in Mbam-et-Kim, Djerem and Vina.

3.2.2 The Ministry for Public Works (MINTP)

The MINTP includes a Technical Studies Support Division and an Environmental Protection for Infrastructures Unit (CPEI). The specific role of the CPEI is to ensure that MINTP's activities, in terms of constructing roads and other engineering works, respect the government's environmental commitments. The CPEI monitors projects on behalf of the government. In addition, the CPEI's mandate includes:

- awareness raising and training for all stakeholders involved in MINTP activities;
- mainstreaming environmental clauses into projects, calls to tender and monitoring contracts;
- adopting a code of environmental practices;
- developing indicators of environmental performance;
- monitoring and evaluation.

3.2.3 The Ministry for Industry, Mines and Technological Development (MINIMIDT)

The MINIMIDT is responsible for drafting industrial development strategies by promoting the country's natural and human resources, and technological development in various sectors of the national economy. It is also responsible for geological prospecting, mining activities and classified establishments. It has a particular role to play in granting authorizations on the use of detonating (explosive) substances and the exploitation of rocky quarries (gravel and rubble) to be used in during construction.

3.2.4 The Ministry for Forestry and Fauna (MINFOF)

The MINFOF is another Ministerial department with particular relevance for this study, both in terms of the sensitivity of the zone as well as its biodiversity. Among other things, this Ministry is responsible for the fight against poaching and the protection of endangered species.

Created following the reorganization of Government by Decree No. 2004/320 of December 8, 2004, the Ministry for Forestry and Fauna (MINFOF) and the Ministry for the Environment and the Protection of Nature (MINEPDD) are responsible for managing environmental

information. Their missions include, among other things, implementation and evaluation of the Government's policy on managing biodiversity, protected areas and the environment.

To fulfill its remit, the MINFOF comprises a central administrative department and decentralized services. Centrally, it includes technical departments, including the Department for Fauna and Protected Areas (DFAP), which is responsible for drafting and implementing policy on the management of fauna and protected areas, and the Forestry Department (DF). The DFAP has three sub-departments, the Sub-Department for Protected Areas, the Sub-Department for Wildlife Conservation and the Sub-Department for Wildlife Exploitation and Development. The decentralized levels include protected areas, and departmental and regional delegations. The Garoua School of Fauna (EFG) and the Mbalmayo School for Water and Forestry, which are responsible for training and education, form part of this Ministerial department.

3.2.5 The Ministry of State Property and Land Affairs (MINDCAF)

This Ministry is responsible for managing the country's natural heritage. It is responsible for drafting, implementing and evaluating the government's property, land and cadastral policy. As such, it is responsible, among other things, for managing the natural heritage and for processing proposals for appropriation. It plays a crucial role in terms of land security.

MINDCAF is the only authority able to issue orders to enforce the acquisition of land for public use (DUP) for all Ministerial departments wishing to undertake operations which may require expropriations. Its managers are members of the departmental expropriation committees and those responsible for assessing built heritage (land and housing).

3.2.6 The Ministry for Agriculture and Rural Development (MINADER)

This Ministry is responsible for the preparation, implementation and evaluation of national policies on agriculture and rural development. It operates in the context of expropriations, to assess damage caused to agriculture during road development work, and is the Ministerial department which leads evaluation missions to determine levels of damage and compensation.

The Ministerial departments responsible for water and public health are also relevant for the environmental management of this project.

3.2.7 The Ministry for Social Affairs (MINAS)

The Ministry for Social Affairs is responsible for drafting and implementing government policy on social prevention and assistance, social protection of the individual, as well as the implementation of National Solidarity. This reorganization is a demonstration of the Head of State's pro-active approach to ensuring better treatment of vulnerable sectors of society.

3.2.8 The Ministry for Housing and Urban Development (MINHDU)

The Ministry for Housing and Urban Development is responsible for drafting and implementing government policy on housing and urban development.

As such, it is responsible for:

a) in terms of housing:

- drafting and implementing a rural and urban housing improvement plan;
- implementing social housing policy;
- monitoring the application of housing standards.

b) in terms of urban development:

- drafting and monitoring the implementation of town planning development and restructuring strategies in partnership with the relevant authorities;
- drafting and implementing the various urban areas' integrated social development strategies;
- drafting and implementing management strategies for urban infrastructures in partnership with the Ministry for Public Works;
- drafting and implementing traffic improvement strategies in major urban centers with the relevant Ministerial departments and decentralized regional authorities;
- making improvements to urban centers in partnership with the relevant Ministerial Departments and decentralized regional authorities;
- planning and controlling urban development;
- overseeing the drafting of master plans for town planning projects in partnership with the decentralized regional authorities;
- monitoring the application of standards relating to sanitation and drainage;
- monitoring compliance with standards relating to hygiene and cleanliness, and the removal and/or treatment of household waste;
- liaising with international organizations involved in the development of major towns in partnership with the Ministry for Foreign Affairs.

The Ministry monitors the professional bodies representing architects, town planners and surveyors.

It works closely with the decentralized regional authorities and is responsible for the Société Immobilière du Cameroun (SIC), and for projects and bodies working on town planning and housing.

3.2.9 The Ministry of Labor and Social Security

The Ministry for Labor and Social Security is actively involved in checking whether site workers' working conditions comply with the relevant legislation.

3.2.10 The Ministry for Water and Energy (MINEE)

The MINEE is tasked with designing ways of implementing the government's policy on energy and water resources, for applying this policy, and for monitoring its implementation.

3.2.11 The Ministry for Public Health

The Ministry for Public Health is responsible for:

- encouraging all forms of collective or individual education likely to improve the population's behavior in terms of health and hygiene.
- providing technical assistance to all public and private bodies.
- implementing mass vaccinations, health checks at border controls, school health, maternal and infant health, occupational health and the prevention of occupational diseases, nutritional education and health and mental health.
- implementing screening programs with a view to avoiding or anticipating outbreaks of disease.
- implementing and monitoring implementation of a family planning policy with a view to protecting the family, ensuring the physical and mental wellbeing of children and protecting the health of mothers.

3.2.12 The Interministerial Committee on the Environment

The Interministerial Committee on the Environment (CIE) was created by the Framework Law of 1996. It is responsible for examining and approving the terms of reference and reports of environmental impact assessments.

This Committee includes a representative of each of the main relevant Ministries (17 to date), including the Ministers for the Environment, Public Works, Mines, etc.

3.2.13 Local and traditional authorities

Local communities and traditional chiefdoms are the first to be involved in projects which are being conducted in their administrative zones and environments. Their role is crucial, given their knowledge of the setting and their ability to mobilize or raise awareness among the local population. Moreover, the choice of measures to support the project is suggested to them, in order to ensure the project integrates smoothly into the social context. This is why they are involved in the public consultations.

3.2.14 The not-for-profit sector and cooperative bodies

The participation of civil society, non-governmental organizations and cooperation agencies in development projects is encouraged by the Framework Law on Environmental Management. They participate by being represented in consultation meetings and having free access to project documents.

It should be noted, however, that the obligation to take into account the environmental aspects mentioned in the laws and regulations mentioned above, is adapted to the context of the project and the area in which it is located. Several organizations are active in the area in question, including:

The International Union for Conservation of Nature (IUCN), the World Wide Fund for Nature (WWF), the Fondation pour l'Environnement et le Développement au Cameroun (FEDEC),

Global Witness, the Centre International pour la Promotion de la Création (CIPCRE), and the Institut Africain de Développement Economique et Social (INADES-Formation). The consultant met with the Wildlife Conservation Society (WCS), who ensured that several NGOs were capable and used to handling awareness raising campaigns during construction work, such as the MINSANTE NGO, which worked on the management plan for the Mbam and Djerem National Park. This NGO encouraged awareness raising among local populations about pandemics such as HIV/AIDS and STDs, river blindness and various epizootic diseases.

In terms of NGOs responsible for forestry management in Cameroon, since 1994 a new law has demonstrated the public sector's desire to open up forestry management to decentralized regional bodies and local communities, as well as to NGOs. The result of this process was the drafting of a Manual on procedures for allocating and standards for managing community forests, since April 1998. This manual highlights the various steps required to obtain and develop a community forest. It is in this context that several NGOs have been created and have begun work on forestry management. This is the case of the NGO Nature+ which is funded by the European Union and which helps the Badjoué community to manage their community forest project. The SNV (Dutch Development Organization) helps the OOCBB, a local NGO in Lomié, to manage community forests. Several national NGOs are currently involved in forestry in Cameroon. The Cameroon Environment Watch (CEW) can be cited as an example. This is an NGO based in Yaoundé which is experienced in forestry issues. It has worked on certification, poaching, and forest cartography in partnership with the Global Forest Watch (GFW).

3.2.15 Institutional difficulties

Significant difficulties face the public sector and are a constraint upon the country's development. There is a lack of sufficient graduates in some technical areas: few graduates are present in the MINTP on environmental issues. Despite their high levels of education, these numbers should be increased in environment-related areas to monitor this large-scale project. The consultant proposes appointing an environmental project manager for each commune.

3.3 National legislation specific to the ESIA

3.3.1 The basic law on the impact assessment process

The legal framework on impact assessments is characterized by a basic law, namely: the Framework Law on Environmental Management, which instituted impact assessments for "any development, works, equipment or installation project which risks, due to its size, nature or the number of activities which are conducted in the natural environment, having a negative environmental impact."

This Framework Law is complemented by a series of sectoral laws with specific provisions for each sector. These are the following:

- Law No. 85/09 of July 4, 1985 on expropriation for public use and compensation mechanisms; Order No. 00832/4.15.1/MINUH/D 000 defining the methods of

implementing Law No. 85/09 of July 4, 1985 on completed and uncompleted constructions; Decree No. 2003/418/PM of February 25, 2003 setting compensation rates to be awarded to owners whose crops and trees are destroyed for public use.

- Law No. 94/01 of January 20, 1994 on the forestry, fauna and fishing regime;
- Law No. 98/15 of July 14, 1998 governing establishments classified as dangerous, unsanitary or uncomfortable;
- Law No. 96112 of August 5, 1996 on Environmental Management;
- Law No. 99/013 of December 22, 1999 on the oil code;
- Law No. 98/005 of April 4, 1998 on the water regime;
- Law No. 001 of April 16, 2001 on the mining code;
- Law No. 2001/013 of December 30, 2001 on the gas code;
- Law No. 2003/007 of July 10, 2003 on the fertilizer sub-sector;
- Law No. 2004/003 of April 21, 2004 on town planning;
- Law No. 89127 of December 29, 1989 on toxic and dangerous waste;
- Decrees Nos. 2011/2583 of August 23, 2011 on the regulation of noise and odor pollution. In particular, Article 3 specifies that the noise emitted by building work must be closely monitored.
- Article 3.- (1) the provisions of this Decree apply to all types of noise, including noisy activities or work which disturbs neighbors, establishments considered as dangerous, unhealthy or uncomfortable, noise produced inside mines and quarries, public and private building sites as well as mobile sources.
- Decrees No. 2011/2584 establishing methods for protecting soil and sub-soil. Specifically Section 1 and Articles 3 and 4 given below:
- Article 3.- Any activity relating to land use must be conducted in such a way as to avoid or reduce soil erosion and desertification;
- Article 4.- (1) The exploitation of areas which are at high risk of erosion is forbidden. (2) An order from the Prefect, upon the proposal of regionally competent technical services, defines areas at high risk of erosion and determining the ways of securing these areas.

The Permanent Secretariat for the Environment includes:

1. The Program and Sustainable Development Department, which is responsible, among other things, for:
 - environmental impact assessments;
 - prevention of pollution;
 - planning the management of natural resources;

- policies and strategies for using less polluting technologies.
2. The Department for Environmental Standards and Inspections, tasked for, among other things, the environmental impact assessments:
 3. The Centre for Information and Documentation on the Environment, which has, among other things, the following remit:
 - drafting and codifying environmental standards and regulations in partnership with the relevant authorities;
 - developing indicators to help monitor environmental quality;
 - collecting, centralizing, processing and disseminating environmental information;
 - working with other networks and information systems which exist in the environment sector on the sub-regional and international level.

It therefore appears clear that through its remit, the Permanent Secretariat for the Environment is the central structure for environmental impact assessments, in terms of standards and procedures, public participation, follow-up, evaluation and monitoring.

3.3.2. Other institutions involved in the Environmental Impact Assessment process

Other institutions which are also involved in the legislative and regulatory framework include:

- The Interministerial Committee on the Environment, created by the Framework Law on Environmental Management which, by virtue of Decree No. 2001/718/PM of September 3, 2001 on its organization and operating role, is presided over by an individual appointed by the Minister for the Environment and includes as members representatives of the 17 Ministerial departments which are: MINATD, MINADER, MINDEF, MINHDU, MINDCAF, MINEPIA, MINEE, MINEPDED, MINFOF, MINMIDT, MINEPAT, MINPMEESA, MINRESI, MINSANTE, MINTOUL, MINT and MINTP.

By virtue of Article 22 of the Framework Law on Environmental Management and Article 2 of the Decree mentioned above, the Committee issues an opinion on all environmental impact assessments, prior to any decision from the relevant Ministry, which can render the decision null and void, a provision which assigns the Committee a key role in the process of evaluating and approving environmental impact assessments.

- The Other Ministerial Departments, each in relation to their own sector, particularly in terms of drafting the specifications documents for the environmental impact assessment.

The procedures for conducting an environmental impact assessment are specified in Decree No. 2005/0577 of February 23, 2005, establishing the methods for conducting ESIA and by MINEP Order of March 8, 2005 defining the various categories of operation which are subject to ESIA.

According to Article 2 of Decree No. 2005/0577 of February 23, 2005, “an environmental impact assessment is a systematic examination with a view to identifying whether a project has any unfavorable impact upon the environment.” Article 3-1 of the same Decree specifies

that “an environmental impact assessment may be summary or detailed and applies to the entire project and not simply a fraction of it.” The Order W 0070/MINEP of April 22, 2005 sets out the various categories of operations which are covered by an EIE.

Decrees dating from 2005 were incomplete and were completed by Order No. 00004/MINEP of July 3, 2007. This Order sets the conditions for engineering consultancies to be approved to conduct environmental impact assessments and audits. With the aim of ensuring that environmental considerations were effectively taken into account in all development initiatives, several legal texts and application Decrees were announced and signed and must be applied under the auspices of the Ministry for the Environment.

3.3.3 The main texts which govern ESIA in Cameroon

3.3.3.1 Framework Law No. 96/12 of August 5, 1996 on Environmental Management

This law sets the general legal framework for environmental management in Cameroon and defines the principles by which the environment and natural resources should be managed. It establishes the EIE as the means of accounting for environmental concerns during project implementation. It states in Article 17 that “the promoter or contracting authority of any development, works, equipment or installation project which risks, due to its size or nature, having an environmental impact, is obliged to conduct, in line with the directions set out in the specifications document, an environmental impact assessment to assess the direct and indirect impacts of the said project on the ecological balance of the region in question, or of any other region, the context and quality of life of local populations, and the impact on the environment in general.” The provisions of the specifications document mentioned here are the terms of reference for the EIE, which must be approved by the Ministry for the Environment prior to the assessment being conducted. Article 18 clearly states that “any impact assessment which does not comply with the provisions of the specifications document is null and void.”

Chapter 1 of the law deals with criminal sanctions. Thus, under the terms of Article 79, “any person who conducts a project which requires an impact assessment or who conducts a project which does not comply with the criteria, norms and measures set out for an impact assessment is liable for a fine of between two million (2,000,000) and five million (5,000,000) XAF and/or imprisonment of six (6) months to two (2) years.” According to Article 96(1), “any decision taken or authorization given under the terms of this law without a prior opinion from the administrative authority responsible for the environment as required by the said law, is null and void.”

3.3.3.2 Decree No. 2005/0577/PM of February 23, 2005 establishing the methods for conducting an EIE

This Decree clarifies the methods for conducting an environmental impact assessment. In four chapters and 24 articles, it specifies, among other things: the content of the EIE, the procedure for drafting and approving impact assessments, the methods for conducting environmental surveillance and monitoring.

Depending on the nature and size of the project, this Decree distinguishes two types of EIE: a Summary EIE and a Detailed EIE. It also specifies, for each category of EIE, the technical and administrative procedures which should be taken to conduct the assessment. Public participation is presented as being an integral part of the process. The two ways in which public participation can be obtained are through public consultations and public meetings. The Decree defining the ways in which an EIE can be conducted prescribes an environmental audit for all functional units which did not have an EIE prior to their creation.

[3.3.3.3 Decree No. 2013/0171/PM of February 14, 2013](#)

This new Decree establishes, among other things, the procedure for conducting assessments, the costs to be paid, and the ways in which public consultations and meetings should be conducted (Articles 11 to 15). It also defines the role of public authorities in the environmental surveillance and monitoring of projects.

[3.3.3.4 Decree No. 2001/718/PM of September 3, 2001](#)

These Decrees define the composition, responsibilities and operating methods of the Interministerial Committee on the Environment (CIE). This Committee assists the Government in drafting, coordinating, executing and controlling national policies on sustainable development. It plays a crucial role in evaluating ESIA by issuing its opinion, which is indispensable for these assessments to be approved.

[3.3.3.5 Decree No. 2008/064 of February 4, 2008 defining the methods for managing the National Environment and Sustainable Development Fund](#)

This Decree defines the methods by which the National Environment and Sustainable Development Fund (FNEDD) should be managed. The FNEDD was created by the framework law on environmental management and falls under the auspices of the Ministry responsible for the environment. It defines the Fund's resources and expenditure, creating a Special Allocation Account for the Environment and Sustainable Development. Financial operations ordered by the MINEPDED are executed by an accounting agent appointed by the Finance Minister. This Decree also creates the Programs Committee, which is responsible for helping the Minister for the Environment to select priority assessments and projects eligible for FNEDD resources.

[3.3.3.6 Order No. 0070/MINEP of April 22, 2005 defining the various categories of operations which are obliged to submit an EIE](#)

In line with Article 6 of Decree No. 2005/0577/PM of February 23, 2005, this Decree defines a list of various operations which are subject to an EIE. This Decree is a checklist to which promoters should refer in order to identify whether a Detailed or a Summary assessment should be carried out for their project, and identifies the elements that both types of assessment are expected to contain. Building upon the Framework Law and the Decree on how to conduct an EIE, this Decree clarifies the content of EIEs and, as such, is the benchmark in terms of the content of assessments.

3.3.3.7 Order No. 00004/MINEP of July 3, 2007 setting the conditions for approving engineering consultancies to conduct environmental impact assessments and audits

This Order sets the conditions which engineering consultancies (engineering advisors, consultants, NGOs) must fulfill to obtain approval to conduct environmental impact assessments and audits from the Ministry for the Environment. It defines the composition of the application to be submitted to obtain approval (Article 5), and specifies that foreign engineering consultancies may only operate in Cameroon as part of an environmentally-related assessment if they are working with an approved national representative (Article 4).

It sets out the conditions which may lead to suspension or withdrawal of approval which has been issued to an engineering consultancy, including poor quality assessments. According to Article 11, EIE assessments and environmental audits can only be received by the Ministry for the Environment if they have been conducted by consultants who are approved under the conditions set out in this Order. As a transitory measure, Article 12 gives ESIA which have already been carried out, or which are already underway (assessments whose terms of reference were approved at July 3, 2007, the date upon which the Order was signed), a timescale of 18 months to be submitted without requiring this approval. After this period, the Ministry for the Environment will only accept assessments which have been conducted by approved engineering consultancies.

3.3.3.8 MINEP Order of February 13, 2007 defining the general content of terms of reference for environmental impact assessments

This Order from the Minister of the Environment and Protection of Nature defines the general content of terms of reference for EIEs.

3.4 Standards

3.4.1 Administrative procedures for conducting an EIE

The presentation of the administrative procedure and approach to conducting an EIE aims to specify the various stages relating to application of Decree No. 2005/0577/PM of February 23, 2005 defining the ways of conducting EIEs. It is addressed to the various stakeholders involved in the impact assessment process, particularly staff from the Ministry of the Environment, project promoters, engineering consultancies, consultants, NGOs and organizations approved to conduct these assessments. This procedure includes seven (7) steps set out below.

3.4.1.1 Submitting the terms of reference and application to the Ministry for the Environment

Using a preliminary selection procedure based on a list of operations which are bound to submit an EIE, all project promoters must identify whether their project is subject to an EIE or not. Promoters of any projects which are bound to conduct an EIE must submit against receipt (indicating the date and application number), in addition to the general project file, the following items to the relevant authority and the Ministry for the Environment:

- a request to conduct an EIE including the company name, share capital, sector of activity and number of jobs anticipated for the project;
- the terms of reference for the planned environmental impact assessment;
- a descriptive and explanatory note highlighting preservation of the environment and the reasons for choosing the site;
- proof of payment for examining the terms of reference with the National Environment and Sustainable Development Fund, set by Article 9 of Decree No. 2005/0577/PM of February 23, 2005.

3.4.1.2 Approving the terms of reference

After receiving the application to conduct an EIE, the relevant authority must send the application, with a reasoned opinion, to the Minister for the Environment within a period of ten (10) days. The authority responsible for the environment rules on the acceptability of the EIE and notifies the promoter no later than twenty (20) days after its receipt.

- either the assessment is receivable unchanged and is published in the press, on the radio, on television or by any other means;
- or the authority responsible for the environment prepares observations with which the promoter must comply to make the assessment receivable.

NB. If the authority does not respond within twenty (20) days, the assessment is considered to be receivable.

3.4.1.3 Conducting public meetings

Public meetings are held when the impact assessment is declared acceptable or when the timescale within which the authority must respond (twenty days) to the admissibility of the EIE has expired.

Public meetings only concern Detailed EIE and are conducted at the project promoter's expense. The promoter is responsible for the costs of advertising and the public authority's participation in the meeting (travel, per diem, expenses). In each reading room opened for this purpose, the promoter must install two registers, one to record the details of participants and one to record any concerns the participants may have.

After the assessment has been ruled as receivable and the public meetings have taken place (in the case of Detailed EIE), the authority responsible for the environment sends the Interministerial Committee on the Environment the receivable applications. These applications include the following items:

- the EIE report which has been judged receivable,
- reports from field missions by the joint MINEP/supervisory authority committee,
- assessment reports and registers from the public consultations and meetings.

3.4.1.4 Approving the study and issuing the Certificate of Environmental Conformity

After receiving the applications which have been ruled to be receivable, the CIE has twenty (20) days to issue its opinion on the EIE. Beyond these twenty (20) days, this opinion is considered to be positive. The Minister for the Environment has twenty (20) days after the CIE opinion to issue a decision on the EIE:

A favorable decision leads to a Certificate of Environmental Conformity

A conditional decision indicates to the promoter the measures which must be taken in order to ensure compliance and to obtain a Certificate of Environmental Conformity. A negative decision leads to implementation of the project being forbidden.

NB. When a project's EIE has been approved but is not implemented within three (3) years from the date of approval, the Certificate of Environmental Conformity which has been issued becomes void.

3.4.1.5 Environmental surveillance and monitoring

Any project bound by an EIE is subject to administrative and technical monitoring by the relevant authorities which focuses on the implementation of the Environmental Management Plan included in the EIE and which is the subject of additional reports. On the basis of these reports, additional corrective measures may be adopted by the authority responsible for the environment after the CIE's opinion, to take into account effects which were not initially identified or which were insufficiently considered in the environmental impact assessment (Articles 18 and 19 of Decree W 2005/0577/PM of February 23, 2005 establishing the methods for conducting EIEs).

NB. In terms of evaluating EIEs and the control, monitoring and follow-up of implementation plans for the proposed measures, the authority responsible for the environment can call upon private expert advice, in line with the methods set out in the regulations on public tenders. This is fundamental, because it enables the authorities to obtain an analysis from experts and specialists when examining assessments conducted in areas which are not always areas in which the CIE members specialize.

3.5 The African Development Bank's Environmental Procedures

In addition to the national regulatory framework, the project is subject to the environmental and social requirements of the African Development Bank, which represents the financial investment institution.

The ADB's main safeguard policies are: summarized in the "ADB's Integrated Safeguards System - Policy Statement and Operational Safeguards" document. They cover:

- (i) the environment through: the environmental protection policy, coupled with the environmental and social evaluation procedures for operations linked to the ADB's public sector, as well as the its Integrated Environmental and Social Impact Assessment Guidance;
- (ii) the Bank Group's Policy on population and strategies for implementation (2002) with the Operational Directives for applying the Bank Group's policy on population;

- (iii) the manual on stakeholder consultation and involvement in ADB's operations (2001);
- (iv) the policy relating to involuntary resettlement, 2003;
- (v) the policy on the integrated management of water resources (April 2000);
- (vi) the Bank's policy on poverty reduction (2004);
- (vii) the gender policy, 2001;
- (viii) policy and directives on cooperation with civil society organizations including the partnership framework agreed with civil society organizations;
- (ix) the ADB Group policy on sharing information and the Bank Group's policy on freedom of information with the provisions of the manual on stakeholder consultation and participation in ADB's operations;
- (x) the ADB Group's strategy on malaria;
- (xi) the Bank Group's strategy for HIV/AIDS (2001).

The ADB has thus adopted an environmental policy, environmental and social assessment procedures and guidelines on environmental assessments. The main objective of this policy is to improve decision making and project results in order to ensure that projects funded by the Bank are ecologically and socially sustainable, in line with its policies and guidelines, which require an environmental and social impact assessment (ESIA), an environmental and social management plan (ESMP) and environmental and social audits as key instruments in order to improve the impact of the project and (in order of priority) to prevent, minimize, reduce or compensate for negative effects.

During the identification phase of the project, a screening exercise will focus on the environmental and social aspects of the project which are subject to funding in order to classify them in one of the following four categories:

- Projects in Category 1 require a complete environmental and social impact assessment (ESIA), including in particular, drafting an Environmental and Social Management Plan (ESMP). These projects are likely to have major and irreversible adverse environmental and/or social impacts or will particularly affect environmental or social components which are judged to be sensitive by the Bank or the lending country. The ESIA enables the positive and negative impacts of the project to be considered, and allows them to be compared with feasible variations (notably the "without the project" scenario) and to re-order all the measures necessary to prevent, minimize, reduce or compensate for negative elements and to optimize the ecological and social aspects of the project;
- Category 2 projects involve drafting an Environmental and Social Management Plan (ESMP). These projects are likely to have lower, site-specific, negative environmental and social impacts than Category 1 projects which are likely to be reduced to a minimum by implementing measures to reduce or integrate design criteria and standards which are internationally recognized.

- Category 3 projects do not require an impact assessment. They do not involve any negative physical intervention and have no negative environmental or social impacts. Apart from the classification of the project, no ESIA is required for this type of project;
- Category 4 projects relate to the Bank's investment of resources through the intervention of financial intermediaries (IF) in sub-projects likely to have negative environmental and/or social impacts. Financial intermediaries include banks, insurance companies and lease companies as well as investment funds which retrocede the Bank's resources to small and medium companies.

According to these categories, the Batchenga - Ntui - Yoko - Tibati - N'gaoundéré construction project would be considered as a Category 1 project. It is important to specify that the ADB requires that populations in the project zone should have access to the conclusions of the ESIA.

In terms of the aspect on involuntary displacement of local populations, and in keeping with the ADB's policies and procedures, the Consultant has drafted a comprehensive resettlement plan (PCR) in line with the relevant directives.

4 DESCRIPTION OF THE INITIAL STATE OF THE ENVIRONMENT

By definition, the term “Environment” refers to a set of elements, circumstances, objects or natural or artificial conditions surrounding a body and/or community and that may exert an influence over it.

Given that the project is taking place in an urban environment, this chapter will cover not only the physical aspects and the resources and ecosystems existing in the area of influence of the project, but also the economic and social conditions within the project zone.

The aim of this chapter is to provide an exhaustive description of the initial state of the environment (zero state or basic state without the project) on the scale of the study perimeter, with a view to identifying the elements that may be affected by the construction work and/or planned activities.

4.1 Demarcation of the study zone

The project's influence will be felt at different levels according to the nature of the impacts considered. The impact zones may be considered as direct or indirect.

4.1.1 Direct impact zone

It is in this section that the interaction between the construction site activities and the environment will be most accentuated during the work.

The direct impact zone extends to:

- the area where the construction site will be installed (site base, staff accommodation site)
- along the RN15 road and detour routes
- the 250 km of rural roads
- the sites occupied and quarries used for the project
- all of the villages identified within the direct influence of route 87 (cf. Appendix 6)
- the scope of the land-use considered for direct impact on the environment is 30 m on each side

4.1.2 Indirect impact zone

The geographical area of the indirect impact zone will extend over:

- the municipal areas of Batchanga, Ntui, Yoko, Tibati, N'aoundal, Martap and N'gaoundéré;
- the departments of Lekie, Mbam and Kim, Djerem and Vina;
- the regions of the Centre and Adamaoua;

- then the regions to the north of Cameroon (Garoua, Maroua, N'gaoundéré) that transport their farm production (onions, peanuts, corn) and cattle to Yaoundé by transiting through Yoko - Tibati;
- the southern region and the areas in the sub-region that receive food products cultivated in these departments.

This zone will be dependent on the project's influence, particularly after the road has been commissioned over a far more considerable distance, with exchanges between Chad and the Central African Republic.

4.2 Description of the relevant environmental components

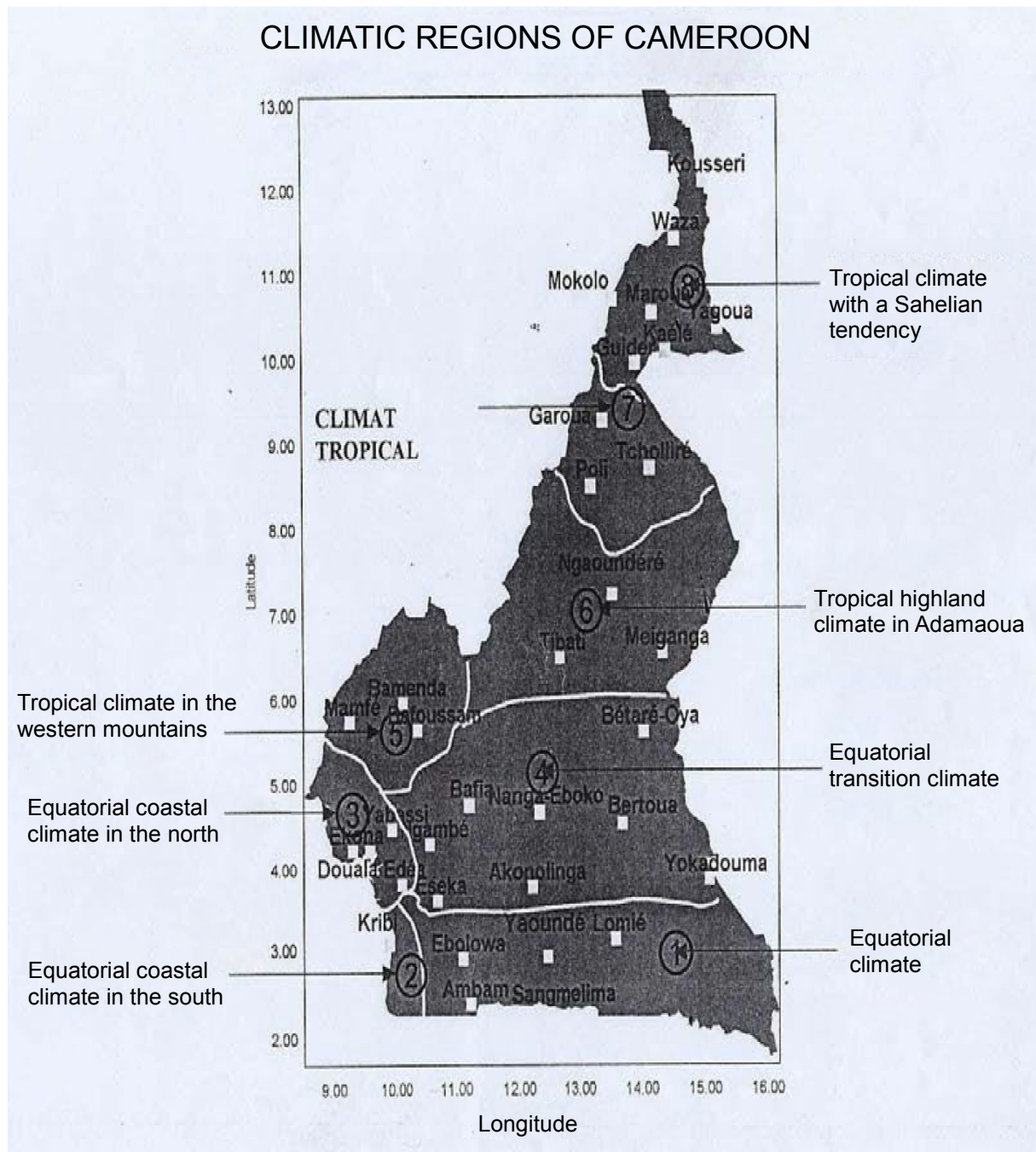
4.2.1 The natural environment

4.2.1.1 The climatic context

Two main general climate zones exist in the area traversed by the road that is the object of this study:

- the equatorial transition climate zone in the Centre (road sections: Batchenga-Ntui-Yoko and part of the Yoko-Tibati section), and
- the high-altitude Sudanese-type tropical climate zone in Adamaoua (sections: Yoko-Tibati-N'gaoundéré).

However, transition between these two zones is not clear-cut and they do not fit exactly within administrative divisions (Figure 6).



Source: INS, 2008

Figure 6: Climatic regions of Cameroon

4.2.1.2 Rainfall and Temperatures

The project zone extends over two regions, the Centre and Adamaoua. The Centre region has rainfall of 1400–1600 mm, falling in 125–175 days over 7 to 9 months. Rainfall in Adamaoua is 1500 mm for 110 to 150 days of rain spread over 7 months (Table 12).

Table 10: Ecological characteristics, physical and rainfall data for the natural environment within the study zone

Agro-ecological zone	Region	Altitude (m)	Number of days of rain per year	Number of months of rain per year	Rainfall (mm)
High Plateau of Adamaoua	Adamaoua	900–1400	110–150	7	1500
Southern plateau of Cameroon	Centre	500–800	125–175	7-9	1400–1600

Source modified according to PAM, 2007: *Comprehensive Food Safety and Vulnerability Analysis (CFSVA)*, Ministry for agriculture and rural development

Travelling from Batchenga towards N'gaoundéré, the annual average rainfall gradually increases from 1500 mm to 1700 mm. In the equatorial zone in the center, rainfall reaches two peaks: in May and in September/October.

The climate in this region has four seasons of unequal intensity and duration. We can thus distinguish:

- a short rainy season (March-June) - this is the season where rainfall is most evenly spread in time;
- a short dry season (July-August) which is more of a diminution of rainfall than a real dry season;
- a long rainy season (September, October and November);
- a long dry season (mid-November, December, January and February).
- The average annual temperature is 24°C with relatively small temperature differences.

The climate in Adamaoua has two seasons:

- a dry season
- a wet season.

The dry season lasts from November to April while the rainy season runs from May to October. As a general rule, average rainfall in the region is around 1700 mm per year, decreasing more towards the north. It is during August that there is a peak in rainfall, with the months of May and June usually rainy. Temperatures fall from November to January, reflecting winter conditions. Temperatures rise starting from January and reach a peak in April. The rains in May and June once more cause the temperature to fall.

Average temperatures are from 22 to 25°C and do not vary much from north to south. The hottest months are February, March or April, with maximum temperatures of over 24-25°C. The coolest months are in July, August or September, with minimum temperatures of around 21-22°C. The monthly temperatures per location are given in the table below:

Table 11: Average monthly temperatures in the project zone

Average T (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Yaoundé	25.2	26.1	25.9	25.1	25.0	24.3	23.5	23.7	23.5	23.8	24.3	24.6	24.6
Nanga Eboko	24.9	26.2	26.7	25.9	25.0	24.5	23.7	23.7	24.2	23.9	24.7	24.7	24.9
Yoko	24.2	25.5	24.7	23.8	22.9	22.2	21.6	21.5	21.9	22.1	23.2	23.5	23.1
Tibati	23.6	25.1	26.2	25.5	24.4	23.2	22.9	23.1	23.1	23.4	23.8	23.5	24.0
N'gaoundéré	20.4	22.2	24.4	24.6	23.4	22.5	21.8	21.9	22.1	22.4	21.2	20.2	22.3

Source: Hydrology Report, STUDI International 2012

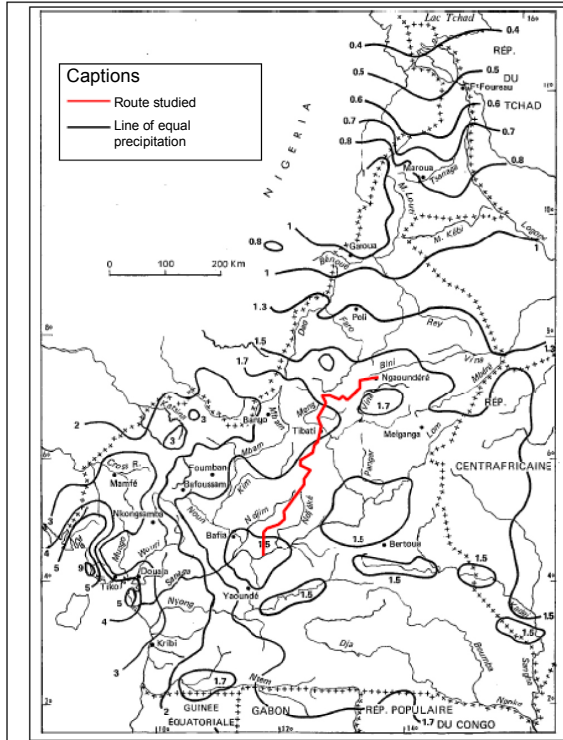


Figure 7: Precipitation along the road axis

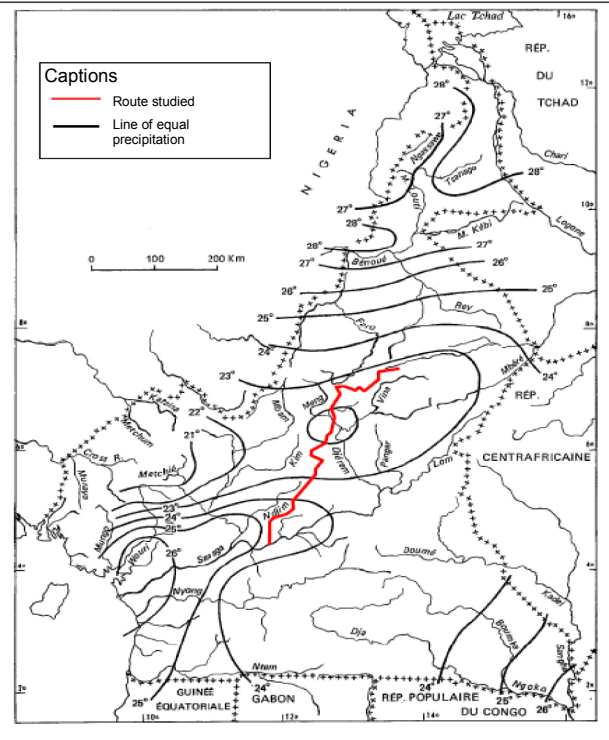


Figure 8: Temperatures along the road axis

4.2.1.3 Air humidity

The air humidity is from 65 to 80% on average. It is variable and gradually increases in the north-south direction. The most humid months are July and August with humidity at 80%, close to saturation point. The driest months are January and February, with an average humidity that does not exceed 45% in the north and is 75% lower on the southern part of the road. The table below shows relative humidity by location:

Table 12: Air humidity: monthly averages in the project zone

Average H (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Yaoundé	73	70	73	77	78	81	82	80	81	81	79	82	78
Nanga Eboko	—	—	—	—	—	—	—	—	—	—	—	—	—
Yoko	56	47	66	76	82	85	86	86	85	82	72	62	74
Tibati	45	44	56	71	76	80	80	81	79	74	64	52	67
N'gaoundéré	45	40	49	68	76	79	80	80	78	75	64	53	66

Source: Hydrology Report, STUDI International 2012

4.2.1.4 Annual and monthly average rainfall

The table below shows the annual rainfall characteristics for the different locations:

Table 13: Annual rainfall

Location	Yaoundé	Nanga Eboko	Yoko	Tibati	Ngaoundéré
average	1483.0	1421.0	1514.1	1727.7	1469.3
maximum	1991.1	2027.8	1859.6	2161.5	1954.8
mean	1494.3	1458.6	1463.5	1724.4	1499.0
minimum	614.3	767.7	1176.5	1182.6	1151.1
standard deviation	295.1	301.8	197.8	222.4	164.1
variation coefficient	0.20	0.21	0.13	0.13	0.11
max/min variability coefficient	3.24	2.64	1.58	1.83	1.70
ave/mean dispersion coefficient	0.99	0.97	1.03	1.00	0.98

Source: Hydrology Report, STUDI International 2012

From one end of the road to the other, the annual rainfall varies between 1727.7 mm in Tibati and 1421.0 mm in Nanga Eboko. Annual rainfall is quite variable and exceeds the average in certain years.

The monthly breakdown of rainfall is as follows:

Table 14: Monthly rainfall

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Yaoundé	19.1	48.2	133.6	170.0	188.7	155.6	75.0	106.5	210.8	257.4	98.1	20.0
Nanga Eboko	18.8	21.3	78.9	143.2	208.3	128.0	96.4	139.7	212.9	269.7	95.5	8.4
Yoko	2.7	0.8	62.3	101.3	168.8	148.8	195.0	229.1	282.3	257.1	48.7	7.1
Tibati	0.9	7.3	47.9	125.1	186.6	231.4	275.1	295.6	293.8	225.7	34.3	4.0
N'gaoundéré	0.1	1.5	33.7	46.0	200.4	205.3	253.1	276.3	20.1	123.7	8.2	1.0

Source: Hydrology Report, STUDI International 2012

It is therefore possible to deduce that:

- In the north (Tibati and Ngaoundéré): The rainy season is concentrated between July and October;
- In the south (Yaoundé and Nanga Eboko): There are two rainy seasons concentrated on peaks, May (March to June) and October (August to November);
- Yoko marks the north-south transition (an intermediate location between one and another rainy season).

According to the available data, it does not seem that there are any particular climate risks in the project zone.

4.2.2 Physical context

4.2.2.1 Geology

The 594 km-long study zone has three main groups of geological formation:

- The pre-Cambrian rocks consisting mainly of granite and migmatites

- The metamorphic rocks, different from the pre-Cambrian
- The volcanic rocks (basalt), from Cretacian to tertiary and even quaternary

The largest part of Cameroon is occupied by pre-Cambrian rocks that are subdivided into three groups (see Figure below):

- The basic complex (early pre-Cambrian) consisting of ectinites, migmatities, granites
- The mid pre-Cambrian consisting of moderately metamorphic rocks (schists and quartzites: Lom, Poli and Ayos series);
- The late pre-Cambrian to which are attributed the quartz schists, dolerites, etc. (Mbalmayo-Bengbis, Dja, Mangbei series etc.). No other rock is known between the pre-Cambrian and the cretaceous: there is a hiatus.

The cretaceous rock is known in the south (Douala basin) and in the north where it represents the maximum advance of the transgression from Benoué. The marine sediments, not existing in great quantity, are overlaid by sandstone of fluvial origin in considerable thickness.

For the tertiary rock, the marine sediments cover the cretaceous rock of Douala. At the end of this era, the Chad valley adopted its current contours and filled with sediments. The volcanism that began in the cretaceous era continued (Mungo, Adamaoua).

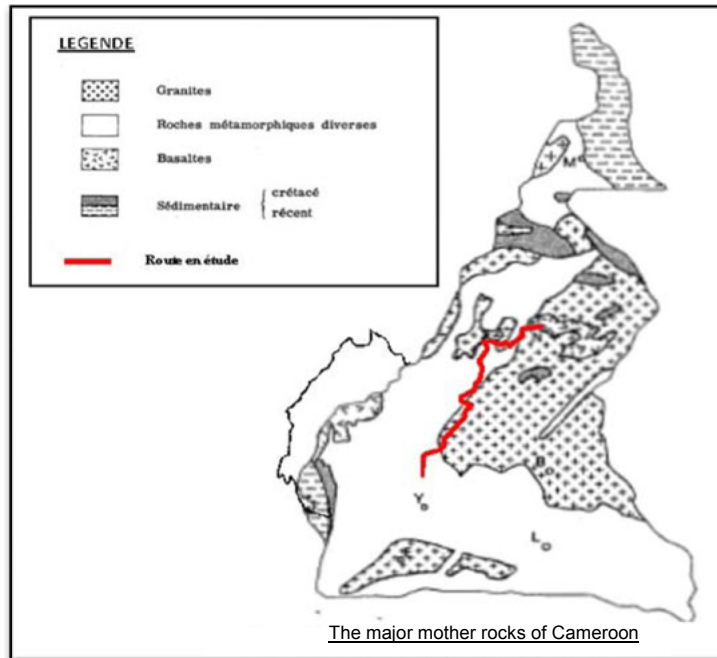
In the quaternary era, the deposits in the Chad valley continued with the volcanism reappearing in the west and in Adamaoua.

The succession of different volcanic phases was studied by B. GEZE who distinguished three parts:

- The lower black series made up of basalts and andesites dating back to the cretaceous era. They are profoundly altered and carry soils that are often rich in ferrous hydroxide and aluminium, in the west and also in Adamaoua.
- The middle white series consists of acid rocks (rhyolites, phonolites, trachytes) whose age is neogenous. Their alteration is less significant than that of the basic underlying rocks (and of the rock above it).
- The upper black series is again composed of basalt, from the quaternary to the present era.

With the exception of recent series, the volcanic rocks are generally profoundly altered. Depending on local conditions, current and past, this alteration has led to the formation of more or less thick soils that in which concentrations of ferrous oxide, manganese and aluminium (and bauxite from Adamaoua to Minim-Martap) can be found.

The formation of the bowl-shaped Chad valley, that began in the tertiary era, is the major geological event in northern Cameroon.



Source: Soil and water investigation, 2010

Figure 9: Geology along the axis of road

4.2.2.2 Geomorphology and relief

The major geomorphological characteristic of Cameroon, that is valid for the part of the territory traversed by the road studied here is the existence of vast surfaces of flat land whose altitude is regular over considerable distances, reminiscent of the steps of a staircase. Transit from one to the other is sometimes abrupt and sometimes gradual. This organization may be interrupted by the localized accumulation of volcanic deposits that are significant in the west of the country and also in Adamaoua. This step-like arrangement is remarkable in the longitudinal profile of the water courses (Figure 9).

The main geomorphological elements in Cameroon are as follows:

- Gondwana surface
- Post-Gondwana surface
- African surface I
- African surface II
- Sub-current surface
- Intermediate reliefs
- Volcanic accumulations
- Alluvial accumulations

Three of these geomorphological elements are traversed by the road that is the subject of this study and we will concentrate on these:

- the African I surface in the south

- the Post-Gondwana surface
- the Gondwana surface

The Gondwana surface corresponds to a major part of Adamaoua and the Bamiléké and Bamoun plateaux. Its altitude is around **1000-1200 m** (measured at the level of the crystallophyllian bedrock). The flattened land as we can see it does not appear excellent as far as we can see. The rock alteration is very profound and of a ferralytic type. This surface has been covered by layers of basalt lava over considerable expanses, bringing the local altitude of Adamaoua to **1200-1300 m**. This basalt, dating back to the cretaceous era, is profoundly altered and is covered by a bauxite encrustation justifying its mining exploitation (MINIM and MARTRAP). Detritic sediments, also from the cretaceous period, are also known on this plateau in the depressed areas.

At the beginning of the quaternary era, new eruptions gave birth to easily visible appareils in the south-east of N'gaoundéré and the Bamoun area. The hydrographic network is sometimes seriously disturbed by this.

The main rivers are quite deeply embedded in the north-east and east of the Adamaoua plateau, that is attached by the banks in both the north (Mbéré, Vina, Faro) and the south (Djerem).

The post-Gondwana surface extends in Adamaoua from Yoko to Bétaré Oya and continues towards Bouar in the Central African Republic. Its altitude, taken at the bedrock level, is **800** to **1000** m. Transition with the Gondwana surface is very clear in the north of Tibati and in the Ngaoundal area. Towards the south, the transition to the lower surface is very abrupt towards Yoko and Linté. It is visible but less accentuated between Bétaré Oya and Bertoua. This surface is crisscrossed by a number of deeply embedded rivers. The ferralitisation process is fairly intense. Concretion is significant there while ferruginous pisolites, which may have been more significant in the past, are currently limited to low plateaux. This plateau is attacked on all sides by deeply embedded rivers (embankments several hundred meters high) that separated a number of isolated rocky outcrops now in the surrounding plain but whose altitude is more or less the same. Two levels can be distinguished on this plateau. The highest shows signs of an ancient pedogenesis (small pisolite zones and ancient ferralitic soils) while the lower level now only reveals soils only slightly evolved and hydromorphous.

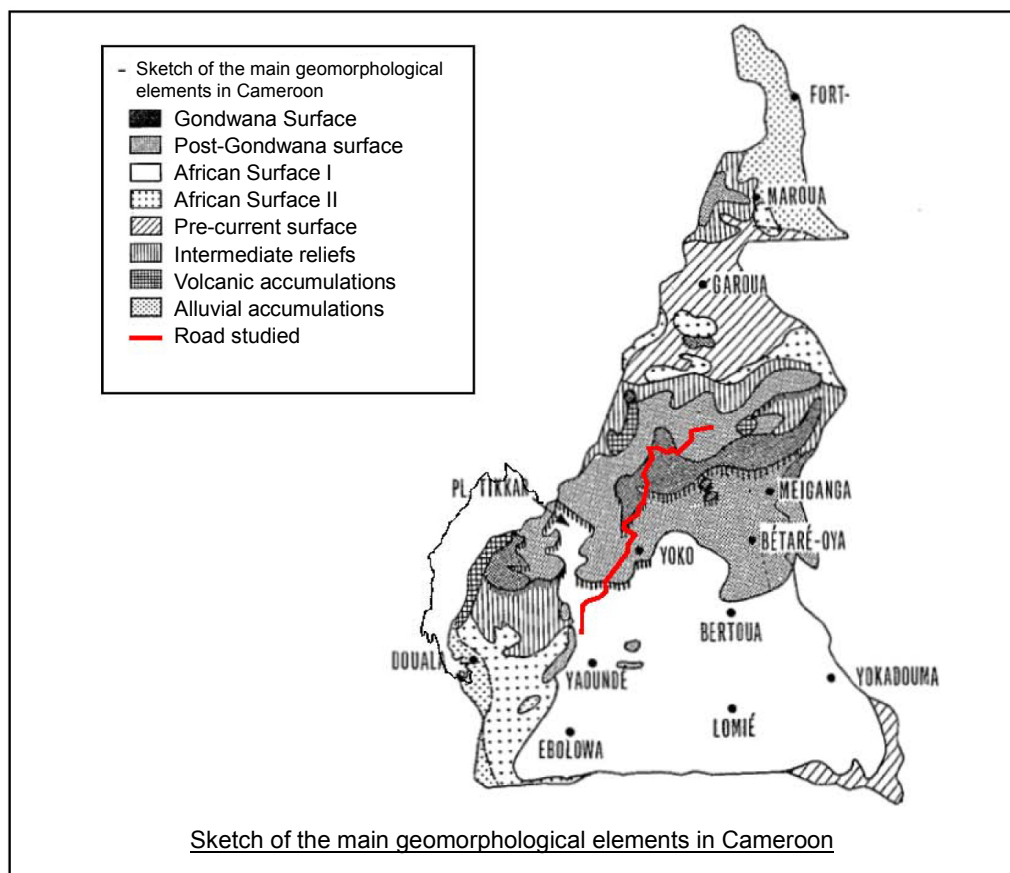
The African Surface I concerns the whole of South Cameroon. It extends into the Central African Republic and Gabon where it preserves almost the same features. Its altitude varies little throughout this extent: **600** to **800** meters, most often coming close to 700 m. Residues of previous surfaces can be observed there, although less frequently. The transition of this surface to the next is generally gradual. The rivers are not deeply embedded but due to the high and evenly spread rainfall, the number of small water sources is greater, breaking up the land into small surface hills where there still remain some horizontal parts nevertheless. The catchment areas are most often convex on their upper parts and concave on the lower part (the shape of half an orange). The soils are deep ferralitic. The pisolites only play an important role in the eastern part of the country. This surface has been subjected to curvatures that have perturbed the hydrographic networks, in particular those where the Sanaga captures the tributaries of the Nyong.

The volcanic accumulations: The volcanic manifestations are numerous in the Adamaoua where three sets of manifestations that succeeded one another in time can be distinguished. These volcanic manifestations will locally disturb organization in steps.

In the center where the first half of the road studied here is located, there is no manifestation of volcanic activity.

To summarize, the morphology of the part of the land traversed by the project studied here is presented in the form of two successive steps, the lowest of which is covered by the first half of the road (Batchenga-Yoko), the “counter-step”(transition between one step and the other) being particularly abrupt close to Yoko and Linté while towards Bétaré-Oya the transition from one step to the other is gradual. In this part, the variations in altitude are small, connected to the existence of half-orange hills. The average altitude is around 700 m above sea level. The other step is traversed by the second half of the road that is the subject of this study. This is the Adamaoua plateau that rises to 1100 m of altitude on average. The surface is far from being perfectly flat here. The basalt mantle here has caused variations in altitude of between 800 and 1400 m.

In certain zones, particularly in the Adamaoua, the torrents formed during the rains to drain runoff water become quite significant, carving very deep U-shaped trenches in the soil. Continuation of this phenomenon ends by causing landslides that even threaten the integrity of the road.



Source: Soil and water investigation, 2010

Figure 10: Main geomorphological elements

4.2.2.3 Pedology

In Cameroon, the ferralitic soils correspond to the lower two thirds of the country. Whatever its altitude or the detail of climate conditions, ferralitization is the dominant process. In the East, and in Adamaoua, pisolites cover the landscape. In certain areas, all of the particular characteristics of ferralitization are not present and there are also weakly ferralitic soils. In various sectors in the West and Center, the young age of the soils (derived from recent materials) causes them to be classified in the class of little developed soils or in that of mull soils. In some flooded valleys and plains, hydromorphous soils develop. The edge of Adamaoua's northern plateau constitutes a very precise pedological limit, marking the end of the ferralitic soils. The tropical ferruginous soils begin at the foot of the cliff.

From Batchenga to N'Gaoundéré

- Typical red ferralitic soils can be observed on acid rocks in the Ntui-Nguila zone, up to the environs of Yoko and south of Tibati where these typically red ferralitic soils alternate with typical yellowish-brown ferralitic soils on different rocks. We thus observed red or yellow clays with lateritic gravelly soils here and there and traces of pisolite relatively scarce.
- To the south of Yoko, the platform of our road traverses an area of sesquioxide soils (red ferralitic soils) just before the typical yellowish-brown ferralitic soils.
- From the south of Yoko to Tibati, as already mentioned above, the typical yellowish-brown ferralitic soils on different rocks (villages Ngoum 2 and Lena, villages Mba'am and Douma, villages Mbitom and Mendjaba) alternate with typical red ferralitic soils (Yoko-center and its environs, and the villages of Doume, Sangbe and Mpang). This is reflected in the alternation of red and yellow clays that we observed along the length of the road in this area.
- From Tibati to N'gaoundéré, we have typical red ferralitic soils on basic rocks (Tibati-center, N'gaoundéré) that alternate with yellowish-brown or red ferruginous sesquioxide soils (Doualayel).
- In the vicinity of the village Louga (between Martap and N'gaoundéré), we have a transition of hardened ferralitic soils on various rocks.
- In the Minim-Martap zone, the road traverses non climate eroded raw mineral soils on ancient aluminous pisolites. We have thus observed yellow clays in this part of the road.
- In badly drained areas, we observe hydromorphous soils developed in favor of the permanent water saturation of the soils. These are low-lying marshy areas.

4.2.2.4 Water resources

The project begins with one of the country's major rivers, the SANAGA, in Batchenga. This zone basically includes the river Sanaga and its tributaries as well as certain minor coastal catchments (Wouri, Cross) to the west. The river Sanaga and its tributaries constitute a significant hydrographic network through their volume that can reach close to 6,000 m³/s depending on the season. The Sanaga collects water from the southern Adamaoua and the central plateau through the Djerem, Meng, Vina and Lom Grossi of Pangar; from the west, it collects water from the Mbam and its tributaries, the Noun and the Kim.

The road then runs over a number of water courses of varying size, from streams to great rivers. These water courses are far more frequent from Batchenga to Yoko. Beyond Yoko and up to N'gaoundéré, there are fewer water courses. The Adamaoua plateau is the water tower of Cameroon. It gives rise to a number of water courses that feed into three of the four catchments of the country's hydrographic network. These are:

- from the Djerem that flows into the Sanaga with its tributaries, the Lom and the Mbam, that flow southwards;
- from the Vina and Mbéré that flow east;
- the Vina and Mde la Bénoué and their tributaries; the Faro and the Déo that flow northwards before joining the Niger.

The project zone is crossed by several water courses which are described in the following three sections:

- **Section 1: Batchenga - Yoko**

The first section is traversed by 58 water courses with catchments varying from 0.4 to 80 km².

The most important water courses traversing this section are the rivers Meloko, Méloké, Messété, Guervom, Ndoundé, Météké, Mengoing, Toumnan, Mengamoum, Metshion, Foufoing, Mavoune, Ndo, Météré and Djiou.

The river Metshion located downstream from the crossings of the rivers Métarlé and Mengamouin constitutes a source of flooding for the lower areas of the existing road.

- **Section 2: Yoko - Tibati**

The main water courses crossing the road are:

The river Mékay and its two tributaries in the Sangbé area

The river Lou at around 5 km from Sola Bitom

The river Mékay at Medjenba.

At the entrance to the city of Tibati, there is a 10-meter-long bridge (with a wooden deck). This bridge is located at the point where the river Tomi flows in to the barrage reservoir of Mbakaou.

- **Section 3: Tibati - N'gaoundéré**

This section can be divided into two branches, the first between Tibati and Tekel and the second from Tekel to the end of the road.

Branch 1: Tibati - Tekel

The first branch is traversed by several water courses flowing into the barrage reservoir of Mbakaou.

Branch 2: Tekel - N'gaoundéré

This branch is only traversed by a river at the entry to the city of N'gaoundéré and three small water courses.

According to the data collected, there is no specific description of the characteristics of each river encountered.

4.2.3 Biological context

The Batchenga-Ntui-Yoko-Tibati-N'gaoundéré road extends over two overall climate zones:

- the equatorial zone and
- the tropical zone.

The vegetation of these two major climate zones is:

1. Forest up to north of Yoko (between Yoko and Tibati)
2. Savannah grasslands from Tibati to N'gaoundéré

In the first forest zone, this is mainly secondary forest deriving from a humid dense forest (primary forest) due to the anthropic actions of Man such as brush fires and the creation of agricultural areas, in particular cocoa, banana and plantain crops in the first half of the study zone and exploitation of forest essences, etc. resulting in a clear decrease in vegetation. Moreover, this secondary forest does not present a continuous occupation of the space. It is occasionally punctuated by islands of either primary forest (relics of the original vegetation) or by savannah.

Beyond the city of Yoko, we enter a zone of contact between the humid equatorial forest and the savannah in the center of Cameroon, made up of dense forest, wooded savannah and grassy savannah. We are therefore witnessing an irregular alternation of wooded and shrubbed savannah depending on the micro-climates, geomorphology and the action of Man at local level. However, the wooded savannah is found more towards the southern part of the branch (Yoko-Tibati) while the shrubbed savannah is more in the northern area (Tibati-N'gaoundéré). Islands of secondary forest are found in some places, particularly along water courses (gallery forests) or simply in places presenting special characteristics.

In Batchenga, on the island in particular, a number of species such as monitor lizards, small monkeys, palm rats (*Euxerus erythropus*), mongoose, blue duikers and *Cob defassa*. Among the small mammals commonly observed, there are: greater cane rats (*Thryonomys swinderianus*), porcupines, squirrels, Gambia rats, African brush-tailed porcupines and various reptiles (cobras, monitor lizards, pythons).

According to the bibliography, from Yoko to N'gaoundéré, the zone is very rich in savannah-type fauna, particularly around the National Park (PNDP, 2011) and after Tibati where the Muslim populations do not hunt much, the fauna is very abundant.

It is diversified and consists of small and large animals, birds and reptiles. The major animal groups found here are presented below (Table 15) (see Appendix 10 for the full list of protected species).

Table 15: Fauna

Name of species	Scientific name	Name of species	Scientific name
Savannah elephant (entirely protected)	Loxodonta africana	Green parakeet	Poicephalus senegalus
Buffalo (partially protected)	Syncerus caffer	Red-tailed grey parakeet (entirely protected)	Psittacus erithacus
Bongo (partially protected)	Boocercus curyceros	Eurasian sparrowhawk	Accipiter nisus
Hippopotamus (entirely protected)	Hippopotamus amphibius	Secretarybird	Sagittarius serpentarius
Yellow-backed duiker (entirely protected)	Cephalophus silvicultor	Peter's duiker	Cephalophus c. callipygus
Blue duiker	Cephalophus monticola	Partridge	Francolinus sp.
Black-fronted duiker	Cephalophus n. Nigrifrons	Wild boar	Sus scrofa
Bush pig	Potamochoerus porcus	Goose	Anser domesticus
Marshbuck	Tragelaphus spekel	Wood pigeon	Columba palumbus
Giant forest hog (partially protected)	Hylochoerus	Vulture	Gyps fulvus
Baboon	Papio spp.	Hare	Lepus spp.
Doguera baboon		Squirrel	Myosciurus
Giant pangolin (entirely protected)	Manis gigantea	Gambia rat	Cricetomys gambianus
Short pangolin	Manis spp.	Antelope	Antilopinae
Guereza	Colobus guereza	Red deer	Cervus elaphus
Hyena	Hyaenidae family	Nile monitor	Varanus nilotica
Dolman		Chameleon	Chamaeleo chamaeleon
Wild cat	Felis silvestris griseola	Python (partially protected)	Python regius
Monkey	Cercopithecus	Corn snake	Elaphe guttata guttata
Water chevrotain	Hyemoschus aquaticus	Viper	Bitis gabonica
Greater spot-nosed monkey	Cercopithecus nictitans	Tortoise (partially protected)	Kinixys spp.
Chimpanzee	Pan troglodytes ssp. ellioti	Boa	Boa constrictor
Common warthog	Phacochoerus africanus	Southern ground hornbill	Bucorvus leadbeateri
Red-flanked duiker (partially protected)	c. callipygus c. dorsalis	Pheasant	Phasianides
Bush buck	Tragelaphus scriptus ornatus	Kingfisher	Alcedo atthis
Potto (entirely protected)	Perodicticus potto	Duck	Aythya affinis
Yellow mongoose	Gynictispenicillate	Red-front gazelle	Gazella rufifrons
African brush-tailed porcupine		Porcupine	Hystrix spp.

Apart from the observations made, the bibliographical research showed some remarkable aspects concerning the fauna:

- Large mammals

With regard to the large mammals, two specific groups present in the zone are particularly important due to the strategies developed by the country and the action plans for their preservation. These are the elephants and the chimpanzees of Nigeria and Cameroon.

The elephant

*Since 1989, the elephant *Loxodonta africana* has been included in the CITES "red list" for Cameroon.*

Among land mammals, the elephant is one of the species that moves around the most and has a relatively wide domain. Its individual or seasonal movements may be due to different causes: search for food, water of mineral salts, poaching, disturbance of habitat, human pressure, etc. One of the direct and major consequences of these movements is the aggravation of the man-elephant conflict.

An exploration carried out in 2006 by the National Park of Mbam and Djerem showed signs of elephant present in the center and south of the National Park. This means that this zone is considered to be confirmed while the rest of the National Park is considered to be unlikely. This area extends towards the south-east of the National Park (in Blanc et al., 2007). The local populations report the movement of herds of elephant outside the Park, particularly in the zone between Nangboko and Yoko.

The elephant population in the National Park was estimated, in 2009, at 907 individuals¹. There are also certain clues signaling the presence of elephant in Mpem and Djim.

The zone is not monitored within the framework of the MIKE program. According to the censuses and the spread of populations indicated based on estimates for different years, through the African Elephant Database (BDEA/Group of specialists on the African elephant (CSEAF) from the IUCN Commission for Protection of Species, there are no demographic indications on the center of Cameroon other than for the National Park. There are no indications on the migration corridors either.

In passing, we note that the zone may form part of the ivory contraband itineraries, from the Central African Republic towards Douala (cf. map of itineraries of illegal ivory trafficking, GRID-Arendal (2012)).

Cameroon has set in place a 10-year strategy (2011-2020) and a sustainable elephant management program that is consistent with and attached to the Regional Strategy for the Preservation of Elephants in Central Africa (MINFOF, 2011). The threats to the elephant populations and that hinder the sustainable management of the species are connected and may act either directly (poaching, fragmentation of habitat) or indirectly (institutional failings). The sustainable elephant management strategy in Cameroon is aimed at reducing these threats and constraints, through obtaining the following results:

- Reduction of poaching
- Reduction of Man-Elephant conflict
- Improvement of habitat
- Collection of reliable data for sustainable management of the elephants
- Reinforcement and application of the law
- Enhancement of the elephant's status
- Reinforcement of institutional capacities
- Reinforcement of sub-regional cooperation in elephant management

Precautions must therefore be taken when considering this species in the zone of the road adjacent to the National Park of Mbam and Djerem as well as to the south of the Park.

¹

http://www.elephantdatabase.org/preview_report/2013_africa/Loxodonta_africana/2012/Africa/Central Africa/Cameroon

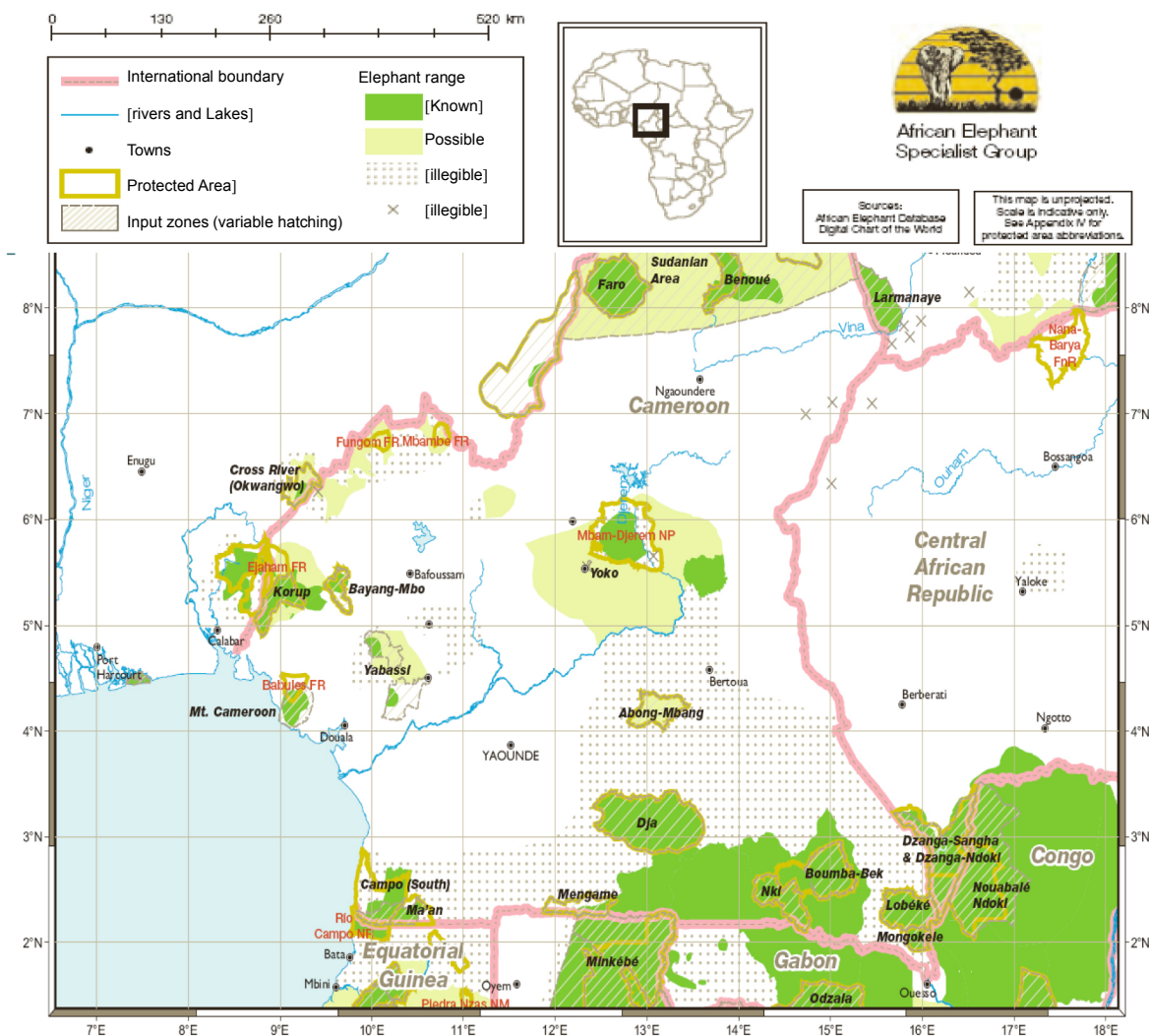


Figure 12: Area showing distribution of elephants in the center and south of Cameroon
 (in Blanc et al., 2007)

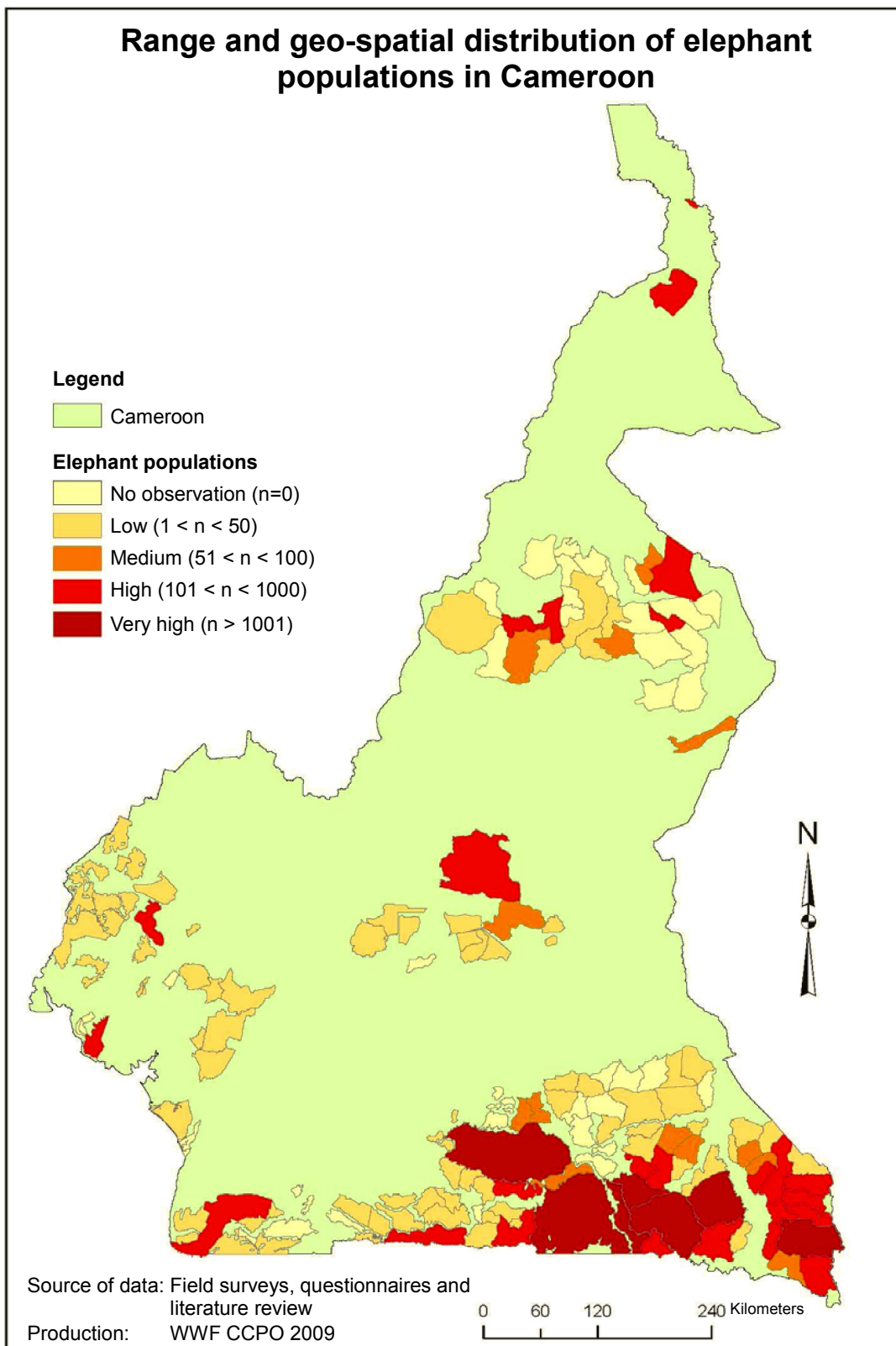


Figure 13: Spatial distribution of elephants

The chimpanzees of Nigeria and Cameroon (according to Morgan, B.J. et al., 2011)

(Pan troglodytes ellioti)

According to the regional action plan (signed by MINFOF in Cameroon and the Ministry for the Environment in Nigeria), the sub-species of the chimpanzee of Nigeria and Cameroon is today the most under threat of all known sub-species of chimpanzees. There are only from 3,500 to 9,000 individuals surviving in a forest habitat to the north of the Sanaga river in Cameroon, on the eastern border of Nigeria and in forest fragments of the Niger Delta and in the south-west of Nigeria.

The area of distribution of the Nigeria-Cameroon chimpanzees corresponds to a biodiversity hot spot of worldwide importance where there are other primates under threat and with restricted distribution. By highlighting the chimpanzee as a "flagship species," most of the biodiversity remaining in these regions can also be preserved.

In Cameroon, the healthiest chimpanzee populations are without doubt in the National Park of Mbam & Djerem, the planned National Park of Ebo and in the Animal Sanctuary of Banyang Mbo. Mbam and Djerem is a mosaic of forest and savannah sheltering in its central part at least 500 chimpanzees (Maisels et al., 2009).

The distribution area of the Nigeria-Cameroon chimpanzee coincides with a region with a dense human population where destruction and fragmentation of the habitat have been considerable in addition to a failure to apply the laws on hunting. Consequently, this chimpanzee has now disappeared from a large part of its former area of distribution.

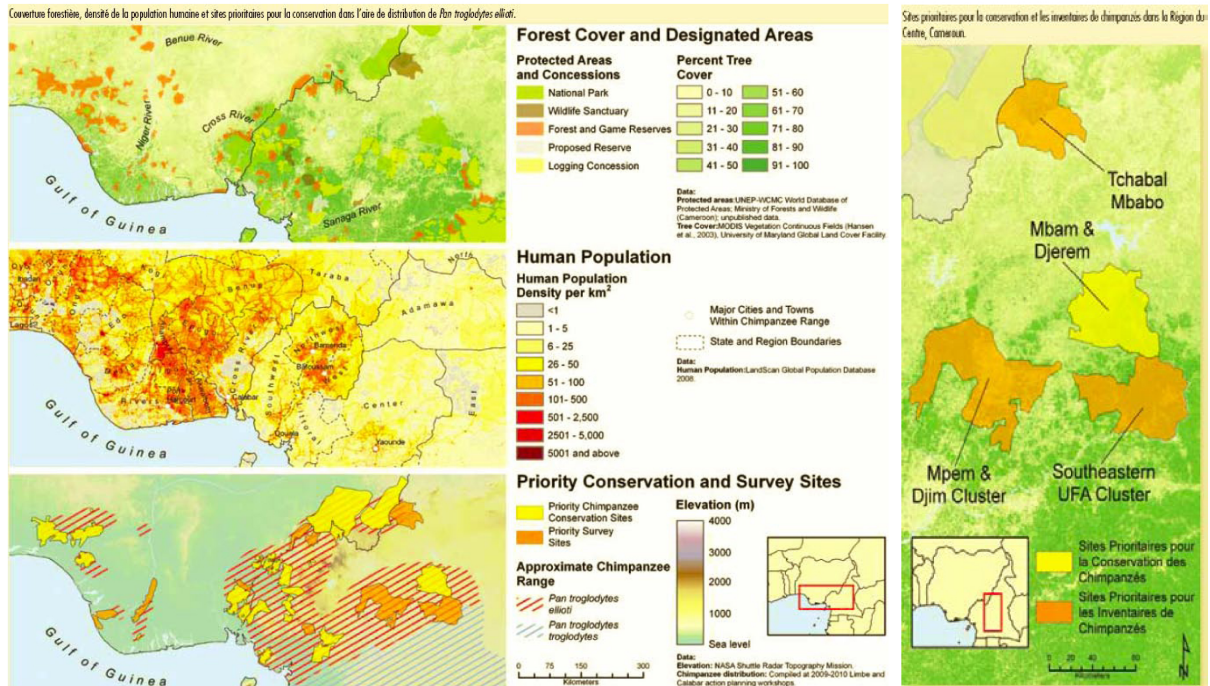
The main threats to survival of wild chimpanzee populations are therefore the conversion and disappearance of their habitat and hunting. These threats are exacerbated by the continuing demographic growth in the area of distribution of *P. t. ellioti* and by the development of the Cameroon and Nigerian economies.

For the Nigeria-Cameroon chimpanzee, re-established as a distinct sub-species during the last decade, conservation measures need to be set in place rapidly to ensure that the viable populations survive.

The action plan identifies the priority chimpanzee populations in Nigeria and Cameroon that should benefit urgently from conservation measures, formulating in detail the priority action, recommending potential partners to carry out these actions and proposing the necessary budgets. The measures identified for the National Park of Mbam and Djerem within this context are as follows:

- *Engaging the industrial sector to attenuate the effects of planned barrages and bauxite mines*
- *Amplifying and adapting the current biological monitoring program to evaluate new problems like the planned barrage and bauxite mine*
- *Reinforcing the protective infrastructures by setting up new guard posts, improving patrols and recruiting more MINFOF officers and ecology guards*
- *Reinforcing the community awareness-raising programs, in particular for aspects such as fire management, environmental education, consultative committees for the park and the resources for sustainable subsistence*
- *Developing a research station with permanent staff at Ganga as indicated in the Park's management plan*

Morgan, B.J. et al. 2011. *Plan d'action régional pour la conservation du chimpanzé du Nigeria-Cameroun (Pan troglodytes ellioti)*. Groupe de spécialistes des primates de la CSE/UICN et Zoological Society of San Diego, CA, USA.



- **Birds**

The bird population is rich in over 187 species belonging to 42 families. It should be noted that none of these species is endemic to the area of the project. Although 32 migrating species can be counted among this number, the Sanaga at Nachtigal is not a particular corridor for bird migration.

- **Fish**

Of the 136 strictly freshwater species reported in the Sanaga (MNH 2006, Stiassny et al., 2007), 26 contribute significantly to the fishing industry. Among these are mainly members of the families of Cyprinidae, Alestiidae, Cichlidae, Clariidae, Mormyridae, Mochokidae and Claroteidae. These fish will not only be affected during the construction work on the barrage but also run the relatively high risk of disappearing from the zone in question. The type of feeding and reproduction will be the two key elements that will determine whether these species prosper after construction of the barrage and which of them are likely to decrease in number.

A summary of the scientific literature available on the biology of fish families represented in the Sanaga catchment area is given in detail in Appendix 1 and summarized in Table 16. The accent has been placed on the two most important characteristics from an ecological standpoint: food and reproduction.

Table 16: List of the freshwater fishes in the basin of the Sanaga River

(Thys van den Audenaerde 1972, de Vos and Lévêque 1983, de Vos 1984, Van den Bergh et al., 1995, Van den Bergh and Teugels, 1998, MNHN 2006, Stiassny et al. 2007). The endemic species are indicated with an asterisk (*). The species introduced are indicated by an "I."

Family	Species	Family	Species
Alestiidae	<i>Alestes macrophthalmus</i>	Cyprinidae	<i>Labeo batesii</i>
Alestiidae	<i>Brycinus kingsleyae</i>	Cyprinidae	<i>Labeo nunensis*</i>
Alestiidae	<i>Brycinus longipinnis</i>	Cyprinidae	<i>Labeo sanagaensis*</i>
Alestiidae	<i>Brycinus macrolepidotus</i>	Cyprinidae	<i>Labeobarbus batesii</i>
Alestiidae	<i>Bryconaethiops microstoma</i>	Cyprinidae	<i>Labeobarbus brevispinis</i>
Alestiidae	<i>Hydrocynus forskalii</i>	Cyprinidae	<i>Labeobarbus habereri</i>
Alestiidae	<i>Micralestes acutidens</i>	Cyprinidae	<i>Labeobarbus mbami*</i>
Alestiidae	<i>Phenacogrammus major</i>	Cyprinidae	<i>Labeobarbus micronema</i>
Amphiliidae	<i>Amphilius longirostris</i>	Cyprinidae	<i>Labeobarbus progenys</i>
Amphiliidae	<i>Doumea (Sanaga)*</i>	Cyprinidae	<i>Labeobarbus versluysii</i>
Amphiliidae	<i>Phractura longicauda</i>	Cyprinidae	<i>Leptocypris crossensis</i>
Amphiliidae	<i>Ctenopoma gabonense</i>	Cyprinidae	<i>Opsaridium ubangensis</i>
Amphiliidae	<i>"Ctenopoma" kingsleyae</i>	Cyprinidae	<i>Prolabeops melanhypopterus*</i>
Amphiliidae	<i>Ctenopoma maculatum</i>	Cyprinidae	<i>Raimas senegalensis</i>
Amphiliidae	<i>Microctenopoma nanum</i>	Cyprinidae	<i>Sanagia velifera</i>
Aplocheilidae	<i>Aphyosemion bamilekoraum*</i>	Cyprinidae	<i>Varicorhinus fimbriatus*</i>
Aplocheilidae	<i>Aphyosemion bualanum</i>	Cyprinidae	<i>Varicorhinus jaegeri*</i>
Aplocheilidae	<i>Aphyosemion dargei*</i>	Cyprinidae	<i>Varicorhinus mariae</i>
Aplocheilidae	<i>Aphyosemion edeanum*</i>	Cyprinidae	<i>Varicorhinus wernerii</i>
Aplocheilidae	<i>Aphyosemion elberti</i>	Distichodontidae	<i>Distichodus kollerii*</i>
Aplocheilidae	<i>Aphyosemion franzwernerii</i>	Distichodontidae	<i>Distichodus notospilus</i>
Aplocheilidae	<i>Aphyosemion reggenbachi</i>	Distichodontidae	<i>Nannaethiops unitaeniatus</i>
Aplocheilidae	<i>Aphyosemion splendopleure</i>	Distichodontidae	<i>nannocharax intermedius</i>
Aplocheilidae	<i>Epiplatys infraesciatus</i>	Distichodontidae	<i>Nannocharax rubrolabiatus*</i>
Arapaimidae	<i>Heterotis niloticus</i>	Distichodontidae	<i>Neolebias trewavasae</i>
Bagridae	<i>Bagrus docmak</i>	Distichodontidae	<i>neolebias unifasciatus</i>
Channidae	<i>Parachanna obscura</i>	Hepsetidae	<i>hemsetus odoe</i>
Cichlidae	<i>Chromidotilapia gunterhi</i>	Latidae	<i>Lates niloticus</i>
Cichlidae	<i>Benitochromis batesii</i>	Malapteruridae	<i>malapterurus beninensis</i>
Cichlidae	<i>Hemichromis elongatus</i>	Mastacembelidae	<i>Mastacembelus sanagali*</i>
Cichlidae	<i>Oreochromis niloticus I</i>	Mastacembelidae	<i>Mastacembelus seiteri*</i>
Cichlidae	<i>Pelvicachromis taeniatus</i>	Mastacembelidae	<i>Mastacembelus cryptacanthus</i>
Cichlidae	<i>Sarotherodon galileaus</i>	Mochokidae	<i>Chiloglanis batesii</i>
Cichlidae	<i>Tilapia cameronensis*</i>	Mochokidae	<i>Chiloglanis cameronensis</i>
Cichlidae	<i>Tilapia guineensis</i>	Mochokidae	<i>Chiloglanis sanagaensis*</i>
Cichlidae	<i>Tilapia mariae</i>	Mochokidae	<i>Microsynodontis batesii</i>
Cichlidae	<i>Tilapia zillii I</i>	Mochokidae	<i>Synodontis marmorata</i>
Cichlidae	<i>Clariallabes longicauda</i>	Mochokidae	<i>Synodontis obesus</i>
Cichlidae	<i>Clarias buthupogon</i>	Mochokidae	<i>Synodontis rebeli*</i>
Cichlidae	<i>Clarias camerunensis</i>	Mormyridae	<i>Brienomyrus brachyistius</i>
Cichlidae	<i>Clarias gariepinus</i>	Mormyridae	<i>Campylomormyrus phantasticus*</i>

Cichlidae	<i>Clarias jaensis</i>	Mormyridae	<i>Gnathonemus petersii</i>
Cichlidae	<i>Clarias pachynema</i>	Mormyridae	<i>Hippopotamyrus castor</i>
Cichlidae	<i>Clarias platycephalus</i>	Mormyridae	<i>Isichthys henryi</i>
Cichlidae	<i>Heterobranchus longifiliis</i>	Mormyridae	<i>Marcusenius mento</i>
Claroteidae	<i>Anaspidoglanis macrostoma</i>	Mormyridae	<i>Marcusenius moorii</i>
Claroteidae	<i>Chrysichthys auratus</i>	Mormyridae	<i>Marcusenius sanagensis*</i>
Claroteidae	<i>Chrysichthys longidorsalis</i>	Mormyridae	<i>Mormyrops anguilloides</i>
Claroteidae	<i>Chrysichthys nigrodigitatus</i>	Mormyridae	<i>Mormyrops breviceps</i>
Claroteidae	<i>Parauchenoglanis balayi</i>	Mormyridae	<i>Mormyrops caballus</i>
Claroteidae	<i>Parauchenoglanis guttatus</i>	Mormyridae	<i>Mormyrus macrophthalmus</i>
Claroteidae	<i>Platyglanis depierrei*</i>	Mormyridae	<i>Mormyrus tapirus</i>
Clupeidae	<i>Pellonula leonensis</i>	Mormyridae	<i>Paramormyrops batesii</i>
Clupeidae	<i>Pellonula vorax</i>	Mormyridae	<i>Petrocephalus christyi</i>
Clupeidae	<i>Thrattidion noctivagus*</i>	Mormyridae	<i>Petrocephalus microphthalmus</i>
Cyprinidae	<i>barbus bourdariei*</i>	Notopteridae	<i>Papyrocranus afer</i>
Cyprinidae	<i>barbus ablaves</i>	Polycentridae	<i>Polycentropsis abbreviata</i>
Cyprinidae	<i>barbus aspilus</i>	Poecilidae	<i>Aplocheilichthys spilauchen</i>
Cyprinidae	<i>barbus callipterus</i>	Poecilidae	<i>Micropanchax scheeli</i>
Cyprinidae	<i>Barbus camptacanthus</i>	Poecilidae	<i>Poropanchax luxophthalmus</i>
Cyprinidae	<i>barbus guirali</i>	Poecilidae	<i>Procatopus similis</i>
Cyprinidae	<i>Barbus hologaenia</i>	Polycentridae	<i>Erpetoichthys calabaricus</i>
Cyprinidae	<i>Barbus jae</i>	Schilbeidae	<i>Parailia pellucida</i>
Cyprinidae	<i>Barbus martorelli</i>	Schilbeidae	<i>Schilbe brevianalis</i>
Cyprinidae	<i>Barbus nounensis</i>	Schilbeidae	<i>Schilbe djeremi*</i>
Cyprinidae	<i>Barbus parajae</i>	Schilbeidae	<i>Schilbe intermedius</i>
Cyprinidae	<i>Garra dembeesis</i>	Schilbeidae	<i>Schilbe micropogon</i>
Cyprinidae	<i>Labeo annectens</i>	Schilbeidae	<i>Schilbe mystus</i>

4.2.4 Distribution of species depending on habitat

This ecological zoning is not without consequence on the distribution of species. In the table below, we have indicated the preferred zone for each family. However, it should be considered that these criteria of presence are not absolute, the breakdown into zones that we have done only being a simplification of reality. Also, depending on the growth stage (larva, juvenile, adult) or period (reproduction, latency), a same species may have different preferred zones.

Table 17: General family distribution pattern in the various habitats and ecological niches of the forest rivers

The habitats have been adapted from Lowe-McConnell (1975) based on the Mathes (1964) categories.

Habitat	Detrivores	Planctivores	Herbivores	Insectivores	Piscivores	Omnivores
Major river, pelagics	Alestiidae	Clupeidae Denticipidae			Alestiidae Centropomidae	Alestiidae Cyprinidae
Major river, benthics	Bagridae Citharinidae Cyprinidae Mormyridae			Cyprinidae Mochokidae Mormyridae	Bagridae Gobiidae	Bagridae Mochokidae

Second and third order network including calm banks of the main riverbed	Cichlidae Citharinidae Cyprinidae Mormyridae	Poeciliidae	Alestiidae Cichlidae Citharinidae Mochokidae	Anabantidae Cichlidae Cyprinidae Mochokidae Mormyridae Polypteridae Schilbeidae	Channidae Malapturidae Nandidae Notopteridae Polypteridae	Alestiidae Bagridae Cichlidae Clariidae Mochokidae
Forest streams	Citharinidae			Amphilidae Anabantidae Aplocheilidae Bagridae Clariidae Cyprinidae Mochokidae Poeciliidae Schilbeidae	Amphilidae Cichlidae Hepsetidae Mastacembelidae	Alestiidae Clariidae Kneriidae Mochokidae
Marshland and flooded forests	Clariidae Mormyridae			Anabantidae Mormyridae Pantodontidae Phractolaemidae	Channidae Eleotridae Protopteridae	Clariidae Mormyridae Polypteridae

4.2.4.1 Flora and forests

The region traversed is rich in ligneous resources. The list of main species observed can be found below (Table 16).

Table 18: Flora

Name of species	Scientific name
Ayous	Triplochyton scleroxylon
Sapelli	Entandrophragma cylindricum
Afara	Terminalia superba
Eyong	Eribroma oblongum
Bubinga	Guibourtia tessmannii
Hazelnut	Corylus anellana
Sipo	Entandrophragma utile
Black afara	Terminalia ivorenses
Cedar kokoti	Entandrophragma candollei
Name of species	Scientific name
Wild mango	Irvingia gabonensis
Ironweed	Vernonia spp
Cola nut tree	Cola acuminata
Afzelia	Afzelia bella
Moabi	Baillonella toxisperma
Palm tree	Arecaceae
Tali	Erythroleum ivorense
Teak	Tectona grandis
Kapok tree	Ceiba pentandra
Mansonia	Mansonia altissima
Padouk	Pterocarpus soyauxii
Iroko	Chlorophora excelsa
Okoume	Aucoumea kalineana
Njangsa	Ricinodendron heudelotii
African jointfir	Gnetum africanum
Mango	Mangifera indica
Safou	Dacryodes edulis
Pawpaw	Carica papaya
Cassamangue	
Avocado	Persea americana

Description of flora found in the field (Table 16)

In Ntui, the region is a zone of transition between forest and savannah. The peri-forest savannah of Guinea and Soudan and the semi-deciduous forest of Guinea and Congo. The Guinea-Soudan peri-forest savannah is mainly grassy with more or less dense scattered trees and bushes. It developed over time from the heavy pressure of human activity in the forest: brush fires, collection of firewood, animal grazing, etc. This is the “Sudanization” phenomenon.

The zone where the project begins (Batchenga to Ntui) is classified as a non-permanent national forest domain. No forestry companies are located there and exploitation of the commercial species is done at artisan level (carving wood, firewood) by local populations. This exploitation is on a small scale and does not present a threat for the sustainable management of ecosystems. The other human activities that interfere with the ecosystems are concentrated in the single-crop cultivation by small farmers of palms for oil, corn, soy, pineapple and ginger.

Three vegetation units characterize this transition zone:

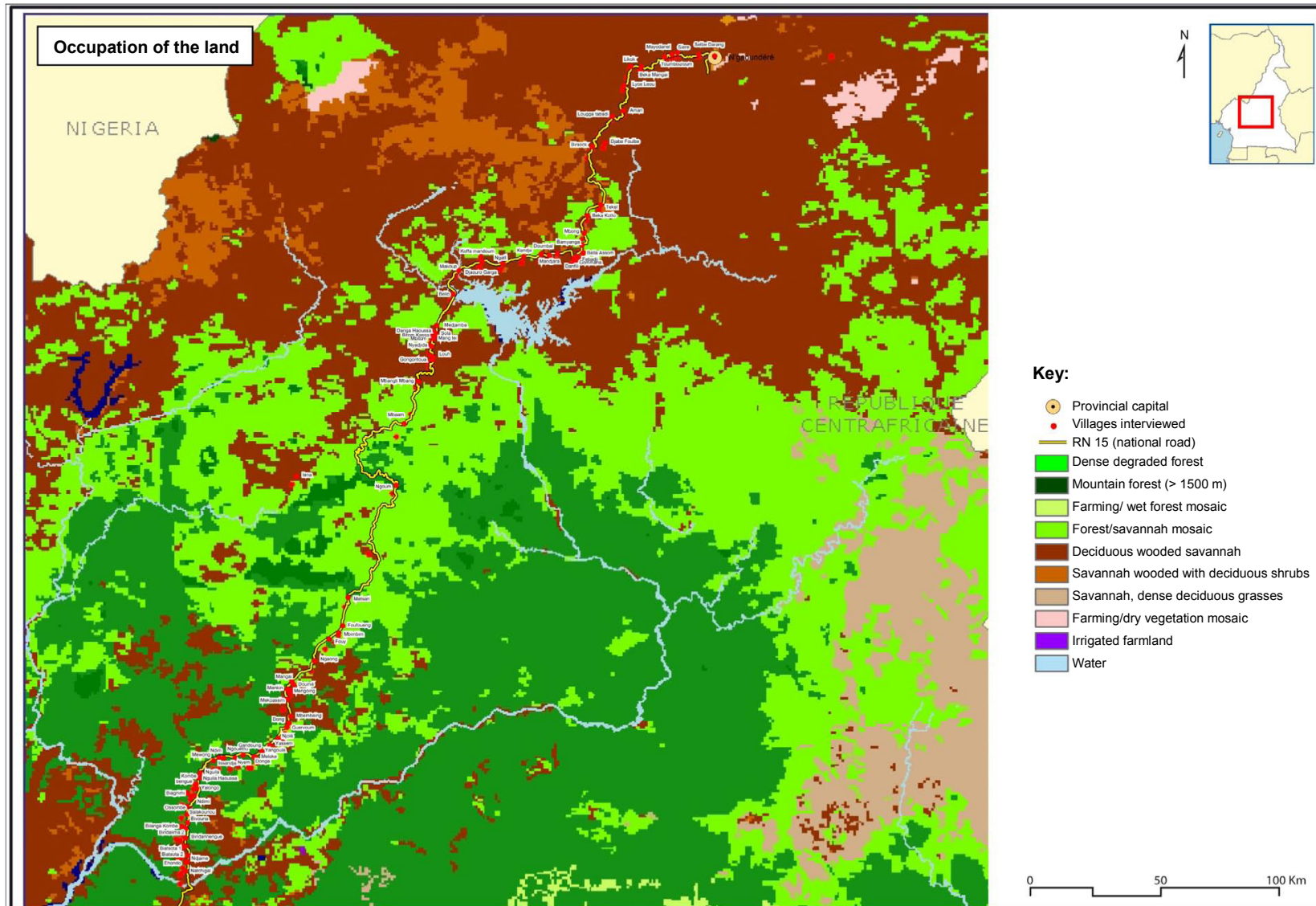
- **The intra- and peri-forest savannah with *Imperata cylindrica*:** This presents two possible routes of evolution: the formation of dense, semi-deciduous forest after cultivation and the formation of savannah grassland formed essentially of *Andropogoneae*, in particular *Hypparrhenia* of the *Rufa* genus after bush fires.
- **The peri-forest savannah with *Annona senegalensis* and *Bridelia ferruginea*:** This succeeds the savannahs with *Imperata cylindrica*. The bushes (*Annona senegalensis* and *Bridelia ferruginea*) are resistant to fire and are very scattered. The mimosa species (*Albizia adianthifolia*, *Albizia glaberrima*, *Albizia zygia*) give an appearance of reforestation.
- **The peri-forest shrub savannah with *Terminalia glaucescens*:** This is not densely wooded. The shrub layers cover 20% and the ligneous layer is less than 10m. The grassy carpet is made up of species of the *Hypparrhienia* genus. The present of Sudan-Sahel elements such as *Accacia siberiana*, *Combretum collinum*, *Psorospermum glagerrinum* and *Combretum spp.* can also be observed.
- **The semi-deciduous Guinea-Congo forest**, fairly sparse: This is often marked along the water courses in the form of a forest gallery. The forest regrowths form by dissemination of the seeds from the *Triplochiton scléroxylon* and *Terminalia superba* species in particular. These regrowths are difficult to describe in floral terms since they correspond to different stages of reforestation. In the bottoms of the humid valleys, there are *Raphia mombuttorum raffias*.

From Yoko to N'gaoundéré:

The flora and vegetation are characterized by savannah (with trees, shrubs and grasses) and forest (dense and galleried). The forest vegetation is rich in trees of different kinds and non-ligneous forest products (PFNL). The non-ligneous forest products encountered, according to our interviews with the population, are Djansang, Okok, Wild Mango and Cola.

The savannah vegetation is made up of small trees. These savannahs are dominated by *Daniella oliveri* and *Lophira lanceolat*, fern species and aquatic ferns that are found in the low-lying land and along the water courses.

The forests and savannahs are exploited by the population for farming purposes. Traditional pharmacopoeia (medicinal plants) can also be found, used by the population for health care. The fruit trees such as mango, safou, pawpaw, cassamangue, avocado, etc. are located in the vicinity of inhabited areas.



Source: Enquêtes socio-économiques projet d'aménagement de la route Ntui Ngaoundéré, STUDI International 2012 et Atlas forestier interactif du Cameroun version 2.0 - WRI / GFW - Données mises à jour Juin 2011

Figure 14: Vegetation coverage

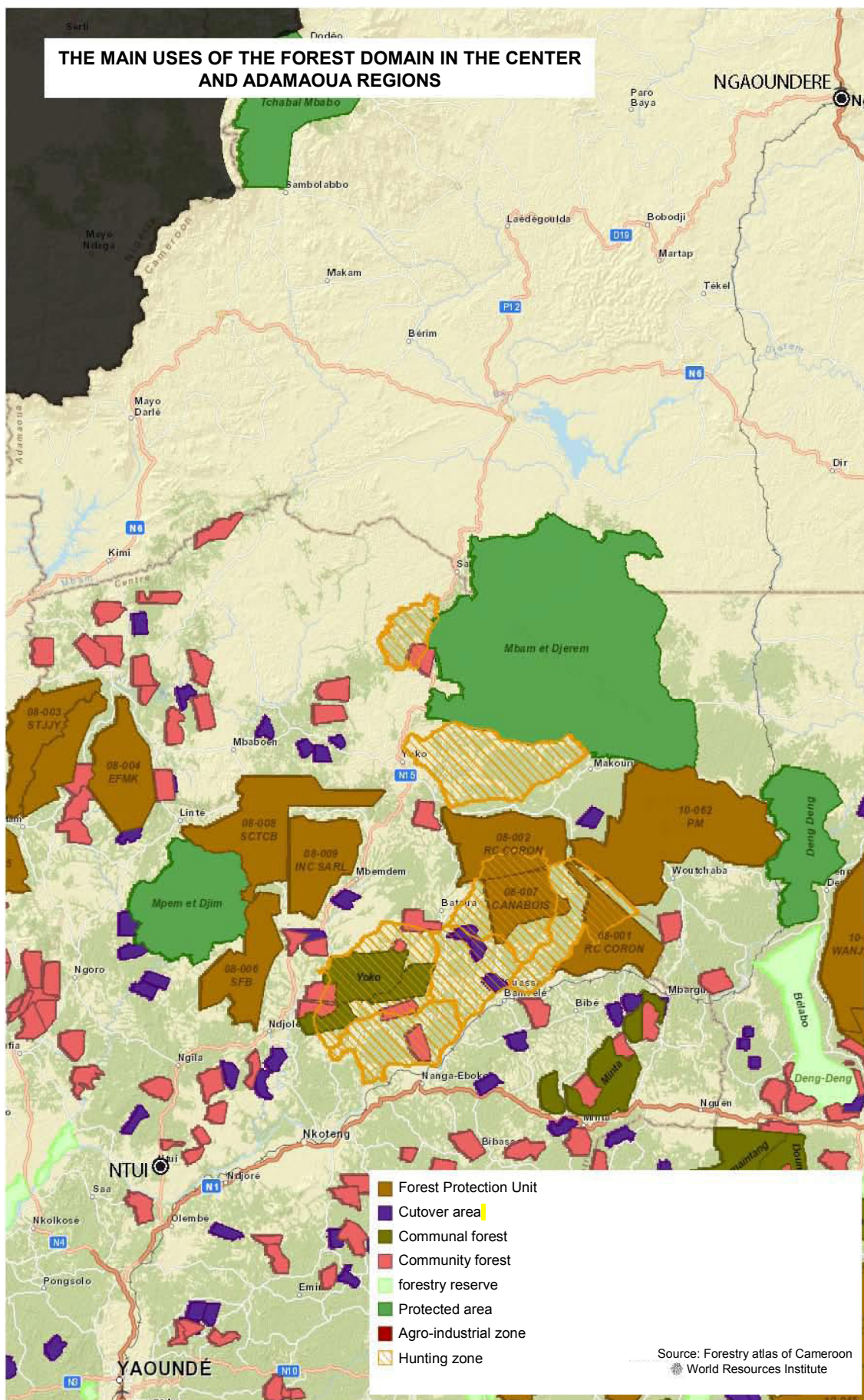


Figure 15: Occupation of the land in terms of forests and protected zones

4.2.5 Community forests

Before 1994, exploitation of the forest resources was exclusively reserved for private operators, and in particular for foreign companies. Although local communities had traditional entitlements to the forest resources, there was no legal framework to guarantee them their rights.

In the Earth Summit of 1992, the Cameroon Government initiated legal and institutional reforms that led to the adoption of a number of legal tools, for example the Forestry Law of 1994 and its implementation decrees, the Land Occupation Map of 1995, the Forest Policy of 1995 and the Forests-Environment Sectorial Program (PSFE) of 2003. These tools established the community management of forest resources as a cornerstone in the process aimed at improving participation of populations in the conservation and management of forest resources to increase their standard of living. On the basis of these legal foundations, a village community can now obtain and manage a forest or hunting area under community management (ZICGC) based on a simple approved management plan (PSG) and a definitive agreement (CD) duly signed with the government. While the UFA protection plan is valid for 15 renewable years, the CD and PSG for a community forest are valid for 25 years, with the PSG having to be renewed every 5 years.

In the area of the study (see map above), several community forests are located in the study zone. The village communities wishing to obtain a forest license identify an area less than or equal to 5,000 ha and draw up a simple management plan to submit to MINFOF for approval. The revenue generated by the sustainable exploitation of community forests is earmarked to finance community development projects.

4.2.6 Brush fires

In the absence of statistics on the number of bush fires declared, it is impossible for the forestry services to assess the size of the surface areas affected annually by bush fires. Nevertheless, according to field observations and the interviews carried out, these surfaces are quite considerable and the frequency of bush fires and their extent are therefore a source of anxiety for the region. These fires may be caused by the forestry operator, the animal herders, farmers burning the earth to plant new crops, honey collectors, etc. Whatever their origins, the brush fires constitute a key factor in the degradation of ligneous plant cover and grazing land. These negative effects are quite significant in the Sanaga catchment area and the interviews with the water and forestry departments revealed their fears with regard to this phenomenon and insisted on finding out the motivations as a first step in combating brush fires. The road construction work may increase the fire incidents and endanger the ecosystems and populations around the work site bases.

4.3 The Protected Areas affected by the Project

Two protected areas lie in the region of the National Park of Mbam and Djerem and of Mpem and Djim (PNMD).

4.3.1 The National Park of Mbam and Djerem

The National Park of Mbam and Djerem is a magnificent place rich in large fauna and flora. It extends over 4,165 km² and is located between the southern slopes of the Adamaoua plateau and the northern borders of the canopy of wet forests in the Congo basin. This is a contact zone between the forest and the savannah in the center of Cameroon, made up of flat-land forests, wooded savannah and grassy savannah. Several water course, including the Djerem river, cross the Park. The extraordinary diversity of the habitat in this Park makes it one of the most biologically rich protected areas in Cameroon with living conditions that are ideal for over 50 species of mammals, such as chimpanzees, leopards, bongos, buffalo and elephant, as well as over 360 species of birds.

4.3.1.1 Geographical location

The National Park of Mbam and Djerem (PNMD) is located between 5°30' and 6°13' latitude North and 12°13' and 13°10' longitude East, at the southern boundary of the Adamaoua plateau and on the northern border of the dense wet forest of the Congo basin.

4.3.1.2 Administrative localization

Compared to the administrative division, the National Park of Mbam and Djerem straddles the regions of Adamaoua, the Center and the East, respectively in the departments of Djerem (Tibati and Ngaoundal district), Mbam and Kim (Yoko district) and Lom and Djerem (Bétaré Oya district). Contrary to the surface evaluation made at the time of its classification (416,512 ha) by the mapping method, use of the Geographic Information System (SIG) indicates that the Park, with the same limits specified in the decree of its creation, covers a surface area of 427,854 ha, i.e. a difference of approximately 11,500 ha. This surface is broken down as follows:

- Mbam and Kim (260,388 ha, i.e. around 61%)
- Djerem (90,620 ha, i.e. around 21%)
- Lom and Djerem (76,846 ha, i.e. around 18%)

4.3.1.3 Background to the creation of the National Park of Mbam and Djerem

The idea of creating a park in the region is very old. It began with the project for classification of the Pangar and Djerem Park at the initiative of the General Delegation for Tourism at the beginning of the 'seventies. However, following extension of the railway towards Ngaoundéré, the site planned for the Pangar and Djerem Park was divided into two. It was thus necessary to create two parks (the Lom and Pangar Park and the Mbam and Djerem Park). Then, to facilitate implementation of the Chad-Cameroon pipeline project, the Cameroon Government decided, with the support of local populations, to make the Mbam and Djerem zone an area of environmental compensation. From March 1999, through Decision No. 0373/D/MINEF/DAG, the Minister for the Environment and Forests declared the forest zone of Mbam and Djerem a protected area. This forest zone therefore covers a surface area of 353,000 hectares. Following meetings of cooperation with the villages, this

surface area was increased to 416,512 ha according to decree No. 2000/005/PM of 6 January 2000. In November 2000, ministerial decree No. 1391/MINEF/DFAP/SA/FB established the Park headquarters at Doumé Yoko.

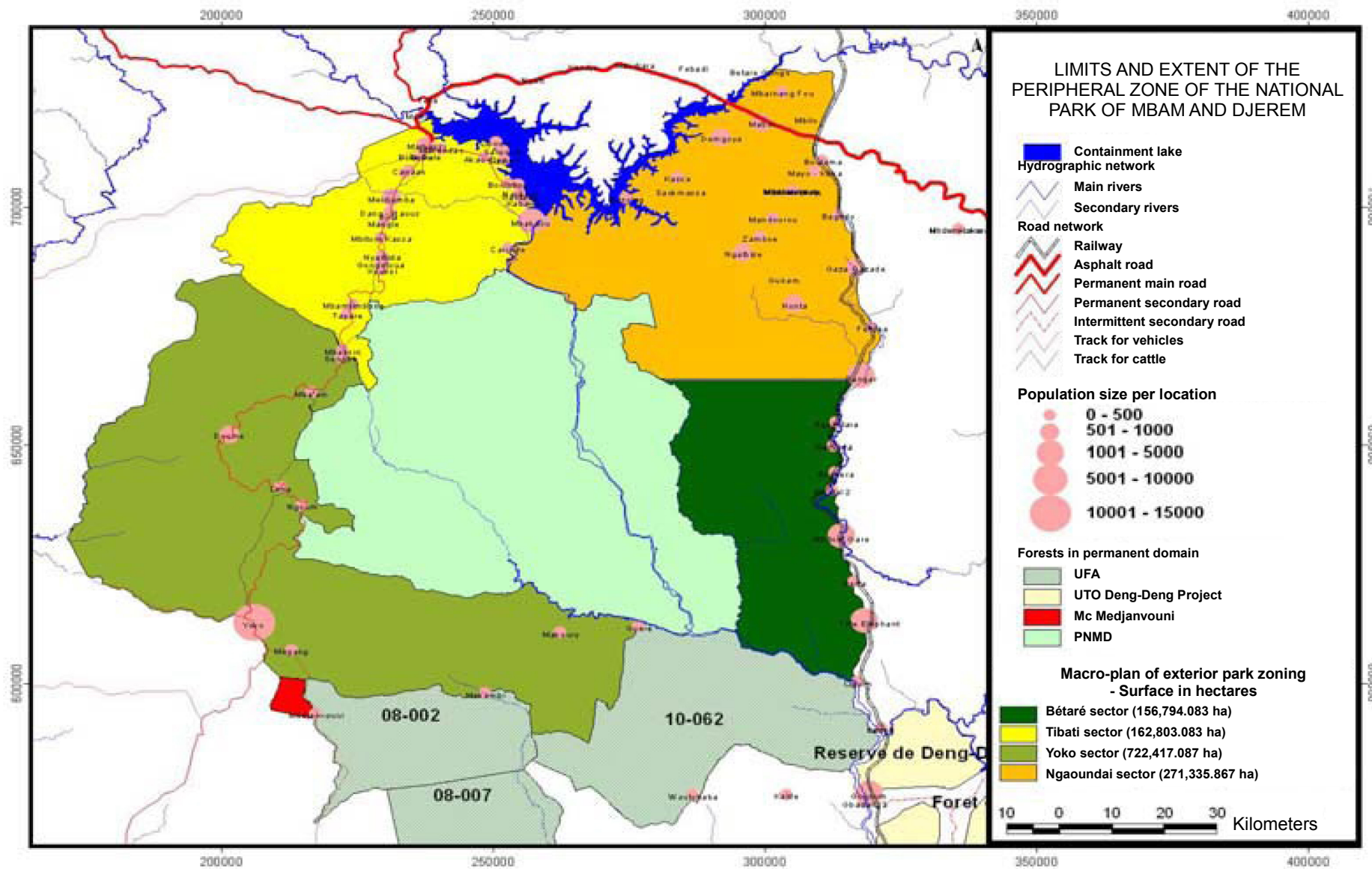


Figure 16: National Park of Mbam and DjereM

4.3.1.3.1 Climate

Three stations situated at the summits of the Mbakaoui, Yoko and Bétaré Oya triangle enabled us to describe the climate of the Mbam and Djerem region. In the absence of exhaustive and continual meteorological data, we took recourse to the monthly temperature averages alone and the maximum rainfall to describe the climate in the region of the National Park of Mbam and Djerem. The data allowed us to calculate the averages and were obtained either directly from data collected at the rainfall station (in Mbakaou) or on the basis of data processed by the Provincial Meteorology Department at the Provincial Delegation for Transport in the Center Region at Yaoundé (Yoko), or again from the site www.Weatherbase.com for the data on Bétaré Oya (see table below).

Table 19: Meteorological data for the Mbam and Djerem region

		J	F	M	A	M	J	J	A	S	O	N	D
Mbakaou	Ave T	23.3	24.5	25.3	25.3	24.4	23.5	22.7	23.7	23.7	23.2	23.8	23.5
	Ave R	0.0	0.0	31.2	163.6	198.3	209.4	301.8	306.1	329.7	258.6	45.0	0.0
Bétaré Oya	Ave T	23	24	25	25	23	22	22	22	22	23	23	23
	Ave R	8	23	83	127	171	176	180	211	267	266	59	7
Yoko	Ave T	24.7	25.8	25.3	24.2	23.6	22.9	21.8	21.6	21.9	22.8	24.6	24.4
	Ave R	2.5	7.5	66.1	105.9	162.9	156.6	204.7	234.3	263.7	261.7	40.1	9.4

The three (3) stations show two seasons, a rainy season that lasts from the second half of March to the beginning of November, and a dry season from November to mid-March.

- Seven (7) months may be considered rainy to very rainy (April, May, June, July, August, September and October)
- Three (3) months are considered dry (December, January and February).

4.3.1.3.2 Topography, Morpho-structural and pedological characteristics

The region of Mbam and Djerem forms part of a geomorphological unit usually called the backbone of Adamaoua. The geological history and morphostructure of Adamaoua were described by S.M. ENO BELINGA (1984). They consist in a set of heavily dissected plateaux between 1000 and 1200 m high, dominating a few isolated rocky outcrops. An eastern platform, situated mainly in the Lom-and-Djerem department, presents more monotonous surfaces. The valleys, deeply embedded from the edge of the plateau then quite shallow in the platform and at the foot of the plateau unfold onto the alluvial plains (Djerem, Pangar and Lom).

4.3.1.3.3 Soils

In the absence of pedological prospection conducted specifically in the Mbam and Djerem region, recourse was taken to the pedological map of eastern Cameroon (scale 1/1000000) drawn up by P. SEGALIN and D. MARTIN (1965). Thus, the class of soils most represented is that of sesquioxide soils, sub-class ferrallitic soils, group of weakly ferrallitic soils, type of soils weakly ferrallitic and model on acid rocks. The group of hardened ferrallitic soils can also be found extensively in this area, type hardened ferrallitic on acid rock. Besides these main types, there are also several other soil types resulting from a pedogenesis connected to topographical conditions and particular hydrodynamic characteristics. This is the case of the

hydromorphic soils and soils scarcely evolved through erosion. The main characteristic of the weakly ferralitic soils is a silica/alumina ratio of 2, a mineralogy in which kaolinite dominates, with some traces of illites and suitability for crops is mediocre with risks of erosion and rapid degradation.

The hardened ferralitic soils are characterized by outcrops of hardened layer in the form of pisolite slabs or gravel. These outcrops are frequent in the savannah.

4.3.1.3.4 Hydrography

4.3.1.3.4.1 Hydrography in the peripheral zone

The geomorphology of the Mbam and Djerem region has formed a dense network of surface water runoff controlled by the watershed of the Sanaga above Goyoum and some smaller tributary basins from the water courses above Mbam and Kim.

The region of Mbam and Djerem affected by the watershed of the Sanaga above Goyoum is drained by the Djerem, Lom, Pangar, Vina, Méré and Meng.

The Djerem, a main river, is called Sanaga after its confluence with Lom-Pangar. It crosses the park from north to south and its principle tributaries are the rivers Mikay, Miyéré and Malao in the north, Merou in the east and Mbi and Medié in the south.

The river Mbam has its source in the north-west of the Mbam and Djerem region where its headwaters can be found. One of its main tributaries, the Kim, has its headwaters in the west where it receives the Ya.

The density of the tributaries of the river Sanaga in this region of Mbam and Djerem would justify the construction of the largest containment barrage in the country in this zone (surface area of 60,000 ha and maximum water volume 5.3 billion cubic meters) with a view to regulating the hydrological pressure of the Sanaga at Edéa.

Moreover, other hydroelectric barrage construction projects are planned in the region, i.e. Nachtigal on the Sanaga and Lom Panghar on the Lom-Pangar confluence. But, in spite of the relative abundance of water in the Mbam and Djerem region, management of the numerous surface ruoffs from all of the headwaters is a priority.

4.3.1.3.4.2 Hydrography in the protected area

More specifically, inside the park, two types of water courses can be distinguished, the permanent water courses and the intermittent course. Among the permanent course, there are the Djerem, Mérou, Medié, Miyere, Migiri, Koussi Mindiou, Malao, Koussi, Gese and Beboun. The intermittent courses (Maguera, Suenkwe, Makombe, Mapa) are characterized by a severely reduced water levels from May to June. However, it should be noted that the permanent and intermittent character of some of these rivers is not strict. Most of these rivers, outside of the rapids and the rocky outcrops, are navigable most of the year, except the intermittent rivers.

4.3.1.3.5 Flora composition and plant formations

The reports of THOMAS et al (1999) and DAMES and MOORE (1999) give sufficient information on the flora composition of this region of Cameroon where a predominance of

Triplochiton scleroxylon, Terminalia superba and a number of sterculiaceae, Daniella oliveri, Lophira lanceolata, Anona senegalensis, khaya spp. Dylophia oethiopica etc. can be found.

The following plant formations were encountered in the park:

- a) Semi-deciduous forest: closed canopy with individual trees sometimes reaching 35-40 m in height. This is composed of Sterculiaceae (Eribroma oblonga, Triplochiton scleroxylon, Sterculia sp., etc.). Old forests with species such as Pycnanthus angolensis, Myrianthus arboreus and some Klainedoxa gabonensis can also be found here.
- b) Transition forest: around 30 m tall, existence of a layer of graminaceous plants and Psychotria sp. in the undergrowth. The dominant layer is represented by Xylophia aethiopica.
- c) Transition savannah: this plant formation was recently a forest. Its understory consists of Oncoba sp. and Psychotria sp. There are a few Xylophia aethiopica but also some old Hymenocardia acida, Cassia sp., Harungana madagascariensis, Macaranga spp. dominating the tree layer.
- d) Vine forest: this closely resembles the transition savannah but is only found close to rivers. The major vines observed there are Landolphia, Tetracera potatoria and Dioscoraceae.
- e) Bushes: suffocated by the invasive Eupatoria odoratum, Oncoba, Psychotria and typical savannah shrubs.
- f) Multiple wooded savannah lands that are distinguished by a dense canopy dominated by Lophira lanceolata, a dense canopy dominated by Uapaca sp., a mixture of different tree species such as Burkea africana, Lophira lanceolata, Daniellia oliveri, Syzygium guineense, Vitex cf., Doniana, Cussonia sp., and several bush species typical of the Guinea bush savannahs (see below). Occasionally, Borassus aethiopicum can also be found. The understorey consists mainly of Hyparrhenia spp. and other tall graminaceous plants.
- g) Bush savannah: this is made up of bushes such as Acacia lebbeck, Annona senegalensis, Crossopteryx febrifuga, Entada sp., Hymenocardia acida, Nauclea latifolia, Parkia sp., Piliostigma sp., etc.
- h) Riparian prairie: this is a space periodically flooded by the rivers overflowing their banks and covered in a uniform grassy layer consisting mainly of Phacelurus congoensis. Only some examples of Phoenix reclinata are scattered here and there.
- i) Riparian forest: Periodically flooded, it is dominated by Uapaca guineensis with or without an understorey. When the understorey exists, it is made up mainly of a thick layer of Trachypodium depending on the volume and duration of the flooding.
- j) Gallery forests, marshes and raffias: Uapaca guineensis tends to dominate, but there is also Raphia cf. monbuttorum and Mitragyna sp. in the riverbeds. Berlinia sp., Afzelia cf. pachyloba, Zanthoxylum spp., Pseudospondias microcarpa, Anthocleista spp., Celtis spp., Sterculia sp., Pycnanthus angolensis, Eriocoelum sp. and Pandanus sp. have also been reported. The understorey consists of Aframomum sp. and Marantaceae, specifically Sarcophrynium sp., Trachypodium sp., Hypselodelphys sp., Marantochloa spp. and Halopegia azurea.

At the edges of the gallery forests, where they come into contact with the savannah, there are several meters in width of the forest/savannah ecotone.

4.3.1.3.6 Fauna

Given its location in the forest/savannah contact zone (the ecotone), the Mbam and Djerem National Park and its surrounding areas are characterized by a wide diversity of habitats, home to rich and varied fauna, including typical forest or savannah species as well as a complex of species usually associated with the transitional forest-savannah mosaics. As far as is currently known, the fauna includes:

Mammals

Roughly 60 species of mammals belonging to 10 orders, 26 families, and 34 genera, including primates, insectivores, lagomorphs, rodents, carnivores, pangolins, tubulidentata, proboscidea, and artiodactyls.

In general, the Mbam and Djerem National Park is home to exceptionally rich and varied fauna, with large populations of large mammals, including elephants (*Loxodonta Africana*), buffalo (*Syncerus cafer nanus*), chimpanzees (*Pan troglodytes*), giant otter shrews (*Potamogale velox*), pygmy squirrels (*Myosius pumilio*), panthers (*Panthera pardus*), lions (*Panthera leo*), spotted hyenas (*Crocuta crocuta*), kob antelopes (*Kobus kob*), waterbucks (*Kobus defassa*), marshbucks (*Tragelaphus spekei*), bongos (*Boocercus euryceros*), bushbucks (*Tragelaphus scriptus*), and water chevrotains (*Hyemoschus aquaticus*). Although inventories have not yet confirmed the reports, a few hunters have stated with a fair amount of certainty that there are still giant elands (*Taurotragus derbianus*) in the park.

Birdlife

There are slightly more than 360 species of birds belonging to 53 families. This rich birdlife is characterized in particular by the presence of 18 of the 45 Sudano-Guinean savannah species inventoried in Cameroon, 112 of the 215 species typical of the Guinea-Congo forest known in Cameroon, as well as a wide variety of species dependent on the forest/savannah mosaics. Two of these species are limited-range species and are also threatened with extinction: the Bamenda apalis (*Apalis bamendae*) and the white-collared starling (*Grafisia torquata*). It seems clear that this list is far from being complete, because species that are new to the region are frequently seen.

In addition to the exceptional richness and complexity of the birdlife composition specific to the region, a few particularities with respect to birdlife warrant emphasis to make their importance to the region's ecological balance clear:

1 - Species generally considered to be restricted to dense, little-disturbed forest regions are present in the tiny forest galleries of the park's northern sector, which is dominated by savanna. These include, in particular, the following related species: the red-tailed bristlebill (*Bleda syndactyla*), the green-tailed bristlebill (*Bleda eximia*), the white-tailed Alethe (*Alethe diademata*), the forest robin (*Stiphornis erythrothorax*), the red-tailed greenbul (*Criniger calurus*), the spotted honeyguide (*Indicator maculatus*), the black-casqued hornbill (*Ceratogymna atrata*), and the red-billed dwarf hornbill (*Tockus camurus*).

2 – The red-capped robin-chat (*Cossypha natalensis*), which until recently was considered a sporadic, rare species in Cameroon, appears to be a species common in all sectors of the park.

3 – The Bamenda apalis (*Apalis bamenda*), sighted several times in the park and in other sectors around the Adamawa plateau, has always been considered an endemic species living in the mid-altitude range of the Bamboutos Mountains. These sightings indicate that this is a species characteristic of forest galleries.

4 – There are also a remarkable number of species characteristic of the dry savannah that are generally seen not far from species characteristic of the forest: the brown-rumped bunting (*Emberiza affinis*), the black-bellied firefinch (*Lagonosticta rara*), the lesser blue-eared starling (*Lamprotornis chloropterus*), the white-collared starling (*Grafisia torquata*), the brubru (*Nilaus afer*), and the yellow penduline tit (*Anthoscopus parvulus*).

The coexistence of savannah and forest species underscores the biological and ecological interest of the forest/savannah contact zone, which thus offers a vast experimentation field for studies that may provide a better understanding of the processes of evolution and the related mechanisms underlying the processes of constituting and maintaining stable forest ecosystems in topical areas.

Reptiles

Preliminary studies in a few sectors of the park have led to inventorying 65 reptile species belonging to 14 separate families. With regard to herpetofauna, it is clear that sampling to date has involved only reptiles; amphibians have not been studied at all, and all of the park's sectors have not yet been covered.

Fish

Although roughly 21 species have been observed to date according to Ondoua (2005), very little is known about the fish.

4.3.1.4 Development constraints

4.3.1.4.1 Institutional constraints

- Limited human, material, and financial resources

There is a serious lack of supervisory personnel. Essentially 24 contractual agents have been recruited by the Project adjoining the park and their contracts reach their term in November 2006. The Conservationist is the only staff person assigned by the government to date.

Since the park was created, the life base planned for the park seat has still not been built and the logistical means (rolling stock, communication equipment, office furniture and equipment, and field equipment) needed to improve how the conservation services are deployed in the field have remained very limited. The problems in mobilizing investment budgets are partially due to current constraints. This situation gives the stakeholders the impression that the government is paying little attention to the conduct of activities.

- Uncertain coordination with the other MINFOF structures

According to the organizational chart, the PCFCs report to the Departmental Delegate. The lack of formal operational relations between the Conservation Service and the PCFCs on the park's periphery does not require the PCFCs to be involved in the conservation activities.

- Problems instituting coordination mechanisms for the park

The fact that the park overlaps three regions does not make it easy to institute operational coordination mechanisms. This problem is related to territorial-jurisdiction constraints and the fact that frequently, the concerned agencies' upper echelons are insufficiently familiar with field realities, which leads to inconsistent implementation of their respective park-related actions.

The lack of coherent sectoral policies causes conflicting actions to be implemented on the same sites. These actions are initiated by the various ministerial departments, all of which are interested in rural development (fishing, and agriculture in the forest galleries). Monitoring of the impact these sectoral policies have on each other and overall is also insufficient.

- Distrust of certain key players

The park's creation with the support of the World Bank has given rise to a certain level of distrust among some of the key operators operating around the park and overly high expectations of the communities and other players.

- Delayed triggering of the mechanisms for indemnifying the resident populations

The decree creating the Mbam and Djerem National Park, which is available in all the concerned districts, stipulates in Article 4 that the expropriated populations or those occupying an area inside the park will be indemnified. The delay in the launching of this procedure is causing a certain level of frustration among the resident populations.

- Low capacity of civil society

Although from a legal standpoint the importance of civil society in managing forests, fisheries, and natural resources in general has been recognized, it must be admitted that in the Mbam and Djerem region, civil society is poorly equipped to play its role in the devolution process. This naturally limits the innovative scope of the above-mentioned laws and even increases the ambiguities.

4.3.1.4.2 Socioeconomic constraints

- Isolation and poverty of the populations

Isolation considerably limits the region's development. On the eastern side of the park, rail is the mode of transportation, whereas on the western and northern sides, the formerly abandoned road network has only recently begun to be maintained. There was never a road on the south side of the park. This isolation reduces the ability to market and evacuate agricultural products, which lowers both the commercial value of the products and household income. In many cases, this constraint is compounded by a lack of social infrastructures (schools, healthcare centers, developed water sources, etc.).

Proximity of certain villages

Given the proximity of certain villages (Goum, Mba'am, Lena, Sengbe, etc.) to the Yoko-Tibati road (the limit of the park's western sector) and the presence of the livestock trail, residents and herdsmen have entered the park repeatedly. This situation may cause conflicts likely to limit the involvement of the concerned populations in the park's participative-management process.

Land insecurity

Access to land is controlled by the traditional authority, which cedes land as it sees fit. Rendering such land valuable does not confer any ownership rights. This gives free reign to illegal development activities and results in the concerned populations' disinterest in sustainable resource management. Given the weakness of traditional bodies, the abuses seen are tending to increase. It should also be noted that before MDNP was created, this expanse was considered a "no man's land" and a resource base for the populations of the three regions. Placing it in the government's private domain has profoundly disrupted the means of accessing and managing the region's lands.

Unsustainable resource-management policy

This concerns almost all sectors: agriculture, hunting, fishing, livestock farming, and forest exploitation.

- With regard to agriculture, this policy especially affects the park's eastern periphery, with the development of shifting cultivation on burned areas, focused primarily on corn and seeded squash (cucumber).

- With respect to hunting, the long hunting tradition of the area's populations and the high demand for game in the large urban centers constitute a serious threat to the park. The easy circulation and selling of traditionally made arms and ammunition intensify illegal hunting, as does the use of steel cables in traps, which are not allowed for making a selective catch.

The proximity of the Ngaoundal armed forces training center and the Yoko high-security prison further complicates the monitoring of hunting because war-related arms and ammunitions are often used to poach big game.

- With respect to transhumance, given the current herd size and the expanse of the herdsmen cover, transhumance puts perceptible pressure on the quality of the habitat today. The park is an importance base for pasturing and watering during the dry season. Interactions between livestock and wild game pose numerous epidemiological risks. The herdsmen's presence in the park frequently has repercussions on managing brushfires, which often destroy habitats on the savannah, increases poaching, and results in fields being created inside the park.

- With regard to fishing, the use of inappropriate methods, such as poisoning and/or damming watercourses and using small-mesh nets, is practices contrary to the sustainable management of fish resources.

- As regards forest exploitation, the lack of an environmental impact study and an environmental management plan for the UFAs on the park's periphery, exacerbated by

fraudulent operation, poses a serious threat to the resources on the park's periphery and constitutes an additional source of frustration for the populations.

- Population mobility

Mobility is the primary characteristic of the park's resident populations. It is related to the nature of the activities conducted, the techniques for exploiting resources, and the culture of the populations in question. The new administrative apportionment has also contributed to this mobility. The political instability in the neighboring countries (CAR, Chad, and Sudan) has led to the massive installation (roughly 400 families) on the park's periphery.

4.3.1.4.3 Technical and scientific constraints

- Lack of macro-zoning of the northern part of the country

The lack of a strategic framework for guiding the attribution of lands, as is the case in the country's southern portion, makes it impossible to take full advantage of the opportunities offered to the populations by law 94/1 (community forests, community-managed hunting areas, forage crop reserves) without entering into conflict with other forms of land use. Given that the greatest pressures come from outside the park, this void pushes the park's management to focus above all on the plan for attributing peripheral lands, which is in fact not up to it alone. While the peripheral areas have been identified, **the National Park (NP) does not yet have a well-defined buffer zone.**

- Insufficient scientific knowledge

Given the park's newness and the specificity of the environment covering it, we do not yet have enough data to understand how certain processes evolve. Overall, the research data come from relatively limited areas. This situation should encourage flexibility in the action strategies essential to correcting errors.

4.3.1.4.4 Biophysical constraints

Evolution of the forest edge

Satellite images taken over the past thirty years clearly show that the edge of the forest has advanced from the south toward the north, to the detriment of the savannah. This change should change the distribution range of species dependent on certain ecosystems.

Decrease in hydrographic regimes

The destruction of forest galleries, which are large pockets of fertility, disrupts the hydrologic regime of watercourses in this region, which is Cameroon's water tower.

4.3.2. [Mpem and Djim National Park \(MDNP\)](#)

The Mpem and Djim National Park (MDNP) is a vast natural area of nearly 100,000 hectares, delimited by the loop formed by the Mpem and Djim rivers, two large watercourses that are home to a rich and varied waterfowl population. It was created by Decree no. 0836 of May 12, 2004 to sustainably maintain the forest and savannah in order to preserve the potential necessary to develop ecotourism.

- Objective 1: Protect the transition zone to develop ecotourism
- Objective 2: Guarantee the longevity and flow of its watershed's hydrographic network

4.3.2.1 Geographical situation

The MDNP is more or less circular, its core covering a surface area of roughly 100,000 hectares not counting the periphery, which remains to be defined. Located between latitude 5° and 5°20 North and longitude 11°30 and 12° East, its exceptional geographic situation in the forest-savannah ecotone offers a blend of animal and plant species common to tropical forests and savannah. Its limits are:

- to the west, the Djon, Mbo, and Pi watercourses;
- to the south, the Mpem and Ndjim rivers;
- to the east, the Ndjim river; and
- to the north, the Meti watercourse and the Ndjim river.

4.3.2.2 Administrative situation

The Mpem and Djim National Park (MDNP) is located in the center region, entirely within the Mbam and Kim department. Its periphery extends into the districts of Ntui (Nguila), Mbangassina (Nvoundou), Ngoro (Séréré), and Yoko (Linté). The entrance is 170 km from Yaoundé and the life base in the village of Linté is roughly 200 km north of Yaoundé.

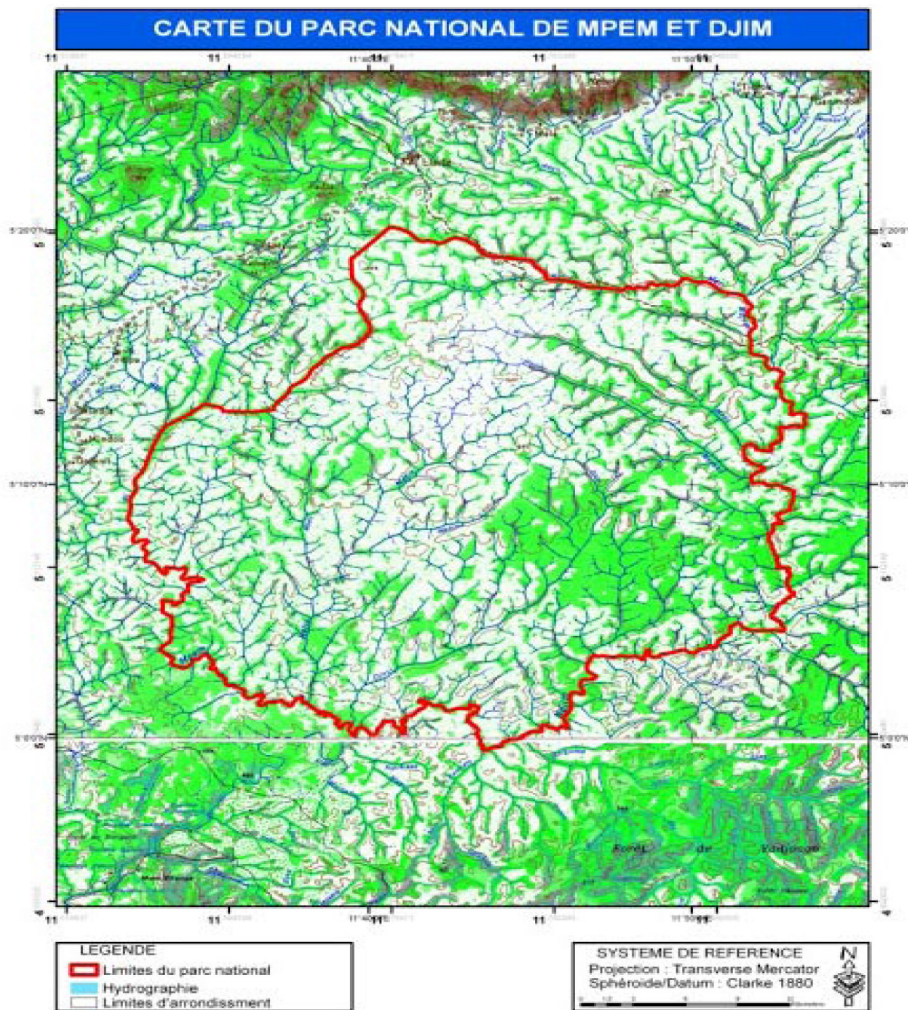


Figure 17: Mpem and Djim National Park

4.3.2.3. Characteristics

4.3.2.3.1 Climate

Despite the recurrent disturbances related to climate changes, two uneven seasons prevail in the region:

- a dry season from November to April
- a rainy season from May to October, with a slight break in August.

4.3.2.3.2 Topography, morphostructural and pedological characteristics

The park is part of a plain having an average altitude of 640 meters. The western and northern parts are elevated, with hills on the steep slopes rising to 800 meters, whereas the lower-altitude east and south scarcely exceed 560 to 630 meters. In the north, a large mountain range rises to 1,293 meters, forming the Adamawa plateau's first foothills. The subsoil is granite and the soils are reworked ferralitic soils.

4.3.2.3.3 Hydrography

The MDNP is watered by a very dense hydrographic network comprising permanent watercourses that drain this plain, which is located at the foot of the first cliff of the Adamawa plateau. The Mpem and the Djim, the two main watercourses that entirely delimit the park, are tributaries of the Mbam in the Sanaga basin. In addition to the Mpem and Ndjim rivers, there is a multitude of watercourses the beds of which complete the MDNP's natural limits.

4.3.2.3.4 Plant-life composition and vegetation formations

According to the phytogeographic map of Cameroon (Letouzey 1968), the Park has highly diverse plant life and inhabitants, including:

- the Sudano-Guinean savannah of the Adamawa plateau;
- the wooded savannah containing *Uapaca togoensis* and *Isobertia doka*, known only to the north of the Adamawa plateau;
- the shrubby Guinean peri-forest savannah containing *Terminalia glaucescens*;
- saxicolous groups: numerous isolated rocky hills in the middle of the savannah;
- periodically flooded marshy prairies;
- forest galleries;
- dense clusters and forests of semi-deciduous trees;
- regrowth forests of semi-deciduous trees on savannah

Note; Studies have not yet been conducted to determine the spatial distribution and surface areas occupied by these various vegetation formations. However, surveys taken in the region by Jacques Vivien indicate that more than 40% of the forest's tree species are represented there.

4.3.2.3.5 Fauna

According to the latest studies, there are:

- one hundred (100) animal species;
- seventy-six (76) mammal species representing 58% of the 129 estimated mammal species present in Cameroon;
- numerous rare species and species threatened with extinction: honey badgers, servals, African wild dogs, panthers, aardvarks, chimpanzees, hippopotami, and elephants.

In addition, in the MDNP there are:

- three (3) species of pigs: bush pigs, giant forest hogs, and warthogs, and
- three (3) of the four species of antelopes: marshbucks, bushbucks, and bongos.

The fish are just as remarkable. There has not yet been a specific inventory taken, but inquiries at the markets indicate that the Mpem and Djim rivers contain a wide variety of fish,

including large specimens such as a fish roughly 1.3 meters long caught in an Mpem fishery. Non-exhaustive research conducted by Vivien (2012) on the Djim river alone indicates exceptionally rich variety, including endemic species.

4.3.2.4 Development Constraints

4.3.2.4.1 Economic factors

The Park belongs to a Second-Category Technical Unit (UTO) and several operational forest exploitation concessions ring the Park. However, after several years of forest exploitation on the core's periphery, other than the unauthorized cutting that continues, only S.I.M. actively sells standing volume in the Yangba area.

Livestock farming in the mountains is one of the main threats to the health of the fauna and the integrity of the habitats subject to pressure from the herdsmen's uncontrolled fires. In the past few years there has been increasingly worrisome penetration into the MDNP's core by Cameroonian and Central African Mbororo herdsmen installed in the mountain range to the north of the MDNP. The tsetse flies no longer seem to limit livestock farming on the Mpem and Djim plain.

4.3.2.4.2 Main problems and proposals

The major concerns include:

- the lack of a development plan,
- poaching for bush meat, elephant tusks, Pangolin scales, etc.,
- prosperous illegal forest exploitation on the MDNP's periphery. The forest rangers are totally corrupt and have become entirely ineffective,
- livestock are essentially raised by Mbororo herdsmen who live in the foothills of the mountain range to the north of the Park (Linté).

4.3.2.5 Current management proposals

To combat poaching, which is intensifying, it is urgent to:

1. Accelerate the process for elaborating the Park's Development Plan.
2. Give the conservation service personnel the means to:
 - travel (1 4 × 4 vehicle, 8 motorcycles),
 - dissuade (firearms, teargas, etc.)
 - camp out.
3. Develop a development plan for the Park, a document that can be submitted to potential stakeholders (bilateral and/or multilateral aid, NGOs, etc.):
 - incorporate this faunal development into the UTO, with the ability to ask for financing of the first infrastructures from the neighboring forest exploitation companies.

4. Make potential stakeholders aware of the ecotourism plan for the Park:
 - nature walks to discover the Park's biodiversity;
 - tours of the forest galleries and forest blocks
5. Set up 2 tourist camps:
 - one grand-touring camp,
 - one ecotourism camp.

4.4 Human and Socioeconomic Environment

4.4.1 Socioeconomic surveys

The consultant has conducted two types of socioeconomic surveys:

- household surveys (496 questionnaires), Appendix 5
- village surveys in 87 villages (attendance list in Appendix 3, minutes in Appendix 4, and village coordinates in Appendix 6) along the Batchenga-Ntui-Yoko-Tibati-N'Gaoundere road (Figure 11).

A direct interview approach was adopted for the household surveys, with a targeted selection of individuals interviewed, namely, to the extent possible, six households per village: two low-income households, two middle-income households, and two high-income households. This typology is circumscribed from a gender standpoint and makes it possible to analyze the place of women in the division of household labor and decision-making processes marking the household's options in terms of activities, income, education and healthcare. The objectives of the household services were to:

- provide a quantified understanding of the villagers in relation to the road's practicability,
- determine the users' primary methods/reasons for traveling, and
- evaluate the main socioeconomic indicators in the project's area of direct influence: average household size, average farm size, main agricultural and ranch products sold, average household-expense structure, etc.

The village surveys used a certain number of living-environment descriptors to identify the socioeconomic profile of each village and the villagers' needs. They were conducted in every village along the road, always in the presence of the village chief, notables, women's representatives, youths, and the rest of the population.

The main objectives of the village surveys were to:

- determine the main socioeconomic characteristics of the project's area of direct influence: predominant economic activities, socioeconomic structures, etc.,
- identify the main constraints, related to the current state of the road, on the mobility and daily social interactions of individuals and households.

The data collected have made it possible to determine the economic activities of the area described below.

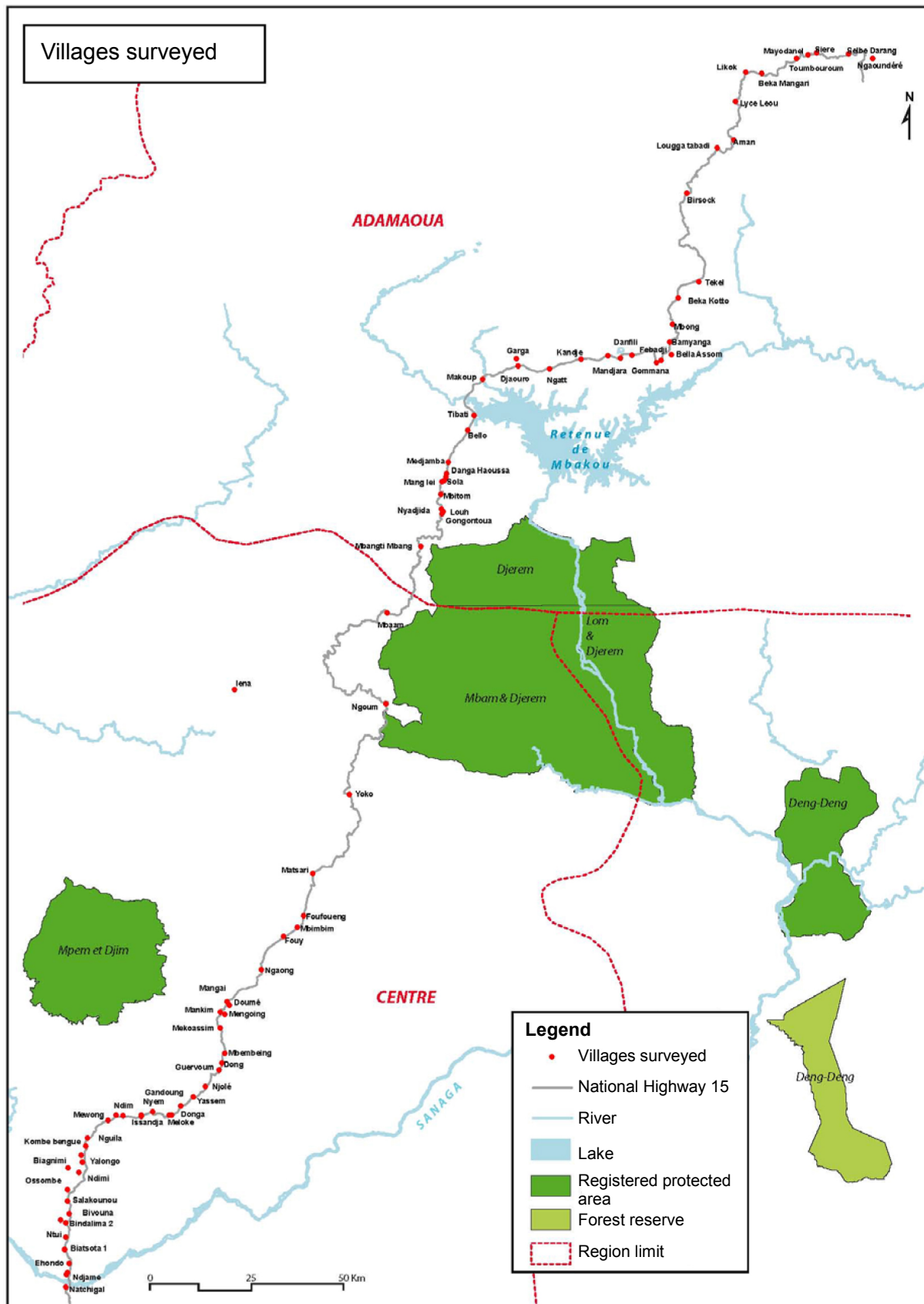


Figure 18: Map of surveyed villages

4.4.1.1 Demographic data and living conditions

The project zone's main demographic characteristics may be summarized as follows:

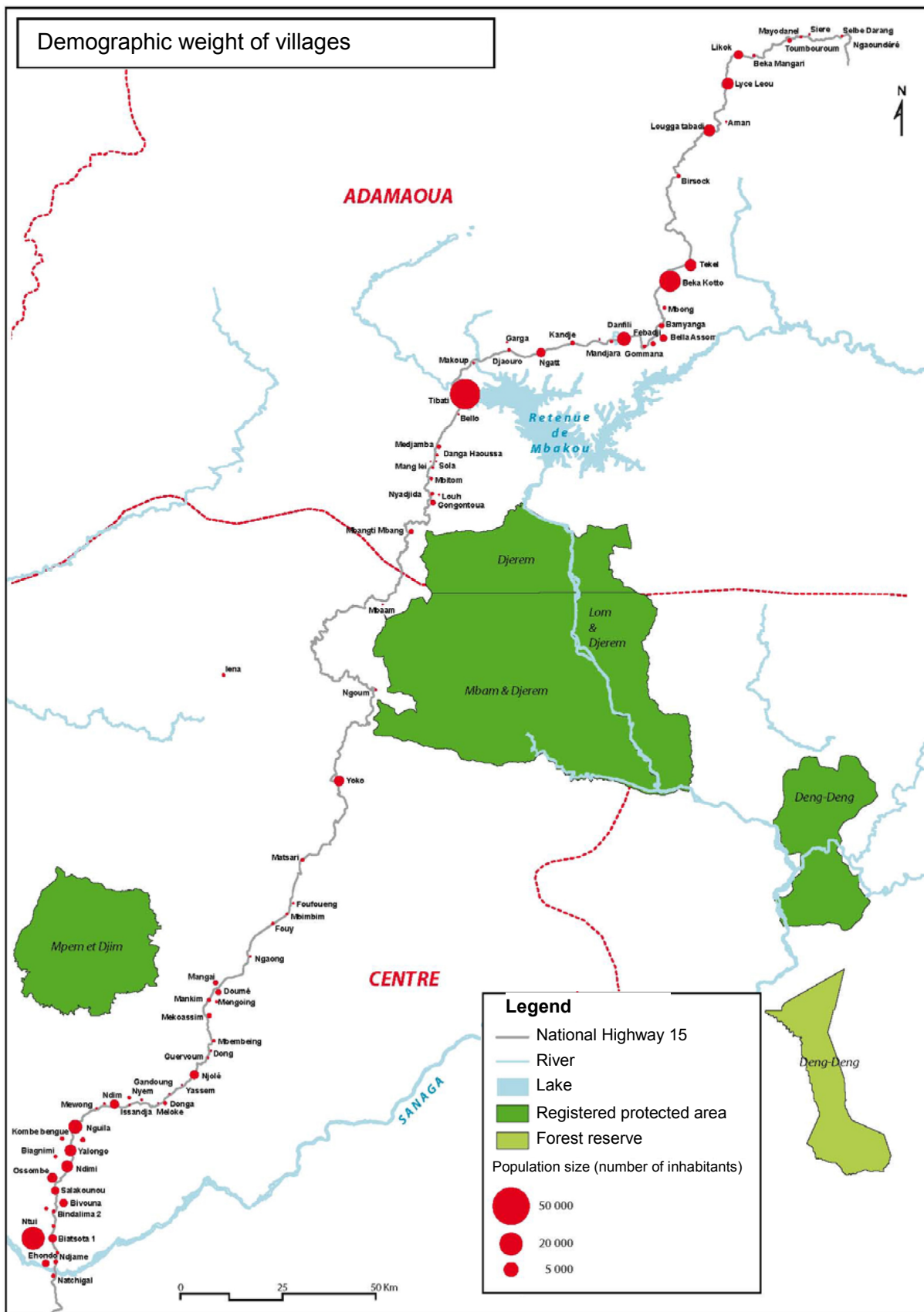
- Cameroon's Center and Adamawa regions have similar overall demographic profiles, with an equal number of men and women (50%).
- In 2012, Adamawa had 1,080,500 inhabitants and the Center had 3,730,784.
- The average annual demographic growth rate is 3.0% in Adamawa and 3.1% in the Center.
- The age pyramid for Cameroon's population generally resembles Sub-Saharan African population pyramids, which have a very broad base and narrow progressively and regularly as people age, narrowing very quickly at advanced ages. This age pyramid reflects the high birth rate related to the equally high mortality rate. The young age groups do not show very marked sex-related structural differences, which become clearly perceptible only at advanced ages. The shape of this age pyramid highlights the extreme youth of Cameroon's population.
- The age pyramid representing the structure of the population concerned by the project, which is purely rural, has of course a very broad base (high birth rate), but it reflects a population deficit in the active ages due to the high emigration of young adults to urban areas. Women clearly outnumber men at these ages. There are slightly more people at the advanced ages. The median age of the rural population is 15.8 years for the entire population, 14.9 years for men, and 17.1 years for women.
- The population is very young: close to 41% of the inhabitants are under 14, and 49% are between 15 and 49 years old.
- As of January 1, 2012, the Adamawa region was estimated to have more than 1,080,500 inhabitants, or 17 inhabitants per square kilometer, representing 5.1% of Cameroon's population. This region's sparse population, dispersed over 63,701 km², is mostly rural and composed of several ethnic groups of varying sizes: the Fulbe, Bororo, Hausa, Gbaya Kaka, Tikar, Konja, Vute, Mbum, and Dourou. Islam is the prevailing religion, especially among the Fula ethnic group. Many ethnic groups have maintained their animist or pagan traditions, however, especially in the mountains near the Nigerian border.
- By contrast, the Center has 3,730,784 inhabitants, distributed unevenly across 68,953 km². Population density in the Center varies significantly and decreases as one moves north. With 1.3 inhabitants per km², the Yoko community has one of Cameroon's lowest density rates, whereas average density for the entire Center region is 54 inhabitants per km².
- The region is home to a multitude of indigenous peoples due to its geographic location at the intersection of various cultures and traditions. In particular, there are Fulas (Fulbes), Mboms, Gbayas, Dourous (Dii), Vutes (Koutines, Baboutes), Nyem-Nyem, Tikar, etc., mixed with peoples who have migrated from other regions (Bamileke, Kaka, Bassa, Toupouri, Beti, Fali, and many others), thus making the Adamawa a cultural melting pot par excellence.

- For the broader scope of the study (including the total population of the departments and communities), according to the 2012 figures, the population affected by the project would be:
 - 414,603 people in the Adamawa: 89,255 in the Djerem department and 325,348 in the Vina department,
 - 46,992 people in the Center region (31,722 for the Ntui community and 15,270 for the Yoko community).

The total population concerned by the project (according to the broader scope of the study, taking into account the total population of the departments and communities involved, and according to the 2012 figures) would be a little more than 500,000 people.

According to this approach, the average density found along the route of national highway 15 (RN15) is roughly 17 inhabitants per km², which, as shown above, is very probably an overestimated figure.

According to the field surveys conducted by the Consultant in February 2012, the 89 urban areas located directly along the project route between Batchenga and N'Gaoundere account for more than 500,000 inhabitants, as illustrated by the list of villages and village information in Appendix 6.



Source: Enquêtes socio-économiques projet d'aménagement de la route Ntui Ngaoundéré, STUDI international 2012

Figure 19: Demographic weight of villages

4.4.1.2 Ethnic groups and languages

Cameroonian languages were so numerous (between 250 and 300), so diverse (overlapping Niger-Congolese, Nilo-Saharan, Bantu, and Hamito-Semitic languages), and spoken by so few speakers that it seemed more practical to maintain French and English as the co-official languages when the country gained independence. In any case, at the time, no one was interested in the fate of the national languages, which were written little or not at all. To map out the ethnic overlap of Cameroon's population, it seems best to use north, south, and west to categorize the ethnic groups by project zone.

Several ethnic groups cover the project zone's geographical area. Conquests and forced labor (to which the populations were subjected when the Ntui-Tibati road was built in 1958) resulted in significant intermingling of populations. Numerous territories are occupied by several ethnic groups. The vanquished peoples were assimilated into the conquering tribes and lost their specific identity. This is particularly the case of the Vute and the Baveuck, which were dispersed and acculturated.

The highly complex intermingling of populations explains their current dispersion and sometimes makes it difficult to distinguish them from each other, the subjugated and the conquerors. It is however possible to identify the major, dominant groups as follows.

- The northern project zone, especially the Adamawa region, is dominated by Muslim Fulas, called Fulbe, and the Bororos, whose chiefdoms hold a dominant political position in the region and/or the country. For the past several centuries they have been the main spreaders of Islam, while the animist populations called Kirdi ("pagans") have generally avoided conversion to Islam. There are also Mboms, Hausas, Bayas, etc. in this region.
- The southern project zone (the Center region) is the region of the Bantu ethnic groups (Vute, Mbum, Baveuck, Etong, Baya, Bassa, Bafia, Boulou, Fulbe, Hausa, etc.), which are organized around their powerful chiefdoms even though they have not formed large political organizations but have instead experienced a fragmentation of authority at the family, lineage and clan levels.

This pluripartite and highly complex world is where the project zone's main languages of communication have developed: the Fula language, which is used in the northern part beginning in Tibati, and the Ewondo, Beti, Bassa, Boulou, and Pidgin English in the rest of the project zone. The consultant has not noticed the presence of pigmy population in the area.

4.4.1.3 Religions

Cameroon is a secular country composed of:

- roughly 70% Christians
 - Catholics (38.4% of the population) living in 22 dioceses,
 - Orthodox (0.5%),
 - Protestants (26.3% of the population) living mainly in the littoral zones and the Anglophone provinces in the northwest and southwest,

- Other Christians (4%);
- 20.9% Muslims, concentrated in the Adamawa, the North, the Far North, and the West (Bamum people);
- 5.6% animists (adepts of traditional religions live mainly in the West, South and East);
- 1% other religions;
- 3.2% free thinkers.

The project-zone population is mostly Christian (Catholics, Protestants, Evangelical Lutherans, Seventh-Day Adventists, Gallicans, Jehovah's Witnesses, and members of the Mission of Full Gospel). There are also Muslims, especially the Hausas, Bororos, and Fulbes.

4.4.1.4 Social and land organization

In general, all of the concerned social groups in Cameroon are structured around the tribe. Every tribe is tied to its land.

The project-zone populations are organized in villages and cantons. Each village is headed by a village chief who has the rank of third-degree chief. Several villages form a canton, the chief of which is a second-degree chief. These cantons are characterized by conservative values intrinsic to the clan, but open to innovating in areas of vital interest. The secular tradition of production by canton shows the tribes' predisposition to contributing to the growth of agriculture in the region, especially since each geographical area is the property of a given tribe or clan. The people are thus found around their traditional chief, who is the canton's guarantor.

After the clan comes in the family, the most viable institution of which is the extended family. It plays an economic role as a production and consumption unit, as well as a social role as guarantor of individual and collective well-being. The base of its social organization is the strength of custom and clan solidarity. Thus, beyond the extended family there is the clan, comprised of families having a common ancestor. The clan is not only an economic and residential unit like the family, but a strong source of solidarity between its members in all circumstances.

Men in the villages occupy a predominant place in relation to women, who may speak during meetings but play background roles. A few villages have more or less well-organized community organizations, such as the ICGs (Inter-Community Groups). Muslim villages whose chiefdoms hold a dominant political position in the country are also headed by third-degree chiefs, who report to second-degree chiefs called lamidos.

All development programs must take this social reality into account if they want to attain their objectives.

4.4.1.5 Land and land management

Land belongs to the clan's community. Occupying lands is the most common way of acceding to ownership. Families delimit their lands by watercourses, hunting trails, and objects abandoned or vegetation planted by their parents or grandparents. The people say

that the trees, cocoa plants and banana trees seen by the side of the road are not only a food source but also a “method for marking boundaries.” In fact the area behind a parcel on which banana trees are growing is the property of the family that planted the trees. While they constitute boundary markers, the banana trees located in the road’s right-of-way may be destroyed during rehabilitation work.

However, the populations in the project zone recognize the areas protected by the government.

4.4.1.6 Urban Organization

Houses are grouped together and people live along the road. In urban areas, more than 70% of the houses are built of fired brick or concrete, while in rural areas almost all the houses are built of unfired clay bricks and have straw or corrugated aluminum roofs and dirt floors.

Four urban centers characterize the project zone:

Ntui: The “county seat” of the Mbam and Kim department, Ntui enjoys an advantageous geographic location near the Sanaga River. As the main entrance/exit into and out of Mbam and Kim, this city will definitely experience commercial growth and strengthen its role as a north-south trading and transit center.

Yoko: This urban area comprises three villages (Mbamdi, Kounde, and Yoko Village) and seven districts located essentially in Yoko Village (North Yoko Baboute; South Yoko Baboute I, called the “Doux quarter”; South Yoko Baboute II, called the “Ntui quarter”; the Megang quarter, the Tikar quarter; and the Hausa quarter). The current administrative quarter and the new quarter currently under construction are located in this so-called urban ensemble. The rest of the Community is rural.

Tibati: This urban area is located in the Djerem department. The backbone of the Adamawa region, this city combines several villages and is a center for trade among the department’s villages, which gather on Friday’s for a communal market. The dam on the edge of the city makes it a city for fishers and fish.

N’Gaoundere: This is the largest urban center in the project zone. Most of the basic infrastructures are concentrated here, and it is experiencing commercial growth and an increase in its role in the transit and trade between Cameroon and Chad.

4.4.1.7. Types of land regimes

The traditional, or “customary,” land regime coexists with a “modern” land regime. Property rights are governed by the Constitution of 1972, amended 1996, which establishes the fundamental principles of protecting individuals’ rights, including property rights.

In addition, ordinances 74-1, 74-2, and 74-3 of July 6, 1974 are fundamental laws defining private property, the scope of the government’s public and private domains, and the national domain. According to this typology, there are four land-occupation statuses:

1. **Public government domain**
(chapter 1 of ordinances 74-1, 74-2, and 74-3 of July 6, 1974)

According to Article 2, all real and other property that, by its nature or intended use, are attributed to public use or public services are part of the public domain. Property in the public domain cannot be alienated.

2. Private government domain (chapter 1 of ordinances 74-1, 74-2, and 74-3 of July 6, 1974)

According to Article 10, the private government domain includes:

- lands supporting buildings, structures and developments built and maintained by the government,
- real and other property acquired by the government for free or for a fee according to common law rules,
- real estate that has devolved to the government pursuant to expropriations for reasons of public utility,
- lands withdrawn from the national domain by the government.

3. National domain (Title 3 of ordinances 74-1, 74-2, and 74-3 of July 6, 1974)

According to Article 14, these are lands that are neither in the public domain nor the property of a private titleholder. According to Article 15, lands in the national domain fall into 2 categories:

- occupied land, as shown by obvious human control of the land and probative valuable use (houses, farming, vegetable gardens, roads),
- totally unoccupied land.

Article 17 stipulates: customary groups, their members, or any other Cameroon national who, on the date this ordinance enters into force, exploits or occupies land in the first category of Article 15 shall continue to occupy and exploit them. They may obtain title deeds if they so request.

4. Private land (Title 2 of ordinances 74-1, 74-2, and 74-3 of July 6, 1974)

Private land is the subject of a legal title deed. There is no such land in rural areas.

4.4.1.8 Graves

In villages where the project will pass, the populations bury their dead in front of their houses, not far from the road. There are two types of tombs: cemented and not cemented, and sometimes even tiled. Some graves will obviously be destroyed during the work. To avoid conflicts between the residents and the company, the heirs must be compensated in accordance with the regulations in force before the work begins.

4.4.2. Economic activities along the route

4.4.2.1 Agriculture

Agriculture is the backbone of Cameroon's economy and the agricultural sector occupies nearly 68% of the active population.

Agriculture is the main activity of the populations in the project zone. It is shifting agriculture on burned areas without addition of fertilizer. Polyculture is widespread. Farming equipment is still rudimentary and labor is essentially provided by family members.

Field surveys made it possible to identify the main crops per village and per community, but it was not possible to determine the surface area per type of crop because the local populations are unaware of the precise surface area farmed. It was however possible to determine the largest crops by asking people to name, in order of size, the largest crops in terms of quantity. The results are presented in the table below. It is important to remember that in all the communities surveyed, farming is primarily for personal consumption. However, surplus production is sold to be able to buy basic foodstuffs and pay school and sanitation fees.

Analysis of types of farming per community (Table 14):

Community of Ntui: Cocoa is the largest crop (60.26%), then food crops such as black nightshade and amaranth (20.51%), manioc (12.82%), corn (1.28%), and various fruits and vegetables (5.13%).

Community of Yoko: Various fruits and vegetables are the largest crops (29.08%), followed by cocoa (21.28%) and manioc (27.66%), then black nightshade, amaranth, and other, minor vegetables (12.77%), and finally corn (9.22%).

Community of Tibati: Various fruits and vegetables (31.25%) and corn (31.25%) are the largest crops, then black nightshade, amaranth, and other, minor vegetables (22.32%), followed by manioc (14.29%) and cocoa (0.89%).

Community of Ngaoundal: Various fruits and vegetables (42.42%) are the biggest crop, followed by black nightshade, amaranth and other, less vegetables (24.24%), then corn (18.18%) and manioc (15.15%).

Community of Martap: Black nightshade, amaranth and other, minor vegetables make up 40% of the crops, followed by various fruits and vegetables, corn (24%), and manioc (4%).

Community of N'Gaoundere: Corn is the main crop (80%), followed by manioc (20%). These staples are rarely sold in raw form but mainly after being transformed into flour for preparing the traditional dish, "foufou."

Due to differences in weather and available soil types, it was possible to observe very high agricultural productivity and a wide variety of crops grown in varying proportions. Various vegetables and fruits were the largest crops on all the lands crossed (25.89%), followed by black nightshade and amaranth (19.54%), cocoa (19.80%), corn (16.5%), and manioc (18.27%) (Table 14 and Figure 13).

Table 20: Main agricultural activities per community

Communities	Various vegetables and fruits ²	Cocoa	Manioc	Corn	Other ³	Overall total (%)
Ntui	5.13%	60.26%	12.82%	1.28%	20.51%	100.00
Yoko	29.08%	21.28%	27.66%	9.22%	12.77%	100.00
Tibati	31.25%	0.89 k%	14.29%	31.25%	22.32%	100.00
Ngaoundal	42.42%	0.00%	15.15%	18.18%	24.24%	100.00
Martap	32.00%	0.00%	4.00%	24.00%	40.00%	100.00
N'Gaoundere	0.00%	0.00%	20.00%	80.00%	0.00%	100.00
Overall total (%)	25.89	19.80	18.27	16.50	19.54	100.00

Source: Enquêtes socioéconomiques STUDI INTERNATIONAL, 2012

Transformation:

Most households transform food products because it adds value. Most transformation involves manioc, which the farmers transform into tapioca or couscous, which may be kept for a long time (one years). The farmers also transform the manioc into more perishable manioc “sticks” or “bibolo.” In addition to the couscous mills found in most large cities, there are small units producing palm oil by hand, but only for household use for the time being.

Several villages through which the road will pass are beginning to gather and transform honey.

² Macabos, plantains, bananas, sweet potatoes, yams, peanuts, sugar cane, okra, and tomatoes.

³ Black nightshade, amaranth, and other, minor vegetables.

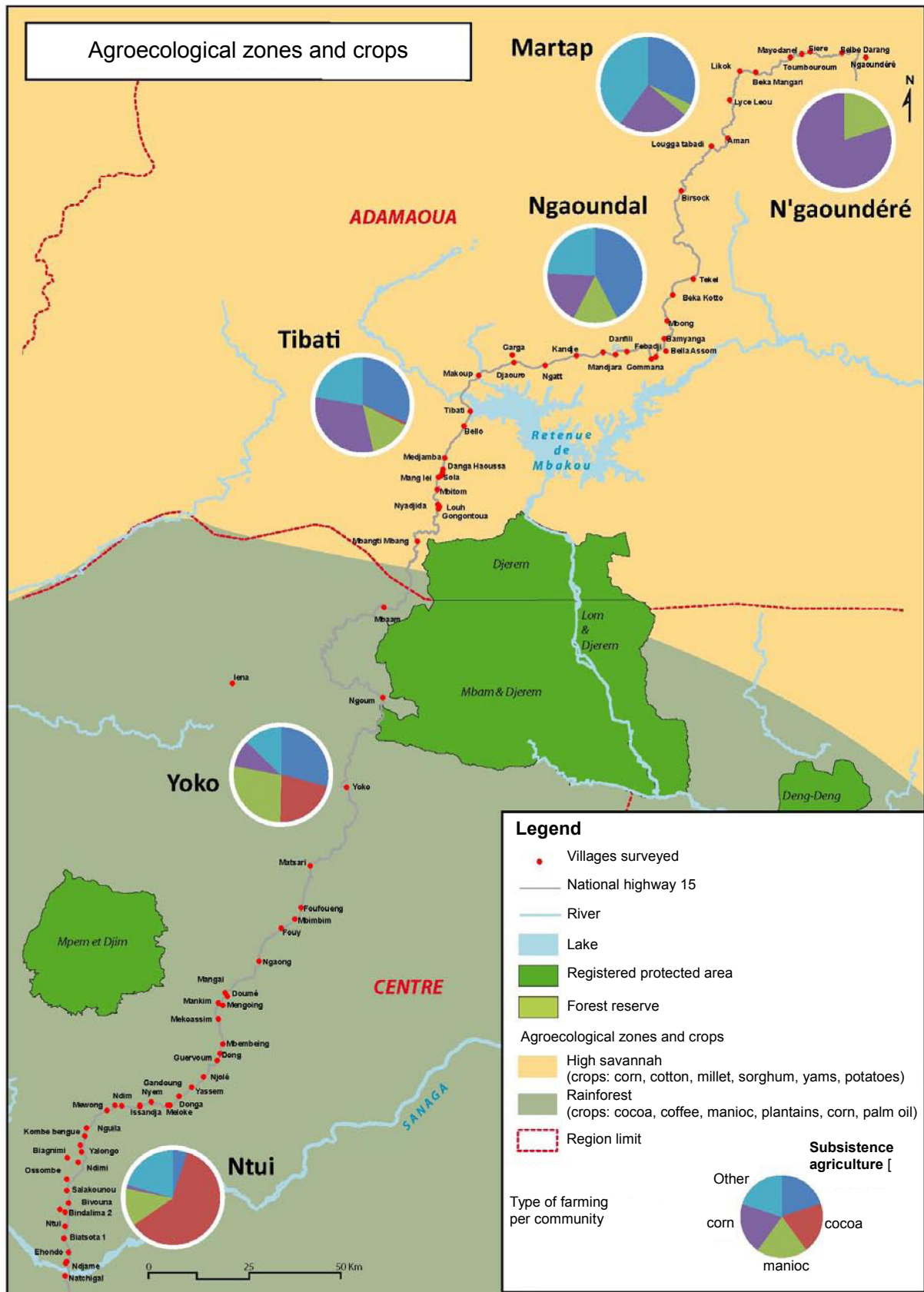


Figure 20: Agroecological zones and crops in the study area

4.4.2.2 Livestock farming

Livestock farming is an important development lever for the country. The country's livestock is currently estimated to be worth nearly XAF 950 billion and its contribution to the agricultural gross domestic product (GDP) is evaluated at 20%. Livestock farming is a predominant activity in the country and the study area: for 70% of the rural population it is a means to diversify their income source and 30% of the rural population lives exclusively from livestock farming.

Socioeconomically speaking, in addition to the role livestock farming plays in saving, it greatly contributes to improving agricultural production by maintaining soil fertility. In addition, the livestock are used to perform agricultural work and provide rural transportation. The industry's weight is therefore certainly underestimated today, since it does not take into consideration the following functions, which are fully integrated into livestock farming in Cameroon's rural economy: domestic animal production, draft and transportation animals, use of animal waste (cow dung, liquid manure, and bird droppings), miscellaneous manual transformations. The lack of studies on this aspect of livestock farming makes it impossible to evaluate the contribution of livestock farming to the country's economy.

Livestock farming's actual, precise contribution to the national economy is therefore difficult to evaluate given:

- the lack of precise production, consumption, and price data; and
- the use of data to evaluate the contribution of animal productions that do not reflect their actual socioeconomic value.

Beyond the value of the country's livestock, exploiting livestock has great potential to create downstream industries (meat transformation, dairy industry, tanneries, etc.) that would provide jobs when generated added value. Although these industries are developing only slowly for now, they have great future potential given the national and subregional markets and the large capacity of the productive base.

The surveys in the study area did not make it possible to determine the number of animals per village and community, as the villagers have only estimates of their herds. It was therefore decided to combine field observations with the verified statistical data from the livestock offices to determine the importance of livestock farming in the project zone.

Livestock is farmed traditionally in the project zone and provides social or financial security. All species are raised by roaming and the herd's size is very important. The species observed include cattle, sheep (for the most part raised in villages by the Fula), goats, and chickens. In the Center, livestock farming focuses mainly on goats (287,635), sheep (269,100), pigs (69,800), and cattle (31,985). In the Adamawa, cattle are the primary livestock (969,147), followed by sheep (122,423), goats (75,383), and pigs (5,676) (see the Table below).

Table 21: Provincial distribution of the country's various types of livestock

Region	Cattle	Sheep	Goats	Pigs	Fowl
Center	31,985	269,100	287,635	69,800	7,230,000
Adamawa	969,147	122,423	75,383	5,676	159,633
Total	1,001,132	391,523	363,018	75,476	7,389,633

Source: 2003 Annual Report of the 10 provincial livestock farming delegations

Transhumance:

There are livestock trails in the project zone that are used to herd livestock from the farming areas to market centers, transhumance areas, or other production areas. The transhumance corridors in the project zone have been subsumed into the livestock trails created by the Ministry of Livestock, Fisheries and Animal Industries (MINEPIA) under decree no. 2/Minepia of July 20, 1988. These trails are sometimes next to the existing roads or old colonial routes. The livestock trails are indicated above all along the Mbam and Djerem National Park and appropriate signs will be posted all along the route during road construction.

4.4.2.3 Fishing at the Sanaga bridge

In the community of Ntui:

The populations fish in the Sanaga and Afamba rivers and in other watercourses and marshes, some of which are far from the villages. The fish currently caught are: carp, catfish, viperfish, Nile perch, red tail catfish, sea catfish, and gudgeons. Shellfish such as crabs are sometimes caught.

Large catches are made from November to January (10-14 kilos/fisherman/day, sometimes up to 20 kilos). The most common technique is to use nets, as well as fish traps and fishing poles. An estimated 10% of the catch is for household consumption, and the rest is sold fresh or hand smoked if sales are poor, to prolong conservation. Fishers struggle with a lack of training in the most effective fishing techniques, difficult access to fishing equipment due to isolation and lack of purchasing power, and the fact that the SOSUCAM and the ADIC in Mbandjock dump their waste in the Sanaga River.

We encountered two camps of fishers, mostly Malians, in the project zone:

- at Nachtigal, with an average of thirty-five fishers;
- and Njame, with thirty-nine fishers.

Fishing is a secondary activity for the households that fish. There are fish-farming joint initiative groups (JIGs) in Ndjore and at Nachtigal *rive droite*. The fish produced there are either sold or consumed by the households. The fish farm at Nachtigal *rive droite* is not far from the river, which indicates that the agriculture in the area does not noticeably pollute the watercourses.

4.4.2.4 Fishing in the rest of the zone

In the community of Yoko:

Fishing is a periodic activity. The dry season is the best period for conducting this activity. It continues to be the work of individuals (men and women) who have a certain amount of energy, because one must sometimes walk 6 to 7 kilometers to reach rivers that have fish. Manual techniques are still used: nets; traps; lines, sometimes with the help of a canoe or raft, and damming. The main species caught are: catfish, panther catfish, viperfish, carp, char, pike, etc. Conservation techniques consist of placing the fish on a shelf and lighting a fire underneath. The income earned is a source for financing peoples' needs and projects, in particular in the areas of agriculture, healthcare, education, clothing, etc.

The camps located in the forest are often mixed camps of hunters, fishers, and gatherers, spending from several days to a full week conducting their activities.

In the community of Tibati:

Fishing is a very important activity in Tibati. Its source is mainly the Mbakaou reservoir (500 km²), which forms a shallow, very carved up lake (15 meters maximum depth) with usually low banks and abundant herbaceous aquatic plant life. There are numerous fish species and the fish that are caught are large. The nets used have a much looser mesh than those used elsewhere. Current production, estimated on the basis of partial data and cross-referencing, is about 3,000–3,400 tons/year, with some 1,500–2,000 fishers.

The high-quality fish available here is in high demand on markets such as the western and northwestern cities of Fouban, Bafoussam, Yaounde and N'Gaoundere, which may all be reached easily by road and/or rail. Roughly 70% to 75% of the production sold is smoked, and 25% to 30% is sold fresh, including about 10% that is frozen (in domestic freezers in Mbakaou and Tibati) and shipped to the cities mentioned above, where they arrive within 24 hours.

The purchase price is low (from XAF 100-200/kg for tilapia and XAF 300-400 for catfish and Nile perch) and the fish are sold for the same or even higher (quality) prices than the fish of other continental origin, or roughly XAF 850-1,200/kg in the large urban centers.

4.4.2.5 Forest exploitation

Industrial forest exploitation is the only industrial activity in the project zone. This is due to the Center region's enormous forestry potential (40% of the region's surface area is forest). Such forestry potential is an important economic advantage. The income gained from exploiting forest products (taxes based on volume and on surface area) amounts to more than XAF 250 million per year, according to Forestry and Fauna Ministry sources.

However, two of three economic operators are still active in the project zone: SIM, which subcontracts UFA No. 08-009 from INC; and Panagiotis Marelis, which exploits UFA 10-062. The others, the RC Coron's UFA 08-002 and SFB's 08-006, are experiencing internal operating problems preventing them from paying the RFA. UFA 08-008 has still not been attributed. In addition to these companies, the population puts pressure on the forest in its search for new agricultural lands, firewood, and pasture lands, as well as through unlawful manual exploitation.

Of the marketable wood species found, close to thirty are exploited: ayous, sapelli, doussie, bubinga, moabi, iroko, dibetou, sipo, kossipo, ebony, tiama, bilinga, aningre, bosse, azobe, bahia, bongo, eyong, longhi, movingui, frake, emien, ilomba, okan, onzanbili, niove, padouk, dabema, tali, etc.

In several villages in the project zone, forest exploitation is above all manual and there are small operators who use chainsaws in most cases. On average, each exploitation involves 7 or 8 individuals: a marketer, a team leader, a sawyer, an assistant sawyer, and 3 or 4 carriers. Those who have more money use more efficient, more practical, portable saws. No statistics are available yet on the volumes of wood logged in the zone. The illegal nature of operations makes it particularly difficult to gather statistics.

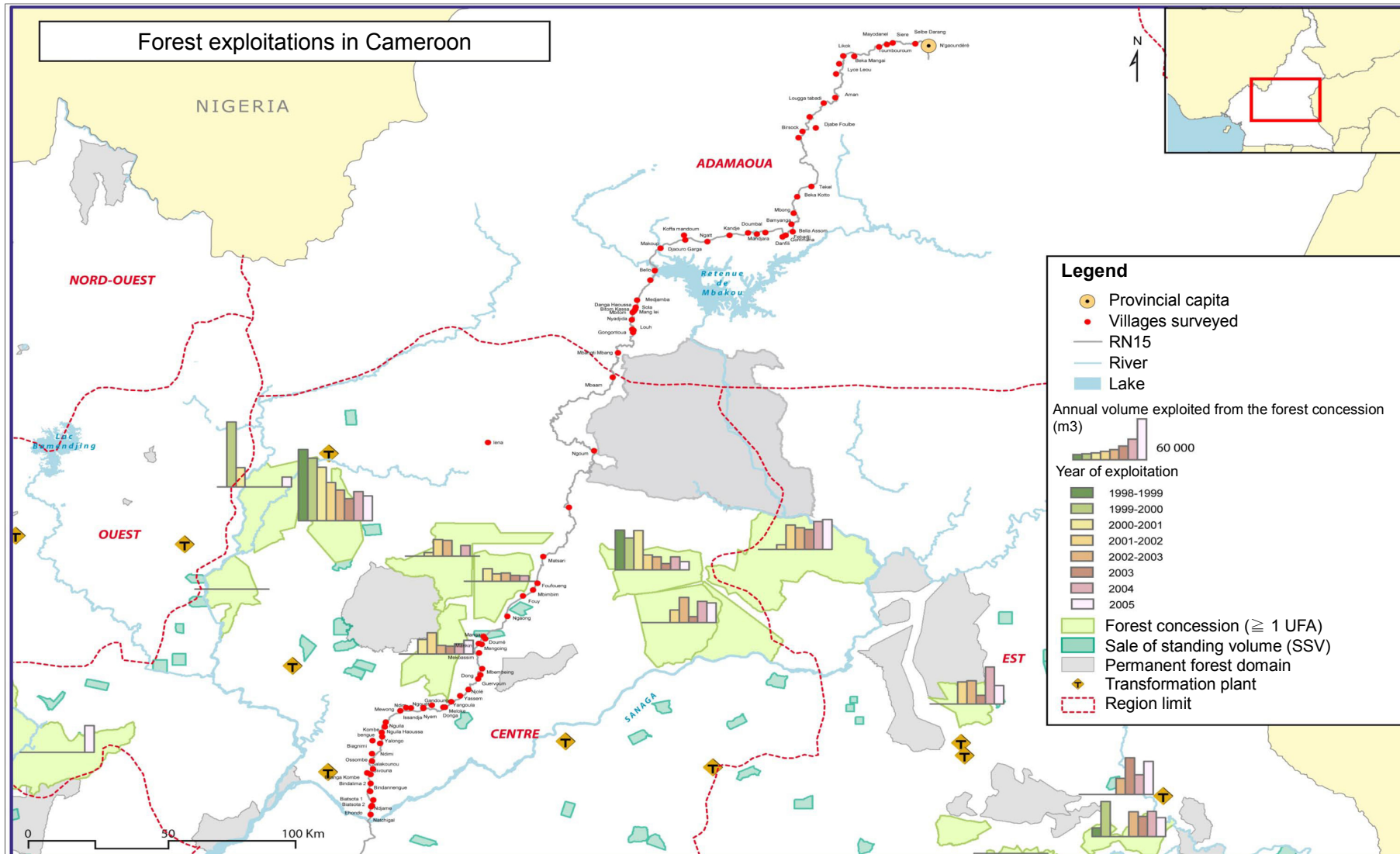
The village Communities, lineages and families claim ownership rights over forest resources based on traditional laws, and therefore feel they have the right to exploit them for their subsistence needs.

Not much wood is chopped for fuel, since cutting down plants provides enough firewood. However, chopping wood into small logs of 25 cm to 50 cm in length and splitting them is a lucrative activity for the marketer.

Exploitation of forest resources for energy purposes:

Chopping firewood and service wood is beginning to be a serious problem around the large urban centers and in relation to certain activities, such as fish smoking. It is estimated that 90% of the populations in the Adamawa region use wood or its derivatives as an energy source. All the woody areas immediately surrounding the city of N'Gaoundere have been attacked, including the replanted areas and especially the forest reserve, which has completely disappeared. Whereas some species were the most sought-after as firewood, all large species are now exploited. The logging ring now extends more than 120 km around the city. Wood consumption for the city of N'Gaoundere alone is estimated to be roughly 275,000 m³ per year. These large volumes are transported into the city on the two main roads, "the N'Gaoundere-Tibati road and the N'Gaoundere-Garoua road," which is the largest firewood supply road.

Despite this intense removal activity, there is no initiative to regenerate wood resources other than the IRAD initiative in the scope of the PAFRA project, which encourages farmers to invest in replanting. However, a study conducted in 2004 shows that planted trees contribute only 3% of the firewood supplied to N'Gaoundere. In such a context, there is naturally "a risk of being in a not-so-far off future faced with the need to institute energy-assistance systems of the same type as the food-assistance systems" (PNA, 2011).



Source: Enquêtes socio-économiques projet d'aménagement de la route Ntui N'gaoundéré, STUDI International 2012 et Atlas forestier interactif du Cameroun version 2.0 - WRI / GFW - Données mises à jour Juin 2011

Figure 21: Forest exploitations in Cameroon

4.4.2.6 Hunting and gathering

- Hunting

Answers regarding hunting were difficult and the population's answers were very vague. The consultant noted the predominant place occupied by game with the local populations for their daily diet and the existence of sales of game meat.

Animals are rare in the fallow fields and especially in the project's right-of-way zone (30 m), where the vegetation is seriously deteriorated, but one sometimes finds civet, African brush-tailed porcupine (Ngom), cane rats, striped ground squirrels (kuis-si), etc. Almost all these species are hunted for their meat and constitute a non-negligible source of protein for the local populations. However, households hunt very little and essentially for their own consumption. Their hunting technique is to use traps, and the most-hunted species is the cane rat (*Thryonomys swinderianus*), locally called "Mbeb."

Most of the bush meat eaten in the small restaurants in Ntui and Batchenga comes from the areas around Yoko, which still have a certain amount of wild species. Despite Camrail's efforts to track poachers, a significant amount of bush meat trafficking is conducted by rail, supplying the zone via the Batchenga train station. Poaching in the region is very preoccupying and measures must be taken to slow this activity.

- Gathering

Non-woody forest products and other freely available wild products are commonly used by most of the communities living in the zone. Edible wild plants and animals often constitute seasonal supplements during the hunger gap, supplement the diet throughout the year, and constitute emergency provisions during war or famine.

Wild resources therefore contribute significantly to subsistence in rural environments and to the national economy in the study area.

4.4.2.7 Crafts and tourism

Crafts are not very developed in the area and are not practiced to earn money. A few handmade products observed are mats, baskets, fish traps, grape baskets, and dryers made of woven lianas. More than 70% of the population (men and women) master the technique of weaving mats because this enables them to cover the roofs of their houses.

- **In Batchenga**

The Nachtigal falls, which take their name from the German who discovered them, are part of the touristic heritage of the region and of Cameroon in general. The upstream and downstream falls are both located upstream of the ferry crossing. These falls, which may become a tourist mecca, are accessible from a pedestrian trail that leaves the RN15, seven kilometers after Batchenga. A rudimentary wooden bridge functions as an observation deck. At the time of the study, the sites seemed abandoned, the trail being overrun with high grass.

Note that the Nachtigal dam construction project planned for 2012 will considerably reduce the water flow near the falls, resulting in the loss of the site's attractiveness to tourists due to the falls.

- **In Yoko**

This community has two national parks in the forest/savannah transition zone (ecotone). This means tourism is an activity to be encouraged and Yoko is a destination to be promoted. Tourists would be captivated by the natural phenomena here, such as the three-headed palm tree (see the figure below), the palm tree growing in another tree, and the marvels of Mount Fouy, the ancient history and culture of the region's peoples, the beautiful, rich landscape (numerous falls along the Djerem River, the park's salt marshes and prairies, the rich and varied fauna for visual tourism, the transitional forests, etc.).



Source: Studi International, 2012

Figure 22: The Mankim-head palm tree

- Tibati/N'Gaoundere:

There are several tourist attractions, including the following examples:

- Lake Tyson: this small volcanic-crater lake, surrounded by trees, is a great place to relax. Legend has it that the lake's waters change colors, so watch them closely.
- Lake Mbalang: located about twenty kilometers west of the city, Lake Mbalang is a pretty, volcanic-crater lake that has a small, wooded island in the middle.
- Vina Lake: hippopotami and crocodiles live here. About fifteen kilometers from N'Gaoundere, the Vina Falls are less spectacular than the Tello Falls, but are still worth a trip to enjoy the landscape and quiet. A long history of volcanoes left a number crater lakes in the region. The best known are Tison and Mbalang, close to N'Gaoundere.
- Tello Falls: about fifty kilometers east of N'Gaoundere, on the Belel road (or rather, trail), Tello Falls are also worth the trip. These spectacular falls spill down from a height of 45 meters, forming a curtain in front of a giant cave accessible from the side of the falls.

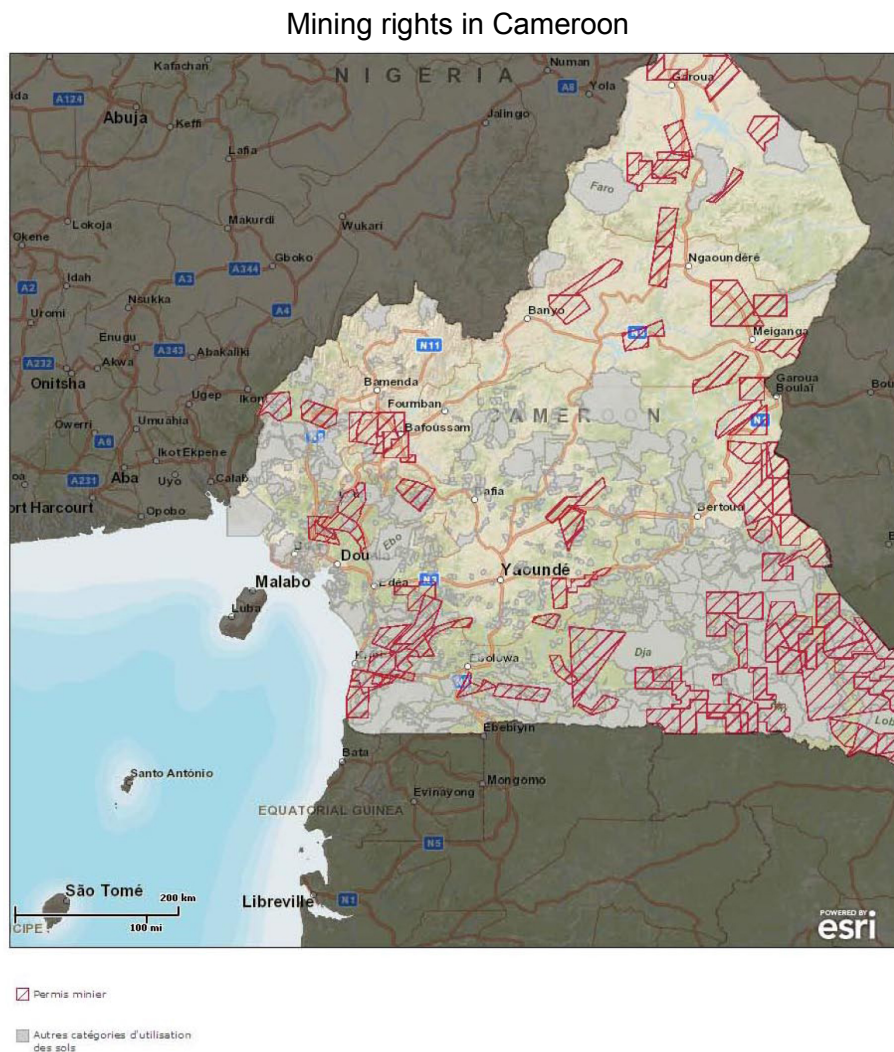
Other attractions in the N'Gaoundere area include the N'Gaoundere mosque, Lake Tyson, Lake Mbalang, Vina Lake and the Beni Falls, Lancrenon Falls (which, falling

from a height of 100 meters, are unforgettable), and the Hossere, Damougare, and Nyem Nyem caves, the latter of which were a refuge for the Nyem Nyem people when they were fighting the Germans. There is a commemoration of these events every year.

4.4.2.8 Industry and mines

Industrial activity in the two departments is not very developed and limited to the agricultural industry. In addition, sand is extracted, on the one hand, by SARL Bremond, an SMC established in Ekombitie that employs 37 people, and on the other by small individual extractors. Sand is extracted from the Sanaga when the water level is low and in the village river when the water level is high (July-August). In Nachtigal, residents collect sand from the foot of the falls and transport it by canoe for delivery along the Ntui bank. Bauxite and sapphire mines are currently in operation.

Figure 23: Industrial activities in the study area



4.4.3. Living environment and socio-collective infrastructures

4.4.3.1 Education

The results of the survey and the literature are summarized below and presented by community:

- Description of the infrastructures in the Community of Ntui:

We count 19 public schools, one high school, and one private nursery school. And in addition to its standard high school, Ntui has a technical high school and the ENIEG (national teachers' school).

Most of the teachers assigned to these schools live in Yaounde and make regular trips from their residence to work. The condition of the RN15 and the ferry's malfunctioning has decreased the means of transportation while increasing their costs as a corollary due to the irregularity of teachers' presence in the classroom.

- Description of the infrastructures in the Community of Yoko:

In the urban area:

we count four francophone primary schools with a full cycle, two of which are public and two of which are religious (one Catholic and one Lutheran), and two francophone nursery schools (one public and one private Catholic).

There is also a primary school with an incomplete cycle in Kounde. This coverage, which at first seems satisfactory, is in fact inadequate because it is not representative of the bilingualism characterizing Cameroon. There is also a Franco-Islamic school.

In the rural area:

we count 28 primary schools overall (18 of which are located on the RN15), with 55 classrooms of permanent construction in good condition and 17 classrooms that are in poor condition or are made of flimsy materials. There are a total of 2,060 students for 52 civil servants and 25 untrained teachers, and 943 old-fashioned 2-seater desks corresponding to 1,886 seats (*source*: Yoko community development plan, 2011).

With regard to secondary education, there is a full-cycle high school and a CETIC (Center for African Excellence in Information and Communication Technologies) that has four industrial options and a marketing section, but the infrastructures are inadequate.

Professional training is represented by the SAR-SM (rural crafts section and household section), which has four study options, but the number of students has increased significantly, causing problems of classroom overcrowding. There is also a lack of personnel and teaching materials.

Education is supervised in the rural area by 3 CESs (secondary education colleges), which together have 5 permanent classrooms in good condition, 23 2-seater desks (46 seats), and 79 students for 10 teachers.

- Description of the infrastructures in the Community of Tibati:

We count 20 primary schools, a bilingual high school, a technical high school, and a secondary education college (CES).

- Description of the infrastructures in the Community of Ngaoundal:

There are 12 primary schools unevenly distributed among the villages located along the RN15, and CES in the village of Danfili. Most of the students go to Ngaoundal to pursue their secondary studies.

- Description of the infrastructures in the Community of Martap:

There are 9 primary schools in the villages located along the RN15.

- Description of the infrastructures in the Community of N'Gaoundere:

In the urban area:

we count a university and several private and public professional training centers.

In the rural area:

We count 4 primary schools.

Analysis of the data indicates that there are a lot of primary schools in the study area departments, but the nursery schools are primarily in the cities and there are not enough of them.

In addition, there are very few high schools and, given the transportation difficulties and lack of housing, those who want their children to pursue secondary studies generally must send them to family members living in the city.

As for professional training and universities, only the cities offer such options, which are therefore poorly represented and require young people to go to the big cities like Yaounde and N'Gaoundere to pursue higher education.

Despite the high number of primary schools all along RN15, the education rate remains low, even though there are many children of school age in several villages. The low education rate may be due to the total lack of schools in some villages, as well as by the distance to school and the lack of teachers in some schools. Several of the schools lack infrastructures, and most are dilapidated and poorly equipped. In some cases, the schools are supported by the students' parents or the village community.

During field visits, it was noted that none of the schools are secured by fences and there are no latrines or even a source of drinking water. In addition, the teachers sorely lack housing.

Analysis of the results of the surveys indicates that the Center and Adamawa regions have the appropriate number of schools, but their poor condition and lack of outfitting affects the attendance rate in these schools and the quality of the education dispensed there.

4.4.3.2. Health

Diseases present in the project zone:

Numerous diseases are currently diagnosed in health consultations. The project is located in a hot, humid area propitious for the development of vector-transmitted endemics, the most important of which are malaria, elephantiasis, and bacterial, fungal, and viral infections. According to the literature, nearly 70% of the population has nematodes (intestinal

parasites), but as in all equatorial zones, malaria continues to be the most deadly disease (47% of deaths), followed by severe anemia, hypertension, tuberculosis, AIDS, and typhoid.

The “Batchenga” project starts in the Mbam elephantiasis foyer. The most common elephantiasis is **Onchocerciasis, or “river blindness,”** caused by *Onchocerca volvuli*. Blindness is the most serious consequence of this disease which, although it is not deadly, reduces life expectancy by 10 to 15 years. Onchocerciasis also causes an ugly skin disease with depigmentation and severe, unrelenting itching. The second cause of blindness in the world (UN Flash, 2006), Onchocerciasis is transmitted to humans through the bites of infected *Simulium* blackflies (*Simulium squamosum*), which breed in fast-flowing streams and rivers, such as the Sanaga.

Specific case of HIV/AIDS in the project zone:

Testing for HIV/AIDS in the project zone is done at the patient's request or authorization. Condoms are available, but the populations do not ask for them much. Under the auspices of the association network, RAFAY, and with the assistance of ACMS (Cameroon Social Marketing Association), local anti-HIV/AIDS committees are working to raise awareness among the populations. Most of the villages in the zone are STDs/HIV/AIDS propagation sites due to inadequate sensitization campaigns of STDs/HIV/AIDS, sexual promiscuity, sexual activity at a young age, and the presence of forestry companies.

Health situation in the project zone:

The field surveys indicate that the project zone is covered by three district hospitals (DHs) (in Ntui, Yoko, and Tibati), twelve integrated healthcare centers (IHCs), a few district medical centers (DMCs), and urban dispensaries. The district hospitals in the urban centers of Ntui, Yoko, and Tibati each have a pharmacy, hospital rooms, a laboratory, a maternity ward, and transportation means in poor condition.

The field analysis indicates that the IHCs in the villages are very rundown and suffer from a lack of medical equipment and personnel, hence the constant reliance on the large health centers. The poor condition of the road and the lack of a permanent connection between the departments makes it difficult to evacuate the seriously ill and to ensure that the IHCs are staffed.

The inadequacy of the infrastructures is related to above all those being inadequately equipped. In particular, they lack fences around the IHCs, latrines, and methods for treating DH waste, as well as water. In addition, almost all the furnishings, in particular sickbeds and birthing equipment, are in poor condition, and there are no incinerators at all.

In conclusion, the project zone has inadequate healthcare coverage. Overall, the health centers do not have adequate medical staff, lack basic equipment, and the pharmacies have very few supplies. None of the centers has electricity or drinking water or is secured by a fence.

4.4.3.3 Transportation

Transportation is given priority in the development context in Cameroon, which has an impressive transportation network but is currently experience constant deterioration and various problems: the transportation system is not integrated, the roads are in poor condition,

there are not enough means of transportation and those that are available are not rotated enough, etc.

In the project's area of direct impact, there is ground, rail, and river transportation.

The RN15 of the unpaved priority network crosses the project zone of Batchenga, Ntui, Yoko, Tibati, N'Gaoundere.

Ground transportation is provided by private vehicles called "opep" (vehicles providing transportation without legal authorization), travel agency minivans, and utility vehicles (pick-up trucks). Young people also operate taxi motorcycles, providing a partial solution to the isolation of certain areas where roads are either non-existent or inaccessible to 4-wheeled vehicles.

Batchenga and N'Gaoundere are also linked by rail, but the train has the reputation of being slow and expensive. It is used more for transporting merchandise.

River transportation is limited to the Sanaga and concerns primarily the ferry, which this project intends to eliminate. There are however canoes, which serve above all for fishing and sand extraction activities, and occasionally for crossing the Sanaga when the ferry is not functioning.

4.4.3.4 Postal service and telecommunications network

The zone has gone straight from total isolation (no cell phones) to almost complete opening up due to the coverage of most of the villages in the project zone by mobile networks. This enables them to stay informed about fluctuations in food prices in Yaounde, where they sell most of their food production.

There is also CRTV radio reception in all the villages in the zone, and television in many of them.

The presence of these communication tools will be advantageous for the project team, which can use them to quickly manage information, especially if warned of danger.

There are a few telecommunications pylons on the edges of the platform along the RN15, including those at PK 31+000 (Ossombe village) and PK 49+000 (Nguila village).

4.4.3.5 Markets

The largest markets in the project zone are located in Ntui, Yoko, Tibati, Danfil, and N'Gaoundere. Small markets also spring up along the edge of the road in the large villages, which limits the right-of-way somewhat (30 m). There are also communal markets once a week in the large villages and urban centers.

4.4.3.6 Places of worship

There are churches in practically all the villages along the route, with mosques in the villages inhabited by Muslims. None of these places of worship are in the road's right-of-way.

4.4.3.7 Water supply

Field observations and surveys indicate that the populations obtain water from undeveloped sources, traditional wells, watercourses, and possibly developed water sources (modern wells, “Volanta” boreholes, developed sources). These infrastructures are mostly traditional and built by the communities themselves or by donors such as Cameroon Oil Transportation Company (COTCO), the National Plan for Participative Development (NPPD), forestry companies, and cooperation missions. Some urban centers in the project zone, such as Yoko, have a drinking water supply system. Water is distributed through a supply system set up by the community and consisting of collecting spring water (3 springs), storing it in an underground tank, and distributing it in the city.

The people obtain water from the city's fifteen (15) fountains and the homes of the most affluent (we count 97) are hooked up to the supply system. Tibati also has a drinking water supply system and boreholes. Beka_Kotto has 9 fountains that supply the village.

We count more than one hundred drinking water sources in the villages, comprising 30 boreholes in good condition, 16 non-functioning boreholes, 10 developed wells in good condition, and 28 non-functioning developed wells and open wells, plus 30 undeveloped sources and 4 developed sources distributed in almost all the villages. Some of these wells produce good-quality water in sufficient quantities. Water from these water sources is used for drinking and cooking. Some water sources provide water of approximate quality and run dry during the dry season, causing an increase in waterborne diseases such as amoebic dysentery, typhoid fever, cholera, and parasitosis.

In conclusion, the number of infrastructures remains insufficient and overall, water flow is very low due to either the surface water drying up during the dry season or to a lack of maintenance. It is important to note that numerous boreholes in several villages do not function and the populations suffer from a lack of water, especially in the villages after Yoko, where water is becoming increasingly rare. Access to drinking water therefore continues to be a major problem even in the most-well-served urban centers, especially since the boreholes that could have mitigated this problem have never been fully operational.

4.4.3.8 Sanitation

Traditional latrines, defined here as a simple board or slab placed across a ditch of greater or lesser depth, are the main type of toilet used by the rural populations throughout the project zone. When use of this type of latrine is less developed, as is the case in some villages, this indicates greater use of nature as a secondary toilet. In the urban centers (Ntui, Yoko, Tibati, Danfili, and N'Gaoundere), there is better use of improved latrines. It is important to underscore that the type of toilet is a socioeconomic factor underlying poverty, just like the educational level of the mother, drinking-water quality, the parents' employment situation, the household's living standard, the health situation, and the availability of food.

4.4.3.9 Energy supply

Electricity is not connected equally in all the villages in the project zone even though a high-voltage power line runs through them. The lack of electricity in the villages is due to the lack of adequate transformers for medium- to low-voltage power. Even when a village is

connected, power failures can last a week, which creates real frustration among the populations.

Sonel supplies electricity to the urban localities in the project zone. It has installed thermal power and electrical energy distribution plant.

In Ntui, the electrical supply network on the road being studied stretches over 22 km, generating from “Ntui” and supplying the village of “Natchigal” where the project starts, and ending in “Biagnimi,” at PK22+000.

In Yoko, electricity is supplied by AES Sonel, under financing from the rural electrification agency (REA), which installed a thermal power and electrical energy distribution plant in the locality and supplies the entire city except for the new administrative quarter and the villages of Kounde and Mbamdi. This is a low-voltage line, which is sometimes disrupted by tree branches falling on the lines, brushfires, etc.

The SAR-SM has a 300 kw generator, but only about 140 kw are used. This is a potential that may be exploited for least-well-supplied villages. Despite their being included politically in the urban area, Kounde and Mbamdi do not have access to the electricity supply.

The cities of Tibati and N’Gaoundere also have electricity networks.

The other villages are connected to the AES Sonel network. The population obtains electrical energy through generators. There are roughly 120 private generators in all the villages crossed by the road. They belong to private individuals. Only two or three villages have shared, large capacity generators that supply several households in the village center. There are large-capacity generators in the villages of Mba’am and Njole, but they have not yet worked due to the lack of financial means and expertise needed to install them.

In addition to these sources of energy, some private individuals in/near Yoko use solar panels. Other energy sources include the oil lamps known in the villages. This extreme lack of adequate electricity is a real obstacle to developing economic activities, and in particular the emergence of companies transforming agricultural products.

Firewood is the energy source most available to and most used by households. The annual clearing of trees to create fields constitutes an important stock of firewood.

5 ANALYSIS OF ALTERNATIVE SOLUTIONS

5.1 Option adopted and justification

The project proposed by the consultancy firm follows the existing alignment, in agreement with the Administration and the authorities, in order to:

- Serve as effectively as possible all the towns and villages along the roadway and improve their living conditions;
- Reduce expropriations as much as possible, as well as the risks of isolation and population displacements;
- Reduce new road construction costs;
- Maintain some parts of the existing road, hydraulic structures or existing bridges.

5.2 “No-project” alternative

5.2.1.1 Consequences for the environment

With regard to the environment, it should be noted that the other disadvantages related to transport difficulties are:

- Risks of accidents for people and goods, due to the difficulties of transport and to frequent accidents between logging trucks and private vehicles;
- Less effective protection of protected zones.

5.2.1.2 Consequences for the socio-economic environment

The surveys conducted among the local populations show that construction of the road has been expected for a long time.

Frustration among local populations and development actors

Non-implementation of the project would risk intensifying the feeling of frustration that the local populations of the project area already feel.

This is because the non-implementation of the project would make the dominant trends observed in the assessment area continue: isolation and multiple problems (i) difficulties of serving villages and towns; (ii) difficulties in access to schools; (iii) difficulty transporting persons with serious illness/injury to the major hospitals in Yaoundé and Ngaoundéré; (iv) dropout among public service personnel (schools, health centers) due to high cost and insecurity of the current forms of transportation, etc.

Continued impoverishment of the local populations and slowdown of development

In the event of non-implementation of the project, economic growth of the departments and trade exchanges with the other regions of the country will be strongly handicapped and will probably lead to worsening of poverty. Indeed, the trafficability of RN 15 strongly influences the mobility of the population and the transport of agricultural production (especially cacao),

which is their main source of income. It can also be noted that, despite their significant agricultural potential, Mbam and Kim and the other departments are handicapped by the state of road infrastructures, which discourages investors and economic operators.

5.2.1.3 Assessment of the “no-project” alternative

Opting to not implement the project (no-project alternative) would be tantamount to partly “forgetting” these local communities in the regional development plan and excluding them from poverty-reduction programs. Thus, to achieve the objectives assigned to the project by the national authorities and address the problems it aims to resolve, “the no-project scenario” is not to be recommended insofar as it runs counter to the economic and social development policies prioritized by the government.

In light of all these risks and constraints related to the transport difficulties, it appears necessary to construct the Batchenga – Ntui – Yoko – Tibati – Ngaoundéré road.

5.3 Positive effects of the project

The advantages of economic prosperity brought on by construction of the road, such as:

- Development of job opportunities during the roadwork and launch of use;
- Improvement in the living conditions and lifestyles of the local communities;
- Improvement of the transport infrastructures connecting the towns of Yoko, Tibati, and Ngaoundéré;
- Improvement in exchanges between Cameroon and Chad;
- Providing the completion of the Douala – Yaoundé – N'Djamena international connection, by using the shortest route;
- It will consolidate Cameroon's use as a transit country, the international reputation of its transport infrastructures, and its position as a hub of trade exchanges in Central Africa.

6 CONSULTING AND INFORMING THE PUBLIC

6.1 Methodology for public consultations

The overall objective of public consultations was to stir up stakeholder interest in the development of their Community via the infrastructure project, and this through information and awareness-raising meetings on the study in general and on the socio-economic study in particular, with special emphasis on the participative and gender approach.

Furthermore, the public consultation made it possible to:

- identify and analyze the gender-related problems;
- estimate the time that men and women devote to their various activities;
- evaluate the volume of work of women and men;
- find out about the roles allocated to women, men, and children;
- highlight existing unbalances in decision-making;
- identify the representativeness of women, men, young people, and the disabled in institutions, as well as the quality of their intervention;
- identify the social and economic status of women.

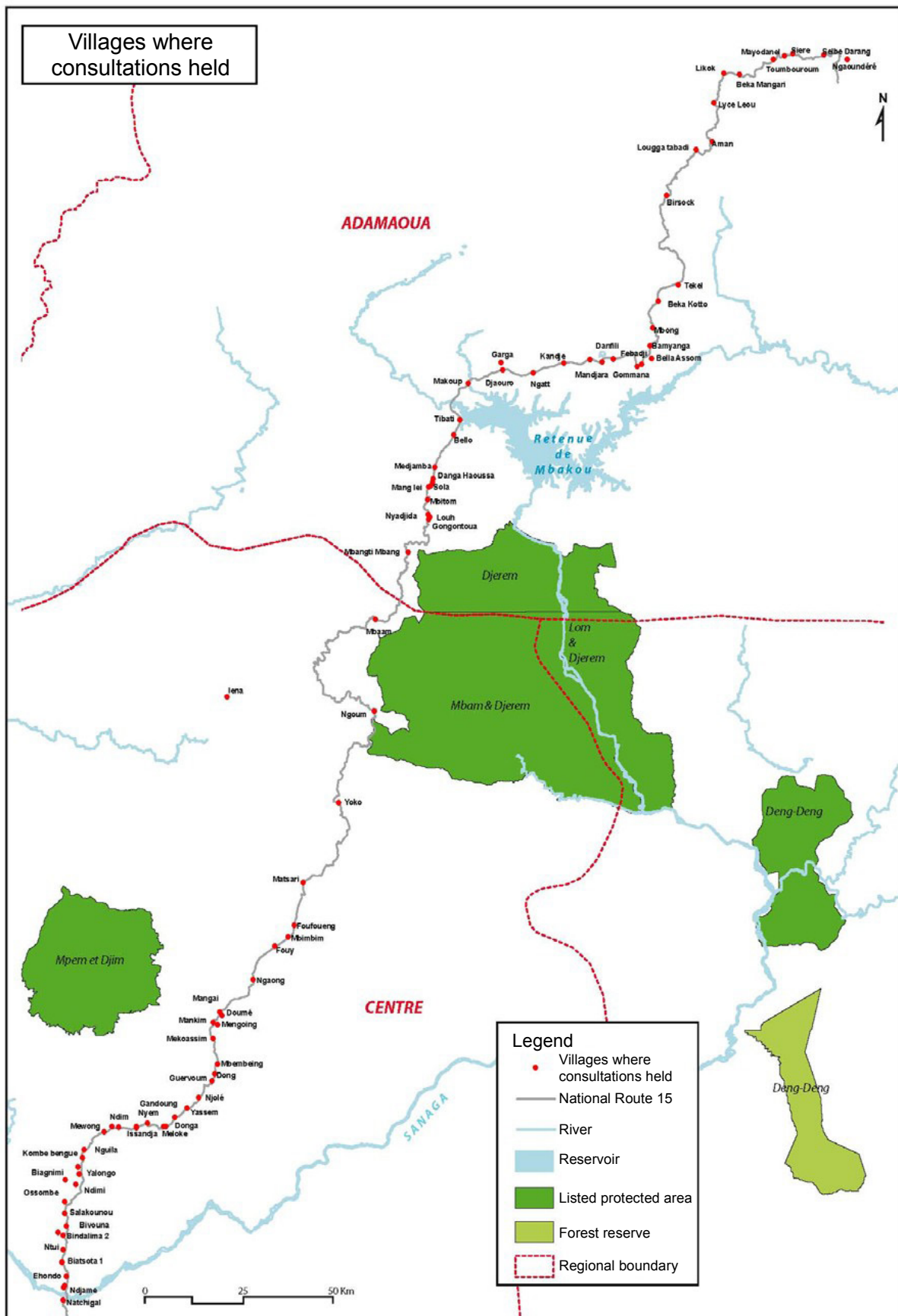
The public consultation sessions were held from February 17 to March 1, 2012, in 87 villages (table below) directly affected by the road. In any project, the community must be informed about the characteristics of the project and their consequences on the local population. Public consultation is a crucial stage during which the local population expresses its opinion on the project and acquires ownership of it.

These meetings were attended by the local authorities, the notables, and the representatives of various categories of the community, bringing together representatives of women, farmers, herdsmen, and young people (cf. list of attendees at the consultations and the signed minutes in Appendices 3 and 4, Questionnaires in Appendix 5).

These meetings were most often held in the village public square after the local population had been informed by the village chief. The meetings began with the presentation by the Head of Mission. After having given the objectives sought by the public consultation, he presented the project and its activities. Then, the consultant in charge of carrying out the study began the interview. The fruitful and sincere exchanges that took place between the mission team and the local populations provided interesting results.

Table 22: Public consultation

Department	Region/town	Number of villages	Number of participants		
			Men	Women	Total
MBAM AND KIM	NTUI	17 village(s)	339	50	389
MBAM AND KIM	YOKO	26 village(s)	469	26	495
DJEREM	TIBATI	19 village(s)	241	25	266
DJEREM	NGAOUNDAL	6 village(s)	79	6	85
DJEREM	NGAOUNDAL	1 village(s)	12	1	13
VINA	MARTAP	11 village(s)	80	10	90
VINA	NGAOUNDERE	3 village(s)	12	2	14



Source: Ntui Ngaoundéré Road Development Project Socio-economic Survey, STUDI International 2012

Figure 24: Map of villages where the public consultations were held

6.2 Results of public consultations

During the public consultation sessions, the people attending were very cooperative and enthusiastic with regard to the initiation of the project study (cf. Appendix 4 Minutes with the various stakeholders).

Following analysis of the public consultation forms, it was observed that the participants from the 87 villages and neighborhoods opted for not having the road diverted from their village. The topic of compensation for property was discussed at length, and the consultant reassured the local population on the state's commitment to see that an FRP was set up.

To conclude, the participants insisted on:

- Involvement by the local populations in the project's implementation;
- The long-term security of the structures and the population;
- Providing for sidewalks for pedestrians;
- Providing for maintenance measures;
- Providing for speed bumps on both sides of the structures to limit vehicle speed;
- Guaranteeing security measures for pedestrians and vehicles;
- Complying with compensation procedures: special attention must be paid to the cost of compensation for fruit trees, because the population depends on seasonal harvests;
- Respect for religious rites in the event that tombs or cemeteries must be displaced.

Many proposals for related measures were suggested (cf. Appendix 4 Minutes with the various stakeholders). Several measures were proposed and included in the ESMP, to guarantee proper integration of the project into its environment:

- Support measures for women in order to increase their income via income-generating activities, or through training by an agricultural technician and distribution of agricultural equipment (detailed in Paragraph 6.2.5.16);
- Measures to improve schooling for children, through building schools and providing equipment for them (detailed in Paragraph 6.2.5.17);
- Measures to improve health care, by building integrated health centers (CSIs) and equipping them (detailed in Paragraph 6.2.5.18);
- Measures to support transhumance, by building watering places for livestock and rest stops (detailed in Paragraph 6.2.5.21).

7 IDENTIFICATION AND ANALYSIS OF THE POTENTIAL IMPACT OF THE PROJECT ON THE ENVIRONMENT

7.1 Identification methodology of the impacts of the project

Impacts identification is based on the principle of impacts sources intersection during and after the construction, with the impacted sides: it is the **Leopold Matrix method**.

- **the impacts receptors**

These are the Valued Environment Components (VEC) which may potentially be affected by the planned works. These VECs described in Chapter 6 are distributed between three components groups:

- the physical environment (air, soil, surface water and ground water, road)
- the biological environment (plant life, wildlife, wetlands)
- the social, economic and human environment (road safety, health, transportation conditions, employment and income, agriculture, economic activities, population and community life).

- **the sources of impacts**

These are the various activities following the project and which may have consequences on the environment. These sources are divided between the following two groups depending on the period when they appear:

- During the implementation phase of the construction work

The selected actions include the whole building operations of the building site, civil engineering works related to construction and access points, roads building.

In addition to the constructions, the staffs' recruitment and their presence in the building site are considered as sources of impacts on the human environment through the conflicts risks with local populations and propagation of STIs/AIDS.

- During the operational phase of the road

Listed actions concern the incidence of the following: the **physical presence** of the work and the environment impacts that might appear following **its use** and the maintenance work.

The consistency of these works has been described previously in chapter 5 in order to highlight all the various activities of the project that may have an impact on the environment. Similarly, chapter 6 description of the project environment made it possible to bring out the various environment sensitivities of the site from the planned works viewpoint.

7.1.1 Impacts characterization and assessment

7.1.1.1 Impacts characterization

Impacts are described in order to foster the determination of their significance. Five criteria have been used for impacts characterization: its nature, the component value, intensity, range and duration.

- **The nature** of the impact indicates if the impact is negative or positive,
- **The value of the component:** indicates if the value is high, medium or low
- **The intensity** or scale expresses the degree of disturbance of the environment, depending on the vulnerability of the component studied; three classes are considered: high, medium and low;
- **The range** gives an idea of the impact spatial coverage. Three classes have also been set apart here: punctual, local and regional;
- **The duration** of the impact indicates the expression of the impact through the time; we talk about short term to indicate an impact which will appears during the project implementation and less than one year later; middle term when the impact appears more than one year after the project implementation; and long term in order to qualify impacts which appear from the project implementation and continue during the operation phase and after one year.

Because this exercise implies value judgments, the results of this characterization follow the consensus between the experts of the study team. The table below shows the main qualifications and symbolism of the different characterization parameters.

7.1.1.2 Impacts assessment

Impacts assessment is based on the FECTEAU method (simplified) which only takes into account three characterization criteria (intensity, duration, and range). The objective of the assessment is to grant absolute significance to the expected impacts due to the combination of the three criteria recalled previously. The following table presents the combination key of the different criteria. The Fecteau method respects the following principles:

- Each parameter used in order to determine the significance has the same weight,
- if two different parameters have the same level of seriousness, they are granted the value corresponding to this level regardless of the level of seriousness of the third criterion,
- if the three parameter values are different, a medium significance value is granted.

The absolute significance may be major, medium or minor and enable to determine the order of priority upon which the impacts shall be avoided, attenuated or compensated.

Finally, the overall assessment of the project on the environment is only obtained based on the **residual impacts** after the proposed environmental measures have been applied.

Table 23: Qualifications and symbolism of the different characterization parameters

Parameters	Qualification and symbolism
Nature	Negative (-) or positive (+)
Constituting value	High, medium or low
Intensity	High, medium or low
Range	Punctual, local or regional
Duration	Temporary (short term) Lasting

Table 24: Combination key of the different criteria

Intensity	Scope/range	Duration	Absolute significance
High	National	Long term	Major
		Middle term	Major
		Short term	Major
	Regional	Long term	Major
		Middle term	Medium
		Short term	Medium
	Local	Long term	Major
		Middle term	Medium
		Short term	Minor
Medium	National	Long term	Major
		Middle term	Medium
		Short term	Medium
	Regional	Long term	Medium
		Middle term	Medium
		Short term	Medium
	Local	Long term	Medium
		Middle term	Medium
		Short term	Minor
Low	National	Long term	Major
		Middle term	Medium
		Short term	Minor
	Regional	Long term	Medium
		Middle term	Medium
		Short term	Minor
	Local	Long term	Minor
		Middle term	Minor
		Short term	Minor

The following paragraphs describe the potential impacts of the project divided into two groups depending on the period when they appear: the work phase and the operating phase. Identified potential impacts take into account the consultation meetings, the interviews with the resource persons, observation on the field and experience acquired by the team experts through environment management for other projects.

7.2 Impacts sources from the project

The various activities related to the works and inputs which are associated constitute potential nuisances and impacts for the biophysical and social environment. A detailed description enables to identify and quantify these activities.

7.2.1 Project activities and tasks typology

The main activities related to the road projects implementation are related to:

- the building site facilities;
- the civil engineering operations related to the road construction;
- the exploitation of borrow areas and quarries.

7.2.2 Building site facilities setting

Building site facilities include car park for the material such as heavy equipment and vehicles, offices and managers housing, materials and other aggregates storage areas, combustible storages, concrete batching plants, etc. These facilities require appropriate locations considering their specific sensitivities according to the pollution point of view.

The building site base also includes a garage for vehicles and heavy equipment maintenance. Due to the pollution potential of the wastes that will be generated here, this site should be developed and managed in such a way that any pollution of the environment is avoided or softened.

7.2.3 Materials transportation/machines traffic

The movements of the materials and staffs transportation vehicles and heavy equipment may become important impacts sources, especially negative ones. It will be especially:

- the more important vegetation destruction in order to open temporary diversion routes or enlarge the existing one in order to make easier their intersections;
- the risks of accidents due to speeding, especially near schools and crowded areas;
- the risks of air pollution from the exhaust fumes, engines noise and horns, etc.

7.2.4 Operations related to the road construction

Technical studies show clearly that the selected version of the route will cross land properties and will require expropriations (land under cultivation, houses). Generally, the construction of the road will include the following steps:

- the clearing and cleaning of the right-of-ways (30 m on both sides of the road) (clearing and deforestation),
- the excavations: this operation consists of using a heavy equipment for civil engineering in order to remove/bank up a space in order to give it the required shape or in order to obtain a clear base and an homogeneous ground;

- the construction of the pavement: by bringing, spreading and compacting the materials according to the technical prescriptions (laterite, natural or improved gravel),
- the draining operations.

If the materials are not watered, bringing and spreading them may generate huge amounts of dust which will cause respiratory tracts infections for the residents who will be exposed. While the vibrations of the compaction equipment are sometimes likely to cause noise nuisances for the residents or to move away the terrestrial wildlife from its initial habitat.

Moreover, bitumen is a toxic and flammable petroleum product which storage and manipulation shall be performed with the utmost care. Bitumen spill on the ground or in the water may become pollution for these environments.

Exploitation of borrow areas and quarries

The borrow areas of laterite and the solid rock quarries will be exploited in order to obtain high quality materials. Laterite for the embankment and the pavement layers, gravel for making concrete or asphalts. Depending on the location and the initial state of the identified sites, their exploitation might require:

- being released from their legitimate owners (expropriation or destruction of the crops or existing properties);
- deforestation and/or clearing, stripping of the plant soil of a greater or lesser bare surface;
- for the case of the quarries, the use of explosives, crushing equipment...

7.3 Inventory of the expropriated properties

7.3.1 Inventory of the properties for housing use

The new road development will cause the expropriation of about 638 houses located mainly in the towns of Yoko and Tibati due to the narrowness of the road in this section (see the table below)

Table 25: Distribution of the expropriated houses per town

Town	Batchenga	Ntui	Yoko	Tibati	Ngaoundal	Martap
Houses	38	203	234	50	49	64

Furthermore, the distribution of buildings per village is detailed in the following table.

Table 26: Distribution of the buildings to expropriate per village for Batchenga town

Town/village	Number of buildings
Batchenga	38
Emana Batchenga	7
M'bassa	8
Otibili	23

Table 27: Distribution of the buildings to expropriate per village for Ntui town

Town/village	Number of buildings
Ntui	200
Nachtingal	15
Ehondo	4
Djamé	14
Biatsota 2	12
Bindannengue	8
Biatsota 1	3
Nkoundoug	13
Bilaga-kombé	3
Biagnimi	1
Bivouna	23
Salakounou	26
Ossombé	42
Ndimi	12
Nguila	18
Nguila -Haoussa	6

Table 28: Distribution of the buildings to expropriate per village for Yoko town

Town/village	Number of buildings
Yoko	234
Guervoum	12
Doung	6
Mbembeing	14
Mankim	14
Mengoeng	5
Nyem	2
Ngoutou	8
Ngoutou	1
Mangai	9
Mbimbim	10
Matsari	9
Jerusalem	1
Yoko	32
Ngoum	3
Lena	6
Doumé	20
Mba'am	11
Sengbé	15
Mbanssiri	11
Malarba	9

Issandja	11
Donga	9
Meloko	2
Njolé	8
Ndim	6

Table 29: Distribution of the buildings to expropriate per village for Tibati town

Town/village	Number of buildings
Tibati	50
Mgbantibang	20
Koussi	1
Nyagida	6
Mbitom	7
Medjamba	8
Bawa	1
Tibati	7

Table 30: Distribution of the buildings to expropriate per village for Ngaoundal town

Town/village	Number of buildings
Ngaoundal	49
Gommana	15
Fabadji	13
Eto-o	4
Mbiwalou	7
Bekagotto	10

Table 31: Distribution of the buildings to expropriate per village for Martap town

Town/village	Number of buildings
Martap	64
Tekel	6
Lewamossa	12
Louga tabadi	19
Likok	26
Horoforet	1

7.3.2 Inventory of the social facilities and public infrastructures expropriated

Through the whole route, only a few businesses and socio-collectives equipment are affected (see the table below). Many cemeteries and tombs should be exhumed and are located mainly in Ntui and Yoko towns or are located very close to the road or in front of the houses. The population is really attached to the elder and to the sacred sites (located in the Ntui and Yoko towns); however, it is possible to move the tombs and take away the sacred from the forest by performing a ceremony in order to appease the site.

Table 32: Inventory of the social services and public infrastructures expropriated per town

	Batchenga	Ntui	Yoko	Tibati	Ngaoundal	Martap
Business	0	3	0	0	0	0
Cemetery/tombs	57	19	1	0	0	0
Sacred site	0	1	1	0	0	0

School	0	2	1	0	0	0
Place of worship (churches and mosques)	1	3	10	0	1	0
Market and warehouse	0	2	2	0	0	0
Water point	4	1	0	0	1	0
Administration	0	1	0	0	0	0
Health center	0	1	0	0	0	0
Others (fence)	0	3	0	0	0	0

7.3.3 Inventory of the trees and crops expropriated

In addition of the building that will be destroyed, the delivery of the right-of-way (30 m) from the new road will cause crops and fruit trees and other expropriations (detailed below). It appears that the most impacted agriculture activities are those concerning the cultivation of cacao trees (67.5%) and bananas (20.5%). These cacao crops are mainly located in Ntui and Yoko towns. The huge number of cacao cultivation that needs to be expropriated is due to the narrowness of the road in this area and the custom of the resident to cultivate the lots close to the road.

Table 33: Trees and crops expropriated (per town)

Village	Oil palm trees	Coconut trees	Banana trees	Cacao trees	Citrus	Mango trees Avocado trees	Safou trees Cola trees	Annona muricata trees Guava, breadfruit trees	Papaya trees	Pineapples	Manioc, sweet potatoes, yams, taros	Peanuts, corn, sugar canes	Various vegetables	Trees and various plants
Batchenga	357	0	903	399	77	187	0	6	138	0	500	450	6	44
Ntui	1121	29	5144	20176	315	275	393	181	99	32	0	1	0	490
Yoko	610	8	3296	7611	190	584	280	154	63	6	0	0	0	35
Tibati	3	2	19	0	1	28	8	0	0	5	0	0	10	0
Ngaoundal	0	0	0	0	1	12	10	0	0	0	0	0	0	1
Ngaoundere	0	0	0	0	1	2	1	0	0	0	0	0	0	0
Sub-total	2121	39	9464	28201	592	1124	692	341	300	43	500	451	16	570
%	4.77	0.09	21.29	63.44	1.33	2.53	1.56	0.77	0.68	0.10	1.15	1.02	0.36	1.28

Table 34: Trees and crops expropriated (per village)

Village	Oil palm trees	Coconut trees	Banana trees	Cacao trees	Citrus	Mango trees Avocado trees	Safou trees Cola trees	Annona muricata trees Guava, breadfruit trees	Papaya trees	Pineapples	Manioc, sweet potatoes, yams, taros	Peanuts, corn, sugar canes	Various vegetables	Trees and various plants
Emana Batchenga	25	0	273	50	54	79	0	0	80	0	0	150	6	35
M'bassa	126	0	247	111	3	31	0	0	16	0	0	300	0	3
Otibili	200	0	383	238	20	77	0	0	42	0	0	0	0	6
Batchenga town	357	0	903	399	77	187	0	6	138	0	500	450	6	44
Natchingal	116	4	240	725	22	44	7	5	2	0	0	0	0	2
Ehondo	29	0	11	221	8	5	0	0	0	0	0	0	0	2
Djamé	33	3	104	738	13	15	23	7	3	0	0	0	0	10
Biastota 2	54	2	159	105	3	10	5	7	6	0	0	0	0	22
Bindadjengue	78	0	90	36	31	19	4	3	20	0	0	0	0	4
Biatsota 1	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Bindalima	3	0	25	0	0	0	0	0	0	0	0	0	0	1
Nkoundoung	71	3	71	1208	3	29	0	2	2	0	0	0	0	3
Bindalima 2	107	1	16	1729	9	9	3	9	10	0	0	0	0	6
Bilaga Kombe	7	0	58	56	4	4	2	0	1	0	0	0	0	11

Village	Oil palm trees	Coconut trees	Banana trees	Cacao trees	Citrus	Mango trees Avocado trees	Safou trees Cola trees	Annona muricata trees Guava, breadfruit trees	Papaya trees	Pineapples	Manioc, sweet potatoes, yams, taros	Peanuts, corn, sugar canes	Various vegetables	Trees and various plants
BIAGNIMI	1	0	0	3	0	0	0	0	0	0	0	0	0	1
BIVOUNA	10	0	448	1873	23	10	14	0	3	0	0	0	0	36
Salakounou	12	1	141	46	23	5	1	1	0	0	0	0	0	8
Ossombé	231	5	1648	7306	111	34	76	48	22	0	0	0	0	251
Ndimi	37	0	311	950	13	19	35	14	0	0	0	0	0	87
Yalongo	19	0	50	9	0	3	0	2	0	0	0	0	0	32
NGUILA	111	4	416	118	3	42	24	17	8	0	0	0	0	1
Amewong	5	0	303	771	13	16	41	9	11	0	0	0	0	2
Kombé Bengué	148	2	590	2713	19	22	60	24	6	32	0	0	0	3
Nguila Haoussa	79	4	565	1584	22	25	98	33	4	0	0	1	0	6
Ntui town	1121	29	5144	20176	315	275	393	181	99	32	0	1	0	490
Issandja	140	0	877	2718	90	24	63	11	12	0	0	0	0	4
Donga	49	0	766	435	21	48	35	21	43	1	0	0	0	2
Meloko	0	0	78	58	0	13	2	1	1	0	0	0	0	2
Ndjolé	31	1	75	351	5	48	11	15	0	0	0	0	0	2
Ndim	46	2	299	836	2	21	9	4	5	0	0	0	0	0
Guervoum	113	0	139	891	4	15	23	10	0	0	0	0	0	1
Dong	15	0	100	351	2	16	13	0	0	0	0	0	0	0
Mekoassim	17	1	12	112	2	15	2	4	0	0	0	0	0	1
Mbembeing	0	0	0	0	1	14	0	2	0	0	0	0	0	1
Mankim	85	3	338	698	12	28	41	12	0	0	0	0	0	4
Mengoeng	9	0	63	223	2	11	6	5	0	0	0	0	0	4
NYEM	5	1	40	217	3	39	11	3	0	0	0	0	0	2
NGOUEYOU	8	0	1	1	4	37	2	1	0	0	0	0	0	1
NGANDOUNG	30	0	80	50	5	51	0	11	0	0	0	0	0	3
NGOAN	0	0	19	0	0	4	0	0	0	0	0	0	0	0
NDENI	0	0	28	432	2	9	4	0	0	0	0	0	0	0
MANGAÏ	4	0	312	224	6	9	34	25	1	0	0	0	0	5
MBIMBIM	13	0	7	7	4	12	5	5	0	0	0	0	0	1
FOUFOUENG	0	0	0	0	3	19	2	3	0	0	0	0	0	0

Village	Oil palm trees	Coconut trees	Banana trees	Cacao trees	Citrus	Mango trees Avocado trees	Safou trees Cola trees	Annona muricata trees Guava, breadfruit trees	Papaya trees	Pineapples	Manioc, sweet potatoes, yams, taros	Peanuts, corn, sugar canes	Various vegetables	Trees and various plants
MATSARI	44	0	0	7	4	29	8	10	1	0	0	0	0	2
Jérusalem	0	0	0	0	0	7	1	1	0	0	0	0	0	0
Yoko ville	0	0	0	0	6	19	1	0	0	0	0	0	0	0
Mbanding	0	0	0	0	0	4	1	0	0	0	0	0	0	0
NGOUM	0	0	0	0	1	15	0	0	0	0	0	0	0	0
Lena	0	0	52	0	0	18	1	1	0	0	0	0	0	0
Doumé	1	0	10	0	8	36	3	3	0	5	0	0	0	0
Mba'am	0	0	0	0	0	14	0	6	0	0	0	0	0	0
SENGBE	0	0	0	0	3	9	2	0	0	0	0	0	0	0
Yoko town	610	8	3296	7611	190	584	280	154	63	6	0	0	0	35
MBANSSIRI	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MGBANTIBANG	0	0	2	0	0	16	3	0	0	0	0	0	0	0
KOUSSI	0	0	0	0	0	1	0	0	0	0	0	0	0	0
GONGONTOUA	1	2	5	0	0	0	2	0	0	5	0	0	10	0
NYAJIDA	0	0	0	0	0	4	2	0	0	0	0	0	0	0
MBITOM	0	0	8	0	0	0	0	0	0	0	0	0	0	0
MEDJAMBA	0	0	0	0	1	2	0	0	0	0	0	0	0	0
BAWA	0	0	0	0	0	1	0	0	0	0	0	0	0	0
TIBATI Ville	2	0	4	0	0	2	1	0	0	0	0	0	0	0
MALARBA II	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Tibati town	3	2	19	0	1	28	8	0	0	5	0	0	10	0
GOMMANA	0	0	0	0	0	2	0	0	0	0	0	0	0	0
FABADJI	0	0	0	0	0	2	0	0	0	0	0	0	0	0
MBIWALOU	0	0	0	0	0	7	10	0	0	0	0	0	0	1
BEKAGOTTO	0	0	0	0	1	1	0	0	0	0	0	0	0	0
LEWA MOUSSA	0	0	0	0	0	2	0	0	0	0	0	0	0	0
LOUGA TABADI	0	0	67	0	0	4	1	0	0	0	0	0	0	0
ANAM Djaourou	0	0	7	0	0	0	0	0	0	0	0	0	0	0
HOREFORET	0	0	0	0	0	27	4	0	0	0	0	0	0	1
Ngaoudal town	0	0	0	0	1	12	10	0	0	0	0	0	0	1

Village	Oil palm trees	Coconut trees	Banana trees	Cacao trees	Citrus	Mango trees Avocado trees	Safou trees Cola trees	Annona muricata trees Guava, breadfruit trees	Papaya trees	Pineapples	Manioc, sweet potatoes, yams, taros	Peanuts, corn, sugar canes	Various vegetables	Trees and various plants
MAYO DANIEL	0	0	0	0	1	2	1	0	0	0	0	0	0	0
Ngaoundere town	0	0	0	0	1	2	1	0	0	0	0	0	0	0
Total	2121	39	9464	28201	592	1124	692	341	300	43	500	451	16	570

7.4 Affected population

7.4.1 Population affected per town

The project of road construction will cause the relocation of an estimated population of 5203 inhabitants. Ntui and Yoko town shelter 67% of the relocated inhabitants. This huge proportion of relocated inhabitants can be explained by the narrowness of the road and the huge number of houses contiguous to the road.

Table 35: Estimation of the relocated population per town

Town	Batchenga	Ntui	Yoko	Tibati	Ngaoundal	Martap
Relocated population	304	1640	1872	400	539	448
in %	6	32	35	8	9	10
TOTAL	5203					

7.4.2 Farmers affected per town

The number of affected farmers is estimated to 564 people. The most affected towns are Ntui (45%) and Yoko (39%), the high figures are explained by the narrowness of the road, the custom of the inhabitants to cultivate the fields adjacent to the road and the tenure of the lands which is more intensive in the southern areas of the project (due to climate and rain regime reasons).

Table 36: Estimation of the number of farmers relocated per town

Town	Batchenga	Ntui	Yoko	Tibati	Martap	Ngaoundéré
Relocated population	83	252	219	5	2	1
%	14	44.7	38.83	0.9	0.36	0.18
TOTAL	564					

7.4.3 Businesses affected per town

The project will cause very few relocation of businesses because only three businesspersons will be affected in Ntui town.

Table 37: Estimation of the number of farmers relocated per town

Town	Ntui
Relocated population	3

7.4.4 Estimation of the overall population affected by all the expropriation types

The overall population affected by expropriations of houses, crops and commercial activities is thus estimated to be 5770 people.

7.5 Detail of the compensation cost

This detail is provided in the PAR report with indications concerning the scale used and equivalent compensations per town, village and type of property expropriated (house, business, public facility, crops, etc.).

Table 38: Overall cost of the compensations and the implementation of PAR

No.	Item	XAF
A	COMPENSATIONS	1,409,288,300
A1	Compensations for crops and trees	191,103,800
A3	Compensations for houses and various buildings	1,006,509,500
A4	Compensations for socio-economical facilities	211,675,000
B	PROJECT MANAGEMENT	178,000,000
B1	Reinforcement of the capacities at the town level	48,000,000
B2	Meeting of awareness raising for the persons who have been relocated	10,000,000
B3	Assistance for the vulnerable persons (NGOs, travel expenses and others)	30,000,000
B4	Cost for the project manager during 1 year	60,000,000
B5	Facilitation of the staffs from the Administration, the elected representatives and the chiefdom	10,000,000
B6	Follow-up of the construction sites, legal consulting	10,000,000
B7	Follow-up and assessment	10,000,000
	OVERALL TOTAL	1,587,288,300

* The assistance will be performed through the town where the vulnerable person is living at a rate of 5000000 XAF per town

7.6 Impacts of the project during the construction phase

7.6.1 Impacts on the physical environment

7.6.1.1 Impact on the air quality

7.6.1.1.1 Sources of dusts

Causes and expression of the impact

A construction site generates a lot of dust in case of demolition operations, when there are huge movements of ground or huge distances to travel on an earth trail between the construction site, the supply areas and the storage areas. In addition, the dust emitted from the traffic due to heavy equipment will depend on the distance to travel, the speed and the state of the equipment and also the characteristics and the degree of humidity of the traveled trails until the operation areas. During the construction phase, several sources might generate dust, these are:

- The clearing and earthworks of the road
- The earthworks and construction of the road
- The traffic of the vehicles

These impacts are detailed in the following table:

Table 39: Impacts of the construction operations on the generation of dust

Operation	Production source of the dust	Area of impact
Clearing and earthworks of the road	<ul style="list-style-type: none"> The earthworks operations will cause huge dust pollution. The initial pulverization after excavation will cause dust to appear. The construction traffic movement (and the materials movement) will also become a huge source of dust. The stored materials may be subjects to be put again into suspension. 	Throughout the route
Earthworks and construction of the pavement		
Excavation: deposit and quarries opening	<p>The main sources are:</p> <ul style="list-style-type: none"> The construction traffic movement The handling and storage of wastes The excavation and transportation of the materials and potential storage on site. 	All
Earthworks — Road construction operations	<p>The main sources are:</p> <ul style="list-style-type: none"> The construction traffic movement The handling and storage of aggregates and other inconsistent imported materials. 	Throughout the route
The movement of the vehicles using the road		
Various activities	<p>The main sources are:</p> <ul style="list-style-type: none"> The construction traffic movement The handling and storage of wastes The excavation and transportation of the materials and potential storage on site. 	Throughout the route

Impact characterization and assessment

The direct sources of impact are therefore: the clearing and the earthworks of the road, the construction of the pavement and the movement of the vehicles on the road under construction. While these impacts represent a nuisance for the residents and the persons using the road, they are of medium significance, temporary and limited in space.

Table 40: Impacts on the air quality: sources of dust

Environment	Environmental element	Impact	Criteria	Assessment
Air	Dust dissemination	Degradation of the air quality during the clearing, earthworks of the construction site and during the construction of the pavement	Nature	Negative
			Constituting value	High
			Intensity	Medium
			Range	Punctual
			Duration	Temporary
			Impact significance	Medium

7.6.1.1.2..... Gas emissions

Causes and expression of the impact

During the construction phase, the construction works are also materialized by gas emissions which are spread from several sources which are:

- Exhaust gas emissions from the construction traffic and the passing vehicles
- The emissions from the storage facilities ventilation (mainly hydrocarbons)

The gas emissions generated by the exhaust gas are not listed below:

- NO_x : motor vehicles, power stations and other sources which burn fossil fuels;
- COV: petroleum based fuels (for example, gas oil and natural gas), painting diluent, and other hydrocarbon products;
- CO: results from the incomplete combustion of carbon during combustion;
- SO₂: is generated when a fuel containing sulfur is burnt;
- PM₁₀: also named “coarse” particles, these are emitted by crushing and grinding operations and the dust moved by vehicles on the roads;
- PM_{2.5}: these particles are generated when the exhaust gas from cars reacts in the air.

Impact characterization and assessment

These activities will therefore be the origin of the degradation of the air quality: the use of the heavy equipment and construction site vehicles will cause the combustion of the hydrocarbons, emissions of carbonic gas and aerosols in the air leading to the increase of greenhouse effect gas concentration in the atmosphere. Theoretically, the complete combustion of pure hydrocarbons generates only water and carbonic gas. However, more than 4 years old vehicles and heavy equipment don't burn all the gas and reject, together with the carbonic gas, non-burned hydrocarbons such as carbon monoxide.

This negative impact is qualified as **medium significance**.

Table 41: Impacts on the air quality: gas sources

Environment	Environmental element	Impact	Criteria	Assessment
Air	Fumes diffusion in the atmosphere	Degradation of the air quality	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Punctual
			Duration	Temporary
			Impact significance	Medium

7.6.2 Impacts on the soil (compaction, erosion, loss of the soil fertility) and reorganization of the profile in the borrow areas:

Causes and expression of the impact

During the earthworks operations and the exploitation of the borrow areas, the uncovered soils will be exposed to the erosion phenomenon.

As the road crosses two areas where high precipitations are recorded, the probability to observe huge gullies on the stored materials and in the borrow zone will be quite high.

Moreover, during the earthworks and the clearing of the right-of-ways (30 m), the scrapped surfaces will constitute plant soil loss.

The bared soils could be seriously affected by the superficial erosion because they contain only little organic matter in order to slow down the water runoff.

Furthermore, heavy equipment movements will contribute to the compaction of the soils leading to the impermeability of the soils and their loss of fertility.

Impact characterization and assessment

Generally, it will be very localized. The impact of degradation from the soil settling is evaluated as low and temporal intensity, the disturbance of the initial profile of the soil due to the borrow areas is assessed as medium and temporary. In case of non-intervention, the soils erosion will only worsen by the time. A strict follow-up of the ESMP shall be set up.

Table 42: Impacts on the soil (compaction, erosion, loss of the soil fertility) and reorganization of the profile in the borrow areas:

	Environmental element	Impact	Criteria	Assessment
Soils	Soils structure	Degradation due to the soil settling	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Punctual
			Duration	Temporary
			Impact significance	Low
	Borrow areas	Disturbance of the initial profile and erosion	Nature	Negative
			Constituting value	Medium
			Intensity	High
			Range	Punctual
			Duration	Temporary
			Impact significance	Medium

7.6.3 Impacts on the soils: Physical and chemical pollution

Causes and expression of the impact

Along the road, there are only gas stations in the towns of Ntui, Tibati and N’gaoundéré. During the construction work that will mainly be performed far away from the towns, the lack of gas station in the areas close to the project will force the company to store fuel on the camps for its vehicle fleet. In addition of the embankment and the wastes from demolition, the uncovering of the soils will also facilitate the liquid wastes, which are brought by the neighborhood and the construction site, to infiltrate in these environments. Therefore, the storage of some materials from the construction site, such as cement and hydrocarbons which are used to operate the heavy equipment, if these materials are stored in unmanaged areas (without protective cover against rain water and runoff or above soil which are not waterproof) can contaminate the soil and be runoff superficially and deeply due to infiltration, towards the groundwater. This kind of environmental accidents are related to the failure to comply with the products storage rules and the bad management of the construction site and the equipment. Among the other operations that may generate soil and groundwater pollution, we can hold as an example:

- the uncontrolled oil change of the heavy equipment of the site outside the waterproof and specifically developed areas for this purpose;
- the fuel supply for the heavy equipment in such a condition that leaks and accidental spills of these hydrocarbons can’t be avoided or contained.

- Production of construction sites wastes: asphalt wastes

In addition, the wastes generated by the workers for their food will generate a further physical pollution. It is thus essential that the rules concerning the storage of construction materials, hydrocarbons, heavy equipment storage, waste and cleanliness are enforced in the construction sites.

Impact characterization and assessment

The impact of the soil pollution from physical and chemical pollution during the construction is assessed as strong with a lasting scale.

Table 43: Impacts on the soil resources: Physical and chemical pollution

	Environmental element	Impact	Criteria	Assessment
Soils	The camp areas (if needed) and	Pollution of the soils due to hydrocarbons leaks, solid and liquid wastes)	Nature	Negative
			Constituting value	High
			Intensity	High
			Range	Punctual
			Duration	Temporary
			Impact significance	High

7.6.4 Effects on the water resources

Impact on the water quantity:

In this region water is available but the local populations are very vulnerable to water supply scarcity during the dry season, especially in the area of the project beyond Yoko. During the construction operations, the water needs will be very huge (construction site, water for spraying/compacting, etc.) and a rational management of this resource shall be implemented in order to protect this resource. In order to support the construction site needs, wells will thus be prepared in order to draw water. A specific attention will be given to the quantity of water drawn from the underground resources in order to avoid prejudice to the resources available for the local populations and the ecosystems.

When drilling is necessary, an application for exploitation shall be given to the Ministry of Water and Energy which will deliver a permit setting the maximum amount of discharge per hour or per day.

Impact characterization and assessment

Water is an essential resource for the populations, the ecosystems and the cattle. It is very important that the amount of resource is preserved and that the drawing is not performed in a chaotic manner. This impact is assessed as medium and of temporary duration.

Risk of pollution and degradation of the water quality

The lack of gas station in the area close to the project will force the company to store fuel for its vehicle fleet. On the construction site will also be used grease and engine oil, cement, concrete, granulates, bitumen and paints for various uses. Hydrocarbons would also damage the water quality during the geotechnical drilling tests, the water withdrawal by the Company for watering or during the cleaning and oil change of the heavy equipment and vehicles close

to the watercourses and/or on the bare grounds. Hydrocarbons are parts of the pollutants recognized as dangerous for aquatic environments (surface water and ground water).

The soil pollution may be caused by non-organic micro-pollutants absorption such as the heavy metals and hydrocarbons coming from activities such as heavy equipment maintenance (oil and diesel filters, used motor oil, plastic wastes...)

Spills of these products may cause soil pollution, the most concerned areas being the fuel storage areas and/or the maintenance garage, the water courses.

Furthermore, the staffs' food may generate various wastes (cans, plastic wastes, office paperwork...) which deposits in the nature may deteriorate the water quality.

Impact characterization and assessment

In principle, except for the significant voluntary spills in non authorized sites, the soils exposed to pollution are also concerned by the construction operations (construction site base, project linear). This impact is assessed as **medium significance** because, depending on the pollution levels, the groundwater may be reached and the impact becomes difficult to reverse.

Table 44: Impacts on the water resources:

Environment	Environmental element	Impact	Criteria	Assessment	
Surface water	Groundwater	Decrease of the quantity	Nature	Negative	
			Constituting value	High	
			Intensity	Medium	
			Range	Punctual	
			Duration	Temporary	
				Impact significance	Medium
	Superficial water and ground water	Risk of deterioration of the quality	Nature	Negative	
			Constituting value	High	
			Intensity	High	
			Range	Punctual	
Duration			Lasting		
			Impact significance	Medium	

7.6.5 Impacts on wildlife: habitat fragmentation and poaching

Causes and expression of the impact

It has been observed that, along the route, almost all the animal species are hunted for their flesh consumption and constitute a considerable source of proteins for the local population. In the central region and Adamaoua region, there are two types of hunting: The hunting for subsistence used for self-consumption and the hunting performed by poachers. The poachers may be villagers who sell their game in order to buy food-stuffs or medical care or, more often, inhabitants from other villages who are selling bush meat. Indeed, bush meat is often consumed in the small restaurants located in Ntui and Yoko. In Tibati and N'gaoundéré, bush meat is less consumed because the population is mostly Muslim but the hunting activity still exist for the local populations and for selling in the more southern areas. The majority of these hunted species thus from areas located around Yoko and which still possess a certain potential of wild species due to the small population and the presence of the national park.

In addition, the wildlife will be disturbed by the construction which will affect the tranquility of the animals, especially the big mammals, due to the noise of the equipment, the presence of the workers and the heavy equipment and particularly when explosives will be used for rock breaking, thus disturbing the animals movements, their diet and their reproductive behaviors.

Impact characterization and assessment

The beginning of the construction works with its influx of labor force will certainly intensify the poaching in the project area. The newly arrived persons will intensify the need in animal proteins and the villagers will thus find an opportunity for further income and the access will be facilitated by the roads constructed and the trails linked to the quarries. This impact is assessed as **high due to the proximity of the National Park and the remarkable concentration of wildlife in the region**. Otherwise, the impact on the wildlife disturbance is assessed as a high intensity and temporary (punctual) because the animals will be able to withdraw to the interior of more quiet areas thus the significance of the impact is noted as low.

Table 45: Impacts on the wildlife

Environment	Environmental element	Impact	Criteria	Assessment
Natural	Wildlife	Poaching	Nature	Negative
			Constituting value	High
			Intensity	High
			Range	Punctual
			Duration	Lasting
			Impact significance	High
			Disturbance of the wildlife	Nature
		Constituting value		High
		Intensity		High
		Range		Zonal
		Duration		Temporary
		Impact significance		Low

7.6.6 Impacts on the plant life and pressure on the NTFPs

Causes and expression of the impact

The activities such as the construction of the Company's base and the operations during the construction period are likely to generate several specific impacts on the plant life, related to the creation of the camp and the influx of labor force:

- The clearing of the right-of-ways (30 m) around the access routes and in the borrow areas will contribute to the reduction of the plant cover on the concerned sites. For the sections which cross or run along the forests, it corresponds to the width of the bush clearing and the ground stripping necessary for the project. Using the road alignment, it has been possible to determine that 300 hectares of plant cover will be destroyed by the enlargements and the detours of the new route. In order to compensate the loss of plant cover, adequate measures are indicated in the ESMP.
- The behavior of the workers is likely to cause wounds and shocks to the remarkable vegetation or the destruction of fragile environments due to bare lack of knowledge

(stamping, wound on the trees, illegal clearing, cutting, uprooting, mutilation and/or incineration of protected forest species and sacred bushes, etc.)

- The labor force consumes a great amount of wood for heating which will be taken directly near the camp.
- The arrival of a population working on the construction site will temporarily leads to an increase for food and food stuffs, increasing the attempts of slash-and-burn farming.
- Bush fires: Due to the lack of statistics concerning the number of declared bush fires, it is impossible for the forest services to evaluate the significance of the surfaces annually affected by bush fires. Nevertheless, according to the observations on the field and the interviews proceeded, these surfaces are very huge and thus the frequency and the scope of the bush fires are very worrying for the region. These fires may be set by loggers, shepherds, clearing farmers (slash-and-burn farming), honey hunters, etc. Regardless of their origin, the bush fires constitute an essential factor of the timber plant cover and the pasture degradation. These negative effects are very significant in the Sanaga basin and the interviews with the water and forestry services have brought forward their fears concerning this phenomenon and they insisted on their motivation in order to fight against bush fires. The road construction operations may increase the number of fire outbreaks and threaten the ecosystems and populations around the camps.
- The treatment of the embankment is likely to generate the uprooting of a significant number of trees.

Impact characterization and assessment

The quantity of plants to destroy will vary depending on the choice of the sites for the base, on the borrow areas to open and on the amount of wood required for the construction will be very significant. Indeed, from Ntui to Yoko, the project area goes through thick secondary forests. Even if no endangered species has been found around the road, the loss of biodiversity will be huge. Considering the fact that this project is located in a transitional zone forest-savanna more or less sensitive and the role played by the forests gallery in the reproduction of aquatic life (spawning area) and for the production of non-timber forest products (NTFPs) used by the residents. Moreover, the fire outbreaks may threaten the ecosystems and populations around the camps. This negative impact has been assessed with a high and lasting significance.

Table 46: Impacts on the plant life and the NTFPs

Environment	Environmental element	Impact	Criteria	Assessment
Natural	Plant life	Destruction of the vegetation and the NTFPs	Nature	Negative
			Constituting value	High
			Intensity	Medium
			Range	Zonal
			Duration	Lasting
			Impact significance	High

7.6.7 Quality of life

Noise nuisances: The significance of the nuisance will depend on the spatial organization of the construction site and especially on the location of the camp, if needed, the borrow areas and the concrete/bitumen batching plants and other noisy heavy equipment compared to the inhabited areas.

Disturbance of the population mobility: The crossing of villages by the road construction site will have a temporary effect on local residents' living environment, whose houses and businesses are sometimes located near the work site: disturbance of the road traffic particularly due to the work on half-pavement, increase of the heavy traffic, brief interruption of the custom links habitat/road-farming lots, problems to access properties, mud produced by the heavy equipment, etc.

The potential impacts of the construction works on the quality of life will affect the usual users of the road (car drivers, travelers, pedestrians, logging truck drivers) because the works, necessarily extended on a quite long period, will create a direct trouble for the road users and will constitute a temporary obstacle to the proper traffic conditions.

The last stage of the implementation phase (restoration of the previous state) might be likely to bring improvements in the living environment. A properly implemented restoration to the previous state will enable to clear the right-of-ways and eliminate all the roads construction wastes. The advantage of this phase might be to stop the perceptible nuisances of the construction site.

Impact characterization and assessment

The noise nuisances from the road construction works as such are punctual in time and space. The construction period will be long, there will be a disturbance for the local populations but it will move to another place little by little. The quality of life of the inhabitants will thus be lightly affected.

These impacts concern the population of all the towns located near the route and borrow zones and construction materials storage and also the persons who use the road. The duration is limited to the works duration. Their intensity is assessed as low to medium depending on the affected environments and the scale of the impacts sources.

Table 47: Impact on the quality of life

Environment	Environmental element	Impact	Criteria	Assessment
Human	Quality of life	Noise nuisances	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Punctual
			Duration	Temporary
			Impact significance	Low
			Mobility	Nature
		Constituting value		Medium
		Intensity		Medium
		Range		Punctual
		Duration		Temporary
		Impact significance		Medium

7.6.8 Visual and landscape impacts

Causes and expression of the impact and characterization and assessment of the impact

It can't be contested that any construction site alters the landscape values of its environment however, these damages vary greatly depending on the receiving environment.

An important part of the landscape impacts of the implementation phase is attributed to quarries and materials shelters. These impacts are irreversible because the landscape is only restored in initial shape with difficulty unless there is human intervention (see Recommended measures).

The investigations at the final draft stage have determined the number of borrow areas and the amount of materials that will be necessary for the construction of this road. The table below shows that a total of 110 borrow areas have been prospected and represent 302 hectares of laterite gravel materials which will be removed (the localization of the later is in Appendix 8).

Table 48: Identified laterite gravel materials shelters

	TOWNS	PKSTART	PKEND	Shelters volume (m ³)	Shelters surface (ha)
S1	S1_1 BATCHENGA-NTUI	0+000	11+950	24275	2.51
	S1_2 NTUI-NGUILA	11+950	47+000	74085	6.93
	S1_3 NGILA-NDJOLE	47+000	80+970	115750	8.90
	S1_4 NDJOLE-MANKIM	80+970	108+690	150480	13.10
	S1_5 MANKIM-MANGAI	108+690	137+654	94903	9.11
	S1_6 MANGAI-MATSHARI	137+654	158+813	106390	12.71
	S1_7 MATSHARI-METEING	158+813	169+498	86450	11.43
	S1_8 METEING-YOKO	169+498	190+780	129015	17.35
S2	S2_1 YOKO-NGOUM	0+000	35+936	251275	26.35
	S2_2 NGOUM-LENA	35+936	44+910	189750	22.00
	S2_3 LENA-DOUME	44+910	78+150	198480	18.65
	S2_4 DOUME-MBA'AM	78+150	104+229	222470	17.14
	S2_5 MBA'AM-SENGBE	104+229	116+447	38805	13.55
	S2_6 SENGBE-SABONGARI	116+447	132+468	481950	29.55
	S2_7 SABONGARI-MANGLE	132+468	158+110	405640	25.79
	S2_8 MANGLE-TIBATI	158+110	180+070	124000	8.65
S3	S3_1 TIBATI-NGATT	0+000	32+656	77600	5.98
	S3_2 NGATT-MALARBABAYA	32+656	68+251	205181	16.27
	S3_3 MALARBABAYA-BEKAGOTTOU	68+251	91+021	74670	6.78
	S3_4 BEKAGOTTOU-TEKEL	91+021	100+788	31050	0.50
	S3_5 TEKEL-LEWA	100+788	126+143	70350	6.75
	S3_6 LEWA-LOUGA	126+143	147+466	114182	8.48
	S3_7 LOUGA-LIKOK	147+466	176+955	114818	7.42
	S3_8 LIKOK-NGAOUNERE	176+955	213+805	77212	6.77
					302.65

Source: Studi International, 2012

At this stage of the study, 15 solid rock quarries have received geotechnical investigations; however, the required amount of materials has not yet being defined because the choice of the road pavement size has not yet been validated. During the implementation phase of the construction work, the extraction of materials will cause several landscape impacts as follows:

Table 49: Assessment of the landscape impact depending on the quarry type

Type of quarry	Assessment of the landscape impact
Laterite quarries	Significant landscape impact regarding the number of sites which are likely to be exploited and the condition of the majority of these sites directly on the roads (visible from the roads).
Sand and gravel materials quarry	Impact depending on the selected site however, generally of low significance because the wooded areas that cover the sandstone massifs should enable to lighten the landscape impact on the extraction sites.
Solid rock quarry	Impact depending on the selected site among the identified sites; however, generally significant because the outcrops of solid rock constitute generally clearly visible hills.

The impacts caused by the laterite gravel quarries and rock quarries have a medium and lasting impact, and the sand and laterite quarries have a low and lasting impact.

Table 50: Visual and landscape impacts

Environment	Environmental element	Impact	Criteria	Assessment
Natural	Quarries	Laterite gravel quarries	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Lasting
			Duration	Lasting
			Impact significance	Medium
		Sand and laterite quarry	Nature	Negative
			Constituting value	Medium
			Intensity	Low
			Range	Punctual
			Duration	Lasting
			Impact significance	Low
		Solid rock quarries	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Lasting
			Duration	Lasting
			Impact significance	Medium

7.6.9 Impacts on the human health: workers and residents exposure to STIs/HIV AIDS and endemic diseases (onchocerciasis, waterborne and respiratory diseases)

Impact causes, characterization and assessment

For such a large road construction work that requires a qualified labor force, a large part of the staffs could be moved from the large cities of Yaoundé-Douala or from foreign countries. Due to the distance between the staffs and their usual partners, these staffs will be likely to entertain sexual contacts in the project area, including the local population, thus exposing mutually to STIs and STDs/AIDS.

In addition, at the beginning of the project in Batchenga, the Sanaga is famous for endemic diseases such as onchocerciasis or river blindness and malaria. A lot of staffs will be exposed at the beginning of the construction work.

Concerning the population, the whole population will be exposed along the whole route to waterborne diseases that will appear in case of increase of stale water or physical or chemical pollution of the water caused by the construction works since almost all the populations located in the project area are consuming water from rivers and wells.

For the workers and the populations, the construction works will also cause a risk of increase of respiratory diseases related to inhalation of the dust produced by the construction works during earthworks, loading and materials transportation operations. The exposed persons will be equally the workers on the construction site and the local populations. In addition, other diseases would also appear during the construction works due to mainly the lack of hygiene if the minimum health rules are not respected.

Impact characterization and assessment

The level of poverty of the residents makes them more vulnerable to STIs/STDs. Furthermore, the precariousness of the sanitary structures existing in the area, the incurability of certain STDs, the quite long time required for the care of onchocerciasis, will make it difficult to control the impact on health at the project level. For all these reasons, the impact on health is assessed as **major significance**.

Table 51: Impacts on health

Environment	Environmental element	Impact	Criteria	Assessment
Human	Health	Spreading of diseases	Nature	Negative
			Constituting value	High
			Intensity	High
			Range	Lasting
			Duration	Lasting
			Impact significance	Major

7.6.10 Impacts on human security: risks of accidents (traffic accidents and occupational accidents)

Causes and expression of the impact

For the staffs of the construction site and the population, the whole construction site will constitute a source of accidents because of the heavy equipment and vehicles mobility and also because of the handling of hazardous objects or products which are the toxic products. A not well organized construction site where security measures are not respected constitute a threat to public and staff safety. Respecting the rules related to limiting the public access to the construction works area and also to the camp and the quarries, the vehicle traffic within this area and having the staffs wearing security helmets, gloves and shoes constitute the fundamental element the construction works management is required to apply strictly.

Other risks for human security exist: we can quote mainly those related to fires and the possible use of explosives for rock breaking.

For the population, since the road RN15 is narrow and without berm, the resident population and especially the schoolboys and schoolgirls who travel by foot will be very exposed to the traffic accidents.

Impact characterization and assessment

Despite the fact that the effects of some accidents are difficult to reverse, the company's respect of the good operational practices of the construction works will enable to prevent these risks of accidents. This is the reason why this negative impact has been assessed with a **high significance**.

Table 52: Impacts on security

Environment	Environmental element	Impact	Criteria	Assessment
Human	Security on the construction site	Risk of accidents for the staffs and the population	Nature	Negative
			Constituting value	High
			Intensity	High
			Range	Punctual
			Duration	Temporary
			Impact significance	High

7.6.11 Impact on the urban mobility

Causes and expression of the impact

Currently, the traffic on the road is difficult due to the very bad shape of the road. At the beginning of the construction phase, the vehicles and pedestrians traffic will be preserved; however, it will become more difficult due to the construction works. As soon as the parallel trails will be opened, the traffic will be facilitated. On the other hand, the great excavation works and the trails detours will lead to the destruction of the residents' access, increasing the mobility difficulties for the concerned residents.

Impact characterization and assessment

The impact in the construction phase is assessed as **medium and temporary**.

Table 53: Impacts on mobility and traffic

Environment	Environmental element	Impact	Criteria	Assessment
Traffic conditions	Mobility and traffic	Mobility affection	Nature	Negative
			Constituting value	High
			Intensity	Medium
			Range	Local
			Duration	Temporary
			Impact significance	Medium

7.6.12 Impacts on road safety

Causes and expression of the impact

The road RN15 is currently very dangerous due to its narrowness, the bad quality of the road and the lack of visibility. Without adequate traffic signs, the construction works of the road are likely to increase the risk of traffic accidents.

Impact characterization and assessment

This negative impact has been assessed with a high significance.

Table 54: Impacts on road safety

Environment	Environmental element	Impact	Criteria	Assessment
Human	Road safety	Increase of the number of accident	Nature	Negative
			Constituting value	High
			Intensity	Medium
			Range	Local
			Duration	Temporary
			Impact significance	High

7.6.13 Impacts on incomes

Causes and expression of the impact

The Company will be able to hire the young people without occupation from the resident villages for the labor-intensive works (HIMO). Moreover, the needs for food, accommodation, leisure for the foreign staffs will stimulate the business sector and the other economic activities such as accommodation, catering and trade. All this will contribute to the increase of households' income and better living conditions while making easier the financial participation to the familial and local development.

Impact characterization and assessment

Generally, the road construction works resort to imported experts and materials for the most part. Considering the low proportion of unqualified workers who can be hired (truck drivers, handlers...) and the average length of the construction works (three years), during which this positive impact will be observed, it has been assessed as **major significance**. In addition, the small businesses and the town services will receive more customers so their incomes will increase.

The current study is at the final draft stage for the road construction. At this stage, the data concerning the number of persons who will be hired on the construction site and the proportion of local population who will benefit from the implementation of this construction are not available. However, considering the huge scale of the work to perform and the length of the construction works, it is certain that there will be positive economic repercussions for the towns of Ntuim, Yoko, Tibati and N'gaoundéré (local level) and the central and Adamaoua regions (regional level). The local competences will be encouraged with a strong participation of the local labor force and the regional and national companies for the earthworks and the materials supply. The economical impact following the construction of the road during the construction work phase is assessed as **high**.

Table 55: Impact on employment

Environment	Environmental element	Impact	Criteria	Assessment
Employment	Population of the town and the region	Hiring of workers on the construction site and increase of activity for the small businesses	Nature	Positive
			Constituting value	High
			Intensity	Medium
			Range	Local to regional
			Duration	Temporary
			Impact significance	High

7.6.14 Risks of conflicts between the construction works staffs and the local populations

Causes and expression of the impact

The temporary presence of the company's staffs in the area may be likely to provoke a cultural mix which might lead to conflicts. These conflicts may be the result of several factors:

- Failure to respect the customs which prevail in their new living environment;
- Lack of communication and awareness rising campaign;
- Failure to respect the procedures of compensation for destructed properties and failure to consult beforehand the resident concerning the expropriation procedures, opening of the detours trails;
- Failure to respect the payment of invoices and salaries (e.g. land location...), adultery, accidents related to the men, the animals, causing the death of incapacity of the Persons Affected by the Project, or the loss of properties or sacred sites and forests
- Pollution of the water courses and cultivated land due to abusive spill of various waste;
- Increase of the petty criminality;
- Partiality during the hiring which may lead to the deterioration of social relationships between the residents and the company, the young people from the resident towns wishing to be considered in priority despite their low skills.

Impact characterization and assessment

This impact has been assessed as **medium significance** and temporary duration.

Table 56: Impact on the risk of conflicts

Environment	Environmental element	Impact	Criteria	Assessment
Human	Population of the town and the region	Conflicts between the staffs and the local populations	Nature	Negative
			Constituting value	High
			Intensity	Medium
			Range	Local
			Duration	Temporary
			Impact significance	Medium

7.6.15 Risk of upsurge of criminal activities

Causes and expression of the impact

The hope of being hired on the project might make a lot of young people to move to the project area. The ones who will not be hired might stay in the area and become subjects to misery. Situation that may lead to delinquent behaviors. Thus, during the periods of salary pay, the cocoa harvesting season, we may observe an outbreak of organized crime in the two big departments of strong food and cocoa production.

Impact characterization and assessment

Considering the current unemployment rate of the young people and taking into account the fact that organized crime already exists in the area (especially during the cocoa harvesting period), it may become stronger due to the presence of the construction site. Since the duration of the construction works and the gravity of the stickup (in term of human lives or properties loss) are not predictable, this impact has been assessed as **medium significance** and temporary duration.

Table 57: Impact on criminal activities

Environment	Environmental element	Impact	Criteria	Assessment
Human	Population of the town and	Criminal activities	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Local
			Duration	Temporary
			Impact significance	Medium

7.7 Identification of the impacts related to the implementation of the road operations

7.7.1 Impacts on wildlife

Causes and expression of the impact

Due to the increase of the traffic volume and speed the road construction might introduce, it is expected that the project leads to disturbances on the animals' moves.

The wildlife is generally subject to the traffic and the influence of the road because of the disconnection effect of the canopy, especially in the area from Yoko to Tibati within the National Parks where the wildlife presence is dense.

Impact characterization and assessment

The most significant impacts of the operation phase of the road rehabilitated to the wildlife consist of:

- Risks of accidents with the animals crossing or using the road, related to the traffic and speed increase compared to the current situation. As an example, a lot of small animals will be ran over by vehicles which speed will be far above the current speed. This impact is assessed as medium and lasting.
- Risks of commercial poaching development related to the improvement of the traffic conditions in the road, despite the fact that this improvement is likely to facilitate the intervention of the forest rangers. This impact is assessed as high and lasting.
- Concerning the disturbance of the wildlife due to the noise of the traffic, the nuisances will be low because the wildlife disturbed by the noise is likely to move away from the road, which may lead to the breaking of certain biological corridors. However, this impact is assessed as medium and lasting.

Table 58: Impacts on the wildlife

Environment	Environmental element	Impact	Criteria	Assessment
Natural	Wildlife	Accidents	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Punctual
			Duration	Lasting
			Impact significance	Medium
		Poaching	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Lasting
			Duration	Lasting
			Impact significance	High
		Disturbance	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Punctual
			Duration	Lasting
			Impact significance	Medium

7.7.2 Impacts on the plant life

Causes and expression of the impact

During the implementation of the road operations, several effects on the plant life might happen such as:

- The settling of new villagers cores together with the mining of the forest landscape in the rear road
- The opening of trails perpendicular to the road
- The increase of the forest clearing and the slash-and-burn farming
- The move of agriculture activities causing new forest clearings and thus encroachment and the loss of natural species and loss of habitat.
- The increase of wood collection and logging

Impact characterization and assessment

The road will develop an area completely landlocked and will attract populations looking for better incomes and better life conditions, the pressure on the plant life and the NTFPs might be huge depending on the scale of the new population that will settle; this impact is assessed as medium intensity.

Table 59: Impacts on the plant life and the NTFPs

Environment	Environmental element	Impact	Criteria	Assessment
Natural	Plant life	Pressure on the natural resources	Nature	Negative
			Constituting value	High
			Intensity	Medium
			Range	Local
			Duration	Lasting
			Impact significance	Medium

7.7.3 Impacts on the biodiversity, specific case of the National Parks

Causes and expression of the impact

The road will enable the development of transportation and tourism in the area which imply the release of waste in all the areas near the trail and a possible deterioration of the protected spaces due to an increased accessibility causing a disturbance of the wildlife population and the consecutive decrease of biodiversity. Concerning the specific impacts on the national parks, these impacts are indirect because the road doesn't cross the parks. These impacts however attract attention because they are close to the Mbam and Djerem park or connected to the access track of Mpem and Djim park.

The Mbam and Djerem park will be particularly affected due to the proximity of the road to its western limit (Yoko-Tibati area). The road passing between the peripheral area and the park may cause disturbance especially for the key species such as elephants and chimpanzees for which conservation strategies have recently been created. The road passes through the vital domain of the elephants and the chimpanzees in the Mbam and Djerem park (cf 4.2.3.1).

The Mpem and Djim park is considered indirectly for the effects of the project since its access is done through a track connected to the future road that will enable a possible increase of the contacts which will lead to potential pressure and disturbance of the wildlife (presence of elephants and chimpanzees suspected by the latest studies).

Impact characterization and assessment

The risks of impact on the biodiversity along this road project are assessed as medium intensity and lasting.

Table 60: Impacts on the biodiversity

Environment	Environmental element	Impact	Criteria	Assessment
Natural	Natural	Decrease of the biodiversity	Nature	Negative
			Constituting value	High
			Intensity	Medium
			Range	Lasting
			Duration	Lasting
			Impact significance	Medium

7.7.4 Impacts on the water resources

Causes and expression of the impact

Qualitative and quantitative aspects of the rain water pollution

A lot of researches have revealed that rain water is, in urban environment, during the first minutes of its fall more polluted than the domestic waste waters.

The rain contains polluting substances collected during its fall across the atmosphere and other constituted by dust deposits formed during dry weather on the consolidated surfaces. Rain is thus contaminated by atmospheric pollutions and land-based pollutions.

Atmospheric pollutions consist mainly of dust and emissions from combustion sources. The exact relationship between the atmospheric pollutants and the consecutive pollution of rain waters is not known precisely. The balance of the partial polluting charges doesn't deliver either valid results. According to the method of measurement used, the dust fallouts with the rain reach values comprised between 35 and 600 kg per ha and per year. Except for the dust, the gases emitted by the combustion sources are counted among the main pollutants of the atmosphere.

The pollutions provoked by land-based causes may come from traffic unrelated causes or traffic related causes.

Traffic unrelated causes; The traffic unrelated causes are waste, plants, animal dung and ground dust:

- We consider as waste, as long as they have been generated by urban and road traffic (pedestrians, car drivers and other road users): the uncollected domestic or green waste, the packaging materials, the fruits and vegetables litter, the uncollected trash, the rubble and waste from construction and public works.
- The vegetation is a significant factor that may influence the composition of the rain waters. Depending on the town, the season and the atmospheric conditions, leaves, flowers, fruits, needles and other organic matters fall to the ground and are evacuated with the rain waters.
- The animal dung contributes to the bacteriological and organic pollution of the rain waters.
- The dust on the ground may also be removed or carried along directly by the wind and the rain water. The pollution increase when the particles carried along by the rain are finer, this is what explains why the concentration is so high at the beginning of the flow. The following table presents a resume of American studies concerning the average concentrations of polluting matters in the dust deposits on the roads.

Table 61: Concentrations of polluting matters in the dust deposits on the roads

Parameters	Average concentration in mg/g of TS
Organic solid matters	51
BOD5	2.3
COD	54
Greases and oils	6.4
Petroleum	3.6
Total phosphorus	0.6
Total nitrogen	0.25
Rubber	2.5
Chromium	0.08
Copper	0.12
Nickel	0.19

Source: DEGREMONT, 2010

Traffic related causes; The pollution due to traffic comes from:

- The pavement worn away because of the friction caused by a continuous traffic influx produces a huge amount of very fine dust. According to Sartor and Boyd, 2010, the wear of the road pavement caused by friction would be around 1.0 mm per year, corresponding to around 17 tons of dust per ha and per year. For pavements wider than 7.5 m, the pollution charge is estimated at 0.66 kg/m³.
- The tires wear due to friction represents a loss of 0.03 g/km per tire, that is to say 0.12 g/km per vehicle. The resulting BOD5 of this wear is generally minimum, the COD, however, is quite high for dense traffic areas.
- The emissions and oil leaks transmitted through the exhaust of the motor vehicles spread into the roads environment under the shape of dust and gas. The average annual dust emissions of a motor vehicle (it is mainly soot, tar and tar derivatives) represent 2 kg/year.

The matters emitted in a gas state, especially nitrogen oxides NO, NO₂, represent 10 kg/year. Unburned hydrocarbons represent annual 38 kg per vehicle.

The nitrous gases oxidize in the atmosphere and are partially dissolved by the rains. The organic hydrocarbons gases fix on the dust and are partially absorbed by the precipitations.

For the time being, however, we don't possess reliable heuristic data on the long term providing to which extend the cars emissions contribute to the pollution of the rain waters effluents in urban environment and along the roads.

- The wear by friction of the breaks and metallic parts generate essentially inorganic materials containing however quite huge amounts of heavy metals such as copper, nickel, chromium and lead.

Risks of accidental pollution

The spills may concern any transported product. There are no statistics concerning the risk from hazardous or polluting materials transportation. A French study on this subject set this risk in the following manner on a highway:

- Frequency: one accident with spills per year and per 100 km.
- Nature of the transported products: various but hydrocarbons are preponderant.
- Quantity spilled: most of the accident concern less than 1 m³; however, complete emptying of the tanks (30 m³) is possible.

Impact characterization and assessment

The increase of the traffic is likely to cause an evolution of the same scale:

- anthropic pollution (runoff contaminated by atmospheric pollutions and land-based pollutions, waste discharged by the car drivers) directly related to the number of vehicles running on the road; the impact is assessed as low.
- the risks of accidental pollution of the waters and soils due to spills of any transported product (especially hydrocarbons), the impact is assessed as medium intensity.

Table 62: Impacts on the water resources

	Environmental element	Impact	Criteria	Assessment
Natural	Water	Pollution from rain water	Nature	Negative
			Constituting value	Medium
			Intensity	Low
			Range	Punctual
			Duration	Lasting
			Impact significance	Low
			Accidental pollution	Nature
		Constituting value		High
		Intensity		Medium
		Range		Punctual
		Duration		Lasting
		Impact significance		Medium

7.7.5 Impacts on the soils

Causes and expression of the impact

The impacts of the road project in its operation phase on the soils can be resumed to the risk of erosion; which has to be considered as an impact (destruction of the environment due to the gullies, sealing and potential loosening of the vegetation) but also as a strong stress against the durability of the road development.

The erosion due to the wing is insignificant on the concerned geographic sector where the superficial flow of water represents the main erosion factor.

The preventive measures are especially required for the road sections:

- with a high slope (declivity exceeding 5%);
- where the road embankments height is significant (thus making them vulnerable to gullies and landslide);
- where it is necessary to perform a forest clearing of the roadsides for the road enlightenment.

The project employs all the necessary measures in order to avoid erosion due to water which, in case it reaches the natural environment, will also endanger the road durability.

Impact characterization and assessment

The risks of erosion along this road project are assessed as medium intensity and punctual.

Table 63: Impacts on the soils

	Environmental element	Impact	Criteria	Assessment
Soils	Soils	Erosion	Nature	Negative
			Constituting value	High
			Intensity	Medium
			Range	Punctual
			Duration	Punctual
			Impact significance	Medium

7.7.6 Impacts of noise and vibrations

Causes and expression of the impact

The noise generated by the movement of the cars is currently considered as one of the major constraint for the local populations during the increase of traffic consecutive to the construction of the road. It will be the inhabitants of all the villages the road go through that will be disturbed. The noise nuisances are subjects to a lot of complains from the citizens who denounce the excessive character, especially by night. The noise represents in every country a public health issue. Indeed, the World Health Organization (WHO), in its definition of health, indicates that it is a "status of physical, mental and social well-being and not only the lack of disease."

Impact characterization and assessment

In the studied area, the disturbance related to the noise will be strongly felt by the whole population because the houses are located near the road at the beginning of the project operation; however, during the development of the villages due to the presence of the road, the houses will be moved a little away from the road and the disturbance will thus decrease. This impact is assessed as medium but lasting.

Table 64: Impacts on the noise and the vibrations

Environment	Environmental element	Impact	Criteria	Assessment
Human	Quality of life	Noise nuisances	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Punctual
			Duration	Lasting
			Impact significance	Medium

7.7.7 Impact on the air quality

Causes and expression of the impact

In the matter of atmospheric pollution, two antagonistic problems are likely to happen due to the operation of the road after its construction:

- In one hand, the improvement of the condition of the road will generate a denser traffic, which implies an increase of the same scale of the number of emission sources represented by the vehicles.
- In the other hand, the construction of the road will enable to increase the average speed of the traffic, which consequence will be a more fluid traffic and generally lesser emissions ratios compared to the current speed (the atmospheric emissions ratios are often inversely proportional to the driving speed).

For reference, the following table shows the evolution of atmospheric emission factors for a speed change from 41 km/h to 74 km/h for different types of vehicle as it came out a study performed in the Ile de France region by ADEME/EDF in 1997.

Table 65: Evolution of atmospheric emissions for a speed change from 41 to 74 km/h

Vehicles*	CO	CO ₂	NOx	Hydrocarbons	SO ₂	Particles
VLES	-41%	6%	50%	-43%	0%	
VLEC	11%	-1%	82%	-10%	0%	
VULE	-20%	-3%	19%	-41%	-33%	
VLD	-20%	5%	0%	-8%	5%	15%
VULD	-25%	-6%	4%	-48%	-4%	-36%
PLA1	-42%	-18%	-19%	-21%	-18%	-20%
PLA2	-42%	-10%	-9%	-12%	-10%	-11%
Medium	-26%	-4%	18%	-26%	-9%	-13%

Source: ADEME/EDF, 1997

*** Types of vehicles:**

- VLES: light gasoline vehicle without catalyst
- VLEC: light gasoline vehicle with catalyst
- VULE: light commercial vehicle (<3.5 t) gasoline
- VLD: light vehicle diesel
- VULD: light commercial vehicle (<3.5 t) diesel
- PLA1: diesel trucks between 3.5 and 16 t
- PLA2: diesel trucks above 16 t

Impact characterization and assessment

This impact is assessed as low and of temporary intensity.

Table 66: Impacts on the air quality

Environment	Environmental element	Impact	Criteria	Assessment
Natural	Air	Increase of the number of atmospheric emissions due to the increase of traffic	Nature	Negative
			Constituting value	Medium
			Intensity	Medium
			Range	Local and regional
			Duration	Temporary
			Impact significance	Low

7.7.8 Impacts on mobility

Causes and expression of the impact

The improvement of the road conditions currently very deteriorated will facilitate the traffic conditions and exchanges between the regions of Mbam and Kim and Adamaoua, the other regions and improve the corridor notion with the neighbor countries. This improvement will be responsible for an increase of the existing activities and the development of new economic activities in these areas.

Impact characterization and assessment

This impact is assessed as major and of lasting intensity through time.

Table 67: Impacts on mobility

Environment	Environmental element	Impact	Criteria	Assessment
Traffic conditions	Mobility and traffic	improvement of the mobility and the economical development	Nature	Positive
			Constituting value	High
			Intensity	Medium
			Range	Local
			Duration	Lasting
			Impact significance	Major

7.7.9 Impacts on human security

Causes and expression of the impact

The leveling of the road will improve the technical characteristics of the route and thus enable cruise speed ranges higher and also an increase of the traffic. Following the expected increase of speed and traffic, we expect an increase of the risks of accidents, especially because here and there along the road, there are pedestrians, children playing in the middle of the road or in area near the road, domestic animals crossing the road or straight sitting in the middle of the road, in addition of the wildlife.

The unfavorable effect of the project is the creation of an incompatibility between the expected speed and the activities around the road. We can thus estimate that the road will affect the security of the residents and users due to the increase of the risks of accidents.

Usage conflicts, potentially generating accidents, are likely to happen then:

- The conflicts between pedestrians and vehicles: The number of these conflicts will be especially large during the periods of large pedestrian influx from and to the markets and to the school infrastructures.
- The conflicts between parking and vehicles: The improvement of the road should go hand in hand with a decrease of certain dangerous practices such as illegal parking on the road due to break down, unloading, bush-taxis and heavy trucks (especially the logging trucks) stopped on the road, the extension of the markets on the road, etc.

But in return, the asphaltting of the road, the improvement of the traffic and visibility conditions related to the improvement of the geometrical characteristics of the road and also the construction of berms (space for the pedestrians circulation, parking space for break-down vehicles, etc.) and creation of parking areas for the logging trucks and the other vehicles, will constitute a significant positive impact for the security of the residents and the users of the road.

Impact characterization and assessment

The construction of the road and its accesses will open the traffic to the heavy trucks and the transportation agencies. This new traffic to which the residents will need to adapt, may be the cause of an increase of the traffic accidents both on the persons and the properties. Ultimately, this negative impact has been assessed with a high and lasting significance.

The advantages of the road improvement for the local population and the increase of security related to their movements will constitute a positive impact of medium intensity for the security of the residents and the road users.

Table 68: Impacts on human security

Environment	Environmental element	Impact	Criteria	Assessment
Human	Road safety	Increase of the number of accident	Nature	Negative
			Constituting value	High
			Intensity	Medium
			Range	Local
			Duration	Lasting
			Impact significance	High
	Residents safety	Users safety	Nature	Positive
			Constituting value	High
			Intensity	Medium
			Range	Local
Duration			Lasting	
		Impact significance	Medium	

7.7.10 Impacts on human health

Causes and expression of the impact

The access to health care will be encouraged by the improvement of the road network conditions. Indeed, the health centers existing in certain villages are often poorly equipped. In order to get medical care, the villagers have to go to an hospital. We can thus expect an improvement of the living conditions of the populations, especially the women due to the improvement of the accessibility to the health coverage. It will be the same for the officials and the public service agents living in Yaoundé and affected to Ntuim, Yoko, Tibati and N'gaoundéré who will be able to go more often to the classrooms and health centers and other services, thus enabling the population to benefit from the basic public services established in their towns.

But in return, the construction of the road may be the cause of nuisances to the human health by helping the mixing of populations and the improvement of travel conditions which help the spreading of sexually transmitted diseases (STDs). The project constitute thus a significant propagation vector for the STDs such as AIDS.

Impact characterization and assessment

The project will have significant positive impacts on human health:

- The access to health care will be encouraged by the improvement of the road network conditions. The impact intensity is high and lasting.
- The huge decrease of dust during the dry season along the first ten kilometers will have a beneficial influence on the health of the residents and the users who are subjects to respiratory diseases, especially the children, the pregnant women and the elderly. The impact intensity is medium and lasting.

But in return, the construction of the road may be the cause of nuisances to the human health by helping the mixing of populations and the improvement of travel conditions. This situation is likely to help the spreading of sexually transmitted diseases (STIs) and AIDS. The project constitutes thus a significant propagation vector for these infections. The impact intensity is high and lasting.

Table 69: Impacts on human health

Environment	Environmental element	Impact	Criteria	Assessment	
Health	access to health centers	Facilitated evacuation of the ill persons	Nature	Positive	
			Constituting value	Medium	
			Intensity	High	
			Range	Zonal	
			Duration	Lasting	
				Impact significance	High
	Sexually transmitted diseases (STD)	Increase of the transmissions	Nature	Negative	
			Constituting value	Medium	
			Intensity	High	
			Range	Zonal	
Duration			Lasting		
			Impact significance	High	
Health	Human	Decrease of dust	Nature	Positive	
			Constituting value	Medium	
			Intensity	High	
			Range	Punctual	
			Duration	Lasting	

7.7.11 Economical impacts

Causes and expression of the impact

The improvement and the development of the communication and travel means represent essential factors of progress.

We expect the asphaltting and the creation of the road will constitute a mean in order to develop the tourism and the economy of the concerned towns.

The project is likely to generate strongly positive impacts both direct and indirect on the economy and thus, on the social side:

- Creation of direct and indirect jobs
- The construction of the road will constitute the engine for the development of the whole Mbam and Kim and Adamaoua department and also between countries. Through the dynamic it will generate, it will probably participate to the improvement of the households incomes.
- The project will enable to better promote the economical development of the region and to promote touristic activities.

Impact characterization and assessment

The project is a significant mean of development for the circulation of the persons and the properties at the territory level, support for decentralization, rapprochement of national and international decision centers, due to especially the decrease of access time to the region. The significance of this project on the economy of the region is high significance.

Table 70: Economical impacts

Environment	Environmental element	Impact	Criteria	Assessment
Human	Natural	Job creation and economical dynamism	Nature	Positive
			Constituting value	High
			Intensity	High
			Range	Lasting
			Duration	Lasting
			Impact significance	High

7.7.12 Impacts on populations migration

Causes and expression of the impact

It is difficult to evaluate the consequences of the construction in term of rural exodus; however, it is easy to suppose it may increase the young people and the labor-force (masculine, in particular) leaving for the towns and the economic centers at the expenses of the rural world. The opening or the leveling of a road creates, however, an attraction pushing the population to settle along the road for commercial activities and in order to benefit from the proximity and the easy access to the collective facilities.

The population influx and the indirect effects of the project on the urbanization (pendular movements related to the relationship between habitat and work) may be assessed knowing that:

- The charge ratio in inhabitant/job of the studied region and the number of job resulting from the project.
- The average number of persons per household in the area of Ntui, Yoko and Tibati towns.
- The average occupation ratio of the housing in the area of Ntui, Yoko and Tibati towns.
- The number of accommodation means per hectare, characteristic of the project area.
- The average ratio between the surfaces reserved for housing and the ones necessary for collective facilities.

Estimates based on the average values will enable to know:

- The additional population generated by the increase of traffic activity.
- The approximative number of additional housing.
- The needs of constructible plots for the habitat.
- The needs of the corresponding collective facilities.

The major economical asset will find its benefit only within the framework of an urban planning consistent and of high quality which can't be expected without the participation of the public authorities which mission consist to anticipate these developments and to follow them, working closely with the local authority.

In the other hand, the increase of the population brought by the traffic will induce not only needed of constructible surface but also an increase of the water, transportation, energy needs, etc. and will generate further solid and liquid waste urging and exerting an additional pressure on the natural resources (water, soils, energy) and the facilities of the region. It is thus necessary from now to study at the regional level the optimum management of the natural resources and to anticipate the additional facilities at the right moment.

Impact characterization and assessment

This impact is assessed as medium and lasting.

Table 71: Impacts on population migration

Environment	Environmental element	Impact	Criteria	Assessment
Human	Natural	Increase of the population	Nature	Negative
			Constituting value	Medium
			Intensity	High
			Range	Lasting
			Duration	Lasting
			Impact significance	Medium

7.7.13 Impacts cultural, archaeological and historical heritage

Causes and expression of the impact

The project will affect several tombs which are located in front of the houses constituting a religious heritage considering the strong relationship between the inhabitants and the deceased. In addition, the areas crossed are rich in culture and traditions especially towards the traditional chiefs of the third and second degree of the villages and lamidats in the northern part of the project. There will also be sacred sites which are likely to be deteriorated (forests, rocks, trees, mosques, churches...)

Impact characterization and assessment

The project will have few negative impacts on the religious heritage because the tombs will be transferred with the respect due to the local rites. This impact is assessed as low and of temporary duration.

And for the traditional chiefs, in certain cases their housing will be strengthened, the impact will be positive, low and lasting.

Table 72: Impact on the cultural and religious heritage

Environment	Environmental element	Impact	Criteria	Assessment
Human	Cultural	Religious heritage	Nature	Negative
			Constituting value	High
			Intensity	High
			Range	Temporary
			Duration	Temporary
			Impact significance	Low
			Cultural heritage: the traditional chiefs	Nature
		Constituting value		High
		Intensity		High
		Range		Lasting
		Duration		Lasting
		Impact significance		Medium

7.8 Impacts related to maintenance activities

The objective of the roads maintenance operations is to preserve the road heritage, to maintain an acceptable level of service for the road transportation and ensure the users comfort and security. However, the construction of the road leads to several negative impacts on the natural and human environment of the project area.

The various tasks related to the existing roads maintenance are identical to the tasks related to the construction of a new road except the following operations which are not included:

- Forest clearing and logging of the right-of-ways necessary for the road construction;
- General earthworks (excavation materials, embankments);
- Road engineering works.

It has been shown, for the maintenance operations, that materials, equipment and staffs settings and implementations are less significant. The assessment of the impacts related to the road maintenance will be noticeably the same as the one for its construction (impacts in implementation phase); however their significance will be lesser.

The objectives of the road maintenance are different from the ones of a new construction. Some impacts on the environment are also different, although several impacts are identical for both phases (construction work and maintenance). For the study of the road maintenance operations impacts identical to those identified in implementation phase, we will then refer to the implementation phase impacts analysis.

The potential impacts related to the road maintenance activities may be resumed as follows:

- Impacts on the drain modification, water quality, the impact of the toxic substances discharge, sewage dispersion.
- Impacts related to the workers arrival, the labor force and materials transportation on the economical and commercial activities, the local and regional labor force, the incomes, the inhabitants heritage and culture, the existing and potential touristic activities.
- Potential impacts on plant life, on the behavior of the animals which food, reproduction and migration, the animals' habitats, the access to exploit the resources of the forest, the increase of heavy traffic, etc.
- Impacts such as the landslides, the soil erosion, the rivers sedimentation, the stagnation of the waters in the borrow areas and the quarries, the construction waste, the air pollution, the noise, the motor oil and fuel leaks, the sanitary conditions and the health risks related to the presence of the construction work facilities.

The road maintenance tasks concern several sections of the road. Their impact on the environment varies in nature and severity according to the nature and the location of the construction works.

The following road maintenance tasks catalog takes into account the location of the construction works in the analysis of their impacts on the environment.

The catalog is composed of three categories:

- (i) The tasks concerning the construction works facilities, the materials borrows and the quarries, applicable regardless the type of road construction operations.
- (ii) The maintenance tasks of the asphalt pavements and the berms.
- (iii) The maintenance tasks of the outbuildings and equipment which include the road banks clearing, the cleaning and maintenance of the ditches, the embankments, the road engineering works and drainage, the traffic signs, the security equipment, etc.

Following there is a synthesis of the impacts of the road maintenance task on the environment for these three groups of tasks.

Table 73: Synthesis of the impacts of the road maintenance

Tasks	Inconveniences	Impacts
(i) Construction works settings and materials borrowing		
Construction works, workshop, garage and warehouse settings	Oil, grease and acid leaks on the pavement, drainage (toilets), poaching, selection of the implantation site	Local pollution of the waters and the soils, wildlife morbidity, temporary loss of agricultural lands.
Materials borrowing and quarries	Exaggerated deforestation, unregulated uncovering, impairment of the flows.	Damages to the natural environment, vegetation restoration compromised.
(ii) The maintenance operations of the asphalt pavements and the berms		
Deposits of the imported materials on the berms.	Obstacle for the road users/during the rainy season, water logging of the fine materials in the draining system.	Water pollution due to the solid products, obstruction of the ditches and the residents accesses, impairment and danger for the users.
Partial uses (multi-layer with untreated materials).	Toxic substances carried away by water, danger for the road users (windscreen broken).	Water pollution due to toxic substances, water pollution due to solid products, impairment of the users' security
Localized or global repair of the pavement structure.	Circulation troubles for the road users.	Impairment and danger for the users.
Creation of a global coating or global cover with coated materials.	Circulation troubles for the road users.	Impairment and danger for the users.
Global reshaping of the uncoated berms.	Fine materials carried away by rains and deposit in the draining systems, risk of accident for the users.	Water pollution due to solid products, threat to the users' security.
Circulation trails on the construction site.	Increase in traffic load due to the heavy equipment circulation and increased danger for the road users, pedestrian or animal circulation impaired and becomes dangerous.	Car circulation impairment, pedestrian and animal put into danger.
(iii) Outbuildings and equipment maintenance tasks		
Manual or mechanical clearing and pruning.	Cut grass and branches left in the cutting site (berms, ditches), ditches obstruction, use of herbicides, cut waste burning.	Impairment of the road circulation, in the ditches, water flow impairment, chemical pollution of the waters, bush fires.
Manual or mechanical maintenance of the ditches.	Discharge in piles near the edge of the ditches, in agricultural/forestry areas or in the river banks.	Quicker filling of the ditches, degradation of the river banks.
Maintenance of the wastewater facilities and road engineering works.	Discharge in piles near the wastewater facilities.	Disturbance of the flows, flooding in the inhabited areas.
Maintenance of the curbs, gutters and water runs.	Car circulation impairment.	Impairment for the users.

Tasks	Inconveniences	Impacts
Stabilization and maintenance of the embankments.	Heap of earth.	Pollution of the waters due to the solid materials, modification of the soils stability.
Planting/maintenance of the trees.		Positive.
Maintenance of the vertical traffic signs.		None.

Source: STUDI International

It should be noted that, compared to the current situation, without the project of construction and consolidation of the road, the maintenance operations happens more frequently than after the project. It has been shown that with this project, the frequency of the maintenance operations will clearly decrease together with the duration of the population and wildlife exposition to the nuisances from the construction works.

7.9 Cumulative impacts

The cumulative impacts area is wide, it stretch out over the towns of Batchenga, Ntui, Yoko, Tibati, Ngaoundal and Martap. It is also possible to extend the impacts area to the Center and Adamaoua regions, between departments

7.9.1 The Chad-Cameroon oil-pipeline project — in progress

The construction of the Chad-Cameroon oil-pipeline will be implemented by COTCO, which is a consortium constituted by the oil companies Exxon/Mobil, Chevron and Petronas. This consortium has been created with administrative and scientific partners, the Fondation pour l'Environnement et le Développement au Cameroun (FEDEC = Foundation for Environment and Development in Cameroon) which is a trust fund which objective is the long term financing of conservation projects for the Mbam and Djerem and Capo Ma'an National Parks and also the program for the development of indigenous people (Bakola, Bagyeli).

7.9.2 The construction project of the Lom Pangar hydroelectric dam — in progress

The government of Cameroon is engaged in the construction of a dam in the South-East of the park over the water courses Lom and Pangar. This dam should contribute to resolve the issue of energy deficiency the country is currently facing.

The Lom Pangar site has been identified in 1980 during the inventory assessment studies of hydroelectric resources in Cameroon. The project includes the construction of a fifty meters dam, covering about 610 km² for a storage capacity of 7 billions of m³, the construction of a hydroelectric power plant at the foot of the dam and a power line.

The first conclusions of the impact assessment studies preliminary to the project reveal that the construction of the dam will have impacts on the natural environment and the life conditions of the resident populations. Based on a maximum dimension of 674.5 m, the overall drowning surface will be of 59,000 ha.

7.9.3 The construction project of the Nachtigal dam, agreement signed in November 2013

The purpose of the Nachtigal hydroelectric construction project is the construction and the exploitation of a hydroelectric power plant on the Sanaga river in Nachtigal. The site of this power plant is located about 13 km from the start of the road. The project will require the construction of new permanent access roads in order to access to the power plant and the water retention of the power plant from the national road 1.

7.9.4 The project of bauxite extraction in N'gaoundal — in progress

The studies related to the bauxite exploitation are sufficiently advanced and the first exploitation tests are in progress. This project is promoted by the Government in partnership with the ALUCAM company in order to supply this plant with feedstock, source of aluminum.

Moreover, in order to ensure energy independence of the bauxite processing plant, the construction of a hydroelectric dam downstream to the Mbakaou dam.

7.9.5 Consequences of these projects on the road

The various development projects in the region will induce, during their construction and operation phases, the move of populations looking for employment or other economical activities and an increase of the feedstock movements, which consequences will be an increase of the road traffic. For example, for the construction of the Nachtigal dam in the beginning of the project area. Close to 70,000 tons of cement will be required for a period of around 2 years which represents 3,500 loads of 20 tons, that is to say 5 to 7 trucks per day during 24 months. To this shall be added the transportation of hydrocarbons, equipment and material. This may produce an influx at least twice, that is to say probably 10 to 20 trucks per day in average, reaching 50 trucks per day during peak periods.

In addition, these projects will induce an increase of the anthropic pressure on the natural resources and a deep modification of the environment, which will disturb directly the ecological balance of the protected areas, including the Mbam and Djerem National Park. It is likely that this population increase will represent another threat for the wildlife. In addition, we can also note the environmental risks related to the ore exploitation for the bauxite production (industrial pollution) (table below).

Table 74: Cumulative impacts

Environment components	Examples of regional impacts
Atmospheric systems	Increase of the atmospheric pollutants emissions related to road transportation and road circulation of the staffs between the various construction sites.
Ground water	Decrease of the volume of the water courses due to the water used by the projects and by other energy production projects. The different types of pollution that may occur shall be listed.
Aquatic resources	Decrease of the productivity in the spawning areas due to the sediments of the hydroelectric dams construction projects combined to the sediments of the forest exploitation and other regional activities.
Soils and land	Loss of soils
Vegetation	Some plant species will be less present at the regional level

Environment components	Examples of regional impacts
Wildlife	The increased access by roads and the modifications of the habitat amplify the regional changes in the number and the repartition of some wildlife species and the animals refuges towards the Parks in the area.
Usage of the resources	The forest activities, the soils usage for the needs of the project and the increased access by roads modify the possibilities regarding hunting.

7.10 Residual impacts

The burying of the camp waste enables to eliminate them visually and to get rid of their smell nuisances on hygiene and the wholesomeness of the environment. However, we can still fear a residual pollution of the soil and the waters (ground waters and surface waters) due to these wastes.

It is the same for the septic tank that shall be installed in the camp whereas, for this one, the middle and long term risks are far lesser because it is an organic pollution which will be reduced to zero through time due to the regenerating capacity of the environment.

7.11 Attenuating negative impacts and enhancing positive impacts

In this part, we will try to define operationally the measures to be recommended to avoid, attenuate, repair or compensate for the harmful effects of the project on the human and natural environment.

The accompanying measures are designed to eliminate or at least attenuate the negative impacts of the project and to enhance its positive impacts. Compensatory measures intervene when an impact cannot be eliminated or reduced to an acceptable level. The implementation of these steps is no longer intended to act directly on damaging impacts of the project, but to offer them something in return.

It is obviously important to focus on the implementation of measures to remove or reduce impacts. Compensatory measures should intervene only when remaining residual impacts cannot be reduced.

In this case, many of the measures were designed, developed and proposed hereinafter to be incorporated in Batchenga – Ntui - Yoko- Tibati- N'gaoundéré road construction project. As for the impacts (Chapter 6), we will successively deal with:

- Attenuating measures related to the nuisances of project footprint,
- Accompanying measures during construction phase,
- Accompanying measures during operating phase.

7.11.1 Attenuating measures related to the nuisances of project footprint: compensation of the expropriated

As part of the project, several expropriations are needed and the detail will be provided in APD phase during PCR. To safeguard the interests of the population covered by expropriating operations, the following recommendations should be taken into consideration:

Try to reinstall whenever possible expropriated near their former homes or premises. The overwhelming majority of the surveyed population prefers that, in case of expropriation, it be relocated to the locations suitable to its production or survival and with adequate community facilities (easy access to drinking water, schools, health center, etc.).

Construction of houses in the vicinity of those demolished will be promoted and research of agricultural land to replace those expropriated will be opted for rather than for monetary compensation that may not provide adequate long-term compensation (shortfalls, permanent losses of income sources, etc.).

To do this upstream of movement, it will be necessary to:

- identify affected people on the basis of an extensive social survey,
- inform and supervise those who to be moved,
- identify the impacts and evaluate the related benefits and/or compensation,
- carry out a check with national departments,
- request to the domains,
- contract and allocate lands,
- move target populations.

7.11.2 Accompanying measures during construction phase

In general, the means to be taken to limit the negative impact of work on the environment shall be:

- to better manage the site and its impacts on the environment (water, soil, waste, security, etc.),
- to be rigorous in drafting the specifications and in implementation of work,
- to secure the services of a responsible awareness of environmental issues and worksite constraints.

Experience shows that in general, consideration of the environment in construction phase of a project, with some provisions, which are sometimes simple, on work conduct and scheduling, allows the nuisances to be considerably reduced.

This is the reason why, in what follows, emphasis will be given to the measures relating to the organization and conduct of the work as key measures for reducing nuisances of construction phase.

7.11.3 Selection and engagement of contractors

7.11.3.1 Selection of contractors

When selecting contractors, the Project Owner shall impose selective criteria in favor of those who will provide the most respectful of the environment.

For example, preference is given to any contractor capable of providing equipment and sufficient staff to reduce the duration of the work. Indeed, limiting the duration of the work is a good action to limit the impacts of construction phase on the human environment.

Also, the terms of reference of tender documents for the execution of the construction work of the Batchenga - Ntui- Yoko- Tibati- N'gaoundéré road must clearly state the specific equipment which a contractor bidder should have to carry out the work, given the particular constraints of the project area and the nature of work to be done

Indeed, a company having no control over the details of the site is likely to encounter significant implementation problems and have significant delays in implementation, which extends the period of construction and environmental pollution.

A permanent notation system is to be worked out for this purpose during the preparation of tender documents to favor the companies having the necessary equipment to particular work.

7.11.3.2 Commitment of a contractor

The contractor shall assume its responsibility regarding the organization of the site, including hygiene, safety and environment. The main actions in this regard are as follows:

- Report clearly the existence of the worksite in the most sensitive areas.
- Be rigorous in carrying out a work, which requires a rational coordination of worksites.
- Indicate, according to the contractual timeframes, work execution schedule in its different phases and respect the period of execution provided.
- Regularly check the proper operation of all equipment to the worksite in order to avoid excessive fuel consumption or intolerable gas emissions and noise generation.
- Reduce noise by using soundproof equipment (compressors, generators, etc.).
- Reduce dust produced during a dry season by watering the roads in order to avoid any nuisance to users and residents and cover the hoppers of dump trucks transporting materials with tarpaulins. Speed limit to the right of villages also reduces dust emissions.
- Ensure staff safety and hygiene of the worksite. To protect workers, it is necessary that they are equipped with a helmet, gloves, a fluorescent vests and safety shoes and ensure their use by all persons working into the right-of-way of the worksite. As for the protection of the public, closure of the base camp and equipment stock closure and prohibition on access must be guaranteed.
- Help in announcing to the public, as often as necessary, through the press, radio and signage on site, stating the purpose and expected duration of ongoing operations by large and highly visible panels. Only in these conditions and by regularly providing information to the public that the project operator will ensure an overall positive image that will limit the impact of nuisances generated by worksite.

- Manage liquid waste of workers while respecting the environment, by providing sanitary, septic tank and soak pit properly sized according to the number of workers to the base camp.
- Manage household waste produced by the workers in accordance with environment. These wastes should be collected, stored in adequate containers and be set at a point correctly arranged for this purpose, in order to prevent waste dispersion (either by natural agents or by animals). This waste shall be regularly burned or buried in a location to be determined in collaboration with the coordination unit. Ensure, from the outset, that construction equipment meet the needs of the work, especially for unconventional operations. The goal is to avoid as much as possible the technical problems causing shutdown or slowdown with all the adverse consequences of the prolongation of the construction period. Longer stop of a worksite as a result of the site constraints not taken into account from the outset is not tolerable.
- Ensure storage of construction materials and hydrocarbons away from weather (rain and wind) and runoff water.
- The materials subject to be carried by wind (such as sand and cement) should be covered or placed behind cover. Others, which may be driven with runoff water, should be stored on waterproof areas (fuel tanks) and away from main water flow lines.
- Materials that are easily damaged by rainwater should be stored in covered areas or cover with plastic films.
- As for fuel tanks, they should be placed on a concrete area isolated from the natural terrain and surrounded by a trough to collect any leakage and drainage to a hole, from which, in case of accidental leak, their pumping can be carried out.
- Perform maintenance of construction equipment in areas to be developed for this purpose: waterproof concrete area, oil collect device, drain connected to a leak collect pit designed to stop sands and oils.

This list of recommendations is not exhaustive and all initiatives should be considered to avoid any problems that could have negative impact on the smooth running of the worksite.

In general, the Contractor agrees to comply with the environmental regulations of Cameroon as well as clauses of respect of the environment that will be part of the specification.

7.11.3.3 Quality assurance plan

The company carrying out a work shall establish a quality assurance plan (QAP) including clauses of respect of environment that the company agrees to comply with. The company shall ask a consultant to monitor proper implementation of the QAP.

Companies bidding to tender documents who already have an internationally-recognized (ISO for example) or at least national QAP, will receive a bonus.

7.11.3.4 Establishing a program for the implementation of environmental measures

Bidding contractors will be asked to submit in their offers a proposal for the implementation of environmental measures and the work of rehabilitation and a methodological presentation outlining how they intend to avoid negative impacts and minimize unavoidable impacts, including a justification of the proposed actions.

7.11.3.5 Extension of the warranty to environmental aspects

The contractor shall, during the warranty period, perform routine maintenance of the works done and remedy to negative Impacts that would be recorded. Environmental aspects should also be covered by this warranty period.

The contractor's obligations run up to the final acceptance of the work that will be acquired after full implementation of environmental improvement work provided in the contract and finding of vegetation regrowth and plantations.

The performance bond will be returned to the contractor after finding (PV signed) the implementation of all environmental measures on which it is committed, including the rehabilitation of lodges, careers and areas used during construction.

In addition, this work of rehabilitation of the places at the end of the project, usually included in the rubric "Installation and downturn of the worksite" will be paid for separately (price apart added to the table of DAO costs), allowing to ensure their implementation at the end of the work.

7.11.4 Measures regarding the organization, conduct and supervision of the work

Worksite accidents may be eliminated or at least limited to a great extent by:

- choosing the dry season to conduct certain structural work;
- favoring certain worksite techniques;
- complying with the regulations in force;

and generally ensuring that the work is adequately organized.

7.11.4.1 Worksite coordination and scheduling unit

An Environmental and Social Management Unit (ESMU) shall be instituted for the worksite to optimize the worksite's technical organization and take environmental problems into account. This unit shall be composed of:

- engineers specializing in environmental and social issues, who will be recruited for the DIPPER's Environmental Division,
- one or more representatives of the company in charge of the work,
- at least one representative of the ministry in charge of the environment,
- at least one representative of the technical authorities of the Center and Adamawa regions,

- representatives from the water and forest inspectorates (one for each region),
- at least one gendarmerie representative,
- at least one labor inspection representative,
- at least one healthcare representative,
- representatives of any local NGOs that wish to participate,
- possibly environmental specialists from various administrative agencies.

The worksite coordination and scheduling unit will be responsible, among other things, for:

Organizing an information seminar before the work begins. This collaborative effort must include all the players concerned (local elected officials, technicians from several ministerial departments, etc.) to obtain their agreement on the measures proposed and invite them to design programs and activities within the scope of their responsibilities;

Drawing up monthly reports on the progress of the work and the compliance of the ESMP's environmental and social considerations and measures with the monthly field visits. These reports shall be submitted to the DIPPER and the head of the MINEPDED's Environmental Division and attached to the work-completion report;

Amending the technical specifications' environmental and social clauses to include any local considerations;

Monitoring the effective implementation of all the measures recommended to prevent and reduce the project's impact on the environment;

Liaising with the company and monitoring the worksite to ensure implementation of the ESMP's environmental measures;

Consulting with the forest companies operating in the project area;

Maintaining relationships with the local population to take their concerns into account and resolve any conflicts.

The Project Owner's representatives in the unit will help the water and forest services with their work regarding the right to supervise the worksite activities and consult with them and with the contractor and the local population to choose the appropriate place for the life base, as well as the other areas to be used by the company (possible waste dump, stockpiles, quarries, etc.).

The coordination unit will also determine more precisely, in collaboration with the villagers, the areas to be protected, and help the local population mitigate the environmental nuisances during the work phase.

7.11.4.2 Complaint logbook

A complaint logbook shall be kept at the mayor's offices in Ntui, Yoko and Tibati. Complaints from the local residents and road users shall be transmitted daily to the coordination and worksite scheduling unit, which will process them with all due care (recommendation of appropriate solutions for the various problems raised).

7.11.4.3 Monitoring implementation of the ESMP by the supervisory office

The task of monitoring implementation of the environmental and social management plan (ESMP) during the work has been assigned to the supervisory office. The office's environmentalist shall be present throughout the duration of the work and will verify the compliance of all those taking part therein (first of all the company) with the ESMP and the environmental and social clauses in the DAO.

7.11.4.4 Submission of a provisional work schedule to the government

While performing the contract, the contractor shall establish and submit a provisional work schedule, including all the information enumerated in the related environmental clauses, for the approval of the Project Owner's representative and to the coordination unit.

7.11.4.5 Choice of period to perform certain worksite operations

The work schedule must take technical constraints into account (e.g., rainy periods), as well as periods during which the environmental components risk being more sensitive to the worksite operations.

7.11.4.6 Choice and development of areas to be used by the company

Areas to be used by the company shall be chosen and managed according to the following general rules:

- Internal rules: the rules governing life in the camp must provide measures to protect the environment (prohibition of poaching, control of the consumption of wild game even by obtaining supplies from persons outside the camp, regulation of forest exploitation, etc.);
- Choosing sites: as a general rule, stockpiling and borrowing areas must be located on land that has low agricultural or forest capacity and is in any event beyond the forest concessions and the villages' exploitation areas, subject to the prior agreement of the provincial water and forest inspectorate and the forestry company holding the concession or the population having the use thereof. Minimizing all types of impact requires site-by-site consultation to determine the post-use rehabilitation objectives. The areas chosen by the contractor for its installations and/or as materials storage or borrowing areas must be further than 500 meters from a watercourse or, when such is not the case, be equipped with a system eliminating all risk of pollution or sedimentation produced by such areas. They must not be located in farming areas without the consent of the farmer. After prospection and identification, the sites intended for borrowing materials shall be subject to a prior investigation that must determine the nature of the customary land rights; the site's traditional use, and in particular whether it is agricultural, permanent or in rotation with shorter or longer fallow periods; the presence of trees that were planted or grew spontaneously, are regularly harvested for fruit or other items; and the agricultural or other use desired by the owners or operators after rehabilitation.

- Areas intended for use by the company may not be installed in protected environments or in special environments, such as wet zones, that are to be protected.
- The sites for preparing tar (which generates unpleasant smells) must be chosen in consultation with the coordination unit and placed fairly far from the villages, taking into account the direction of the prevailing winds.
- Developing the areas for the contractor's use: the areas chosen by the contractor for its installations and/or as areas for storing or borrowing materials must be developed to prevent erosion on the site or in its immediate surroundings and to make it possible to bring any pollution, whether accidental or not, under control.
- Areas intended for storing or manipulating products that are dangerous, toxic, flammable, or pollutants must be developed to ensure effective protection of the soil and subsoil and to enable the recovery and evacuation of products and/or any polluted soil. Such development shall take into account the region's weather conditions (abundant rain during a large part of the year) to avoid any accidental flow beyond the developed areas.
- Waste-storage areas must be provided and clearly identified by the type of waste. The life base shall include an area reserved for storing possibly contaminated/polluted soil, a protected area equipped with watertight receptacles for recovering used oils, and a protected, fenced area for storing toxic or dangerous waste (laboratory reagents, dispensary waste, special products, etc.).

7.11.4.7 Organization of traffic during the work

The contractor must make sure the residents and road users can always drive on/access the road during the work. It is important that the road not be completely barred during the work. The worksite must therefore be organized so as to alternatively rehabilitate one of the two lanes and deviate traffic onto the lane not being worked on (work on half the roadway).

The companies shall indicate the itineraries and frequencies of trucks to reduce the nuisance to the local residents. Final itineraries shall be chosen by the local authorities and the coordination unit.

The contractor shall impose a speed limit of 40 km/hr, in all the villages and hamlets and at intersections with other roads or forest paths, on all of its drivers and their subcontractors, if any. Drivers exceeding this limit must be subject to internal disciplinary measures.

For this purpose, once work begins the contractor will be required to clearly indicate approaches to urban areas or intersections on the roads and paths to be used. It must submit a map to the Project Owner indicating the planned installations and structures and will be liable for maintaining them as long as the work lasts.

The company's vehicles must always comply with Cameroon's vehicle code and, more specifically, with all texts and regulations concerning the weight of loaded vehicles and the condition of vehicles.

7.11.4.8. Choice of the appropriate period to perform certain worksite operations

The work schedule must take technical constraints into account (e.g., periods of strong rains), as well as periods during which the environmental components risk being more sensitive to the worksite operations.

To rehabilitate by natural revegetation, or even more so, by returning to agricultural or forest production, performance of such work must be avoided on soils that are not sufficiently dry. The soil must be loosened (chiseled) before installing topsoil, which must also be manipulated only when sufficiently dry. These constraints require a tight work schedule centered on the dry period.

In addition, considering the serious risk of erosion during the earthworks and preparation of the road base, such work will be performed in the dry seasons as much as possible. The work already performed must be protected with the rainy season begins. Such work consists of consolidating the earthworks with a layer of laterite.

7.11.4.9 Choice of the most suitable implementation techniques

In this context, one should:

use prefabricated elements as much as possible. With regard to the environment, use of such (prefabricated) elements constitutes a contribution from the Project Owner and the company to limiting the work-phase nuisances to the human and natural environment: simplify implementation procedures, limit the right-of-way, shorten the duration, etc.;

avoid using large machines for the work in Ntui, Yoko and Tibati as much as possible;

limit as much as possible the explosive charges in the hard-rock quarries located close to inhabited areas and areas likely to be inhabited by sensitive wildlife;

to the extent possible, choose techniques that use local materials as much as possible and are as highly labor intensive (HLI) as possible, in particular for sanitation works, installation of protection, reconstruction of small engineering works, etc.

The cost of measures related to organizing, conducting and supervising the work are set out in the section below.

7.11.4.10 Cost of measures related to organizing, conducting and supervising the work

A cost-summary table excerpted from the ESMP is attached hereto (subject of Appendix 9):

Recommended measures and actions						Monitoring/Supervising implementation of the measures				
No.	Contents of recommended measures and actions	Term Account	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
1.0	Publication of the EIES, PGES, PCR, before the publication of the EIES summary posted on the bank's website		Measure not leading to supplementary costs				Project Owner (Project Owner (Four months before the project hand-out submitted to the administration unit for the bank's project approbation	Clippings for the press publishing – Complaints transmitted
1.1	Choice and contractor's engagements: selective criterium favoring those who will provide the most environment friendly benefits in the best delays (disposable resource of human and material means)	A	Measure not leading to any supplementary cost				Project Owner/ Research unit	Project Owner	Preparation of the DAO and counting of the offers	Company's choosing
1.2	Creation of an Environmental and Social Management Unit (ESMU)	A	Measure not leading to any supplementary cost				Company/ Project Owner	Project Owner	Before the construction process	Monthly reports and minutes of the construction process written by the unit
1.3	Publishing of the PCR and of the PGES as well as creation of a complaint's directory in collaboration with the city offices of Ntui, Yoko and Tibati.	A	Measure not leading to any supplementary cost				Project Owner/ City Offices of Ntui, Yoko and Tibati, Departmental Assembly of the Adamasoua region and of the Center	Project Owner	Right from the beginning of the construction/ To be continued during the exploitation stage	Existence of the directory/Quickness in dealing with the complaints by the Environmental Service of the MINEPDED
1.4	Handing out of the planning schedule by the company to the Mayor related to the construction process and to the implementation program of the environmental measures	A	Measure not leading to any supplementary cost				Company	Project Owner/ Coordination unit	Before the construction initial phase	Program completion and relevance

1.5	Creation of an environmental management system by a consultant (SME) for the Company	B	F/Company	8	2,000,000	16,000,000	Company by an independent consultant	Project Owner	At the latest, starting the construction initial phase	SME's file, Certification, Auditing Reports
1.6	Surveys made according to the zones aimed at being used by the company (sites, implantation of the site facility, of the crushing and coating, of the passage and dumping zones, of the dumping ground aimed at releasing the waste, etc.)	B	F/Company	8	4,000,000	32,000,000	Company by an independent consultant	Coordination unit	Before the initial phase of the construction	Report of the initial phase
1.7	Creation of an initial contradictory inventory (before construction) by an independent consultant, including an inventory of the common interest substances aimed at the local population or the wildlife.	B	F/Company	8	15,000,000	120,000,000	Company by an independent consultant/Local population	Project Owner/Coordination unit	Before the construction initial phase	Report of the inventory made by an independent consultant certified and approved by the Coordination unit
1.8	Creation of a forum related to the construction initial phase or to the first informative meeting and of the dialogue involving the different parties (local administrations, NGOs, associations, populations and human resources undertaking action within the community, etc) for presenting the project and acknowledge the needs of the different parties, of their sensibility in regards to the project (acceptation, reluctance, complaint's specificities and requests).	A	F/Company	8	5,000,000	40,000,000	Company	Coordination unit	Before the construction initial phase	Report of the forum/Number of persons attending the forum

7.11.5 Environmental preservation measures during the construction phase

7.11.5.1 Reinforcement of the capacities

In view of the difficulties of displacement between the city of Yaounde and the city of Ntui, Yoko or Tibati, given the trip takes several hours, It is therefore recommended to proceed right from the beginning stage of the preparatory phase of construction by recruiting 4 engineers specialists of environmental and social aspects in order to represent the Head Chief of the Environmental Department in each county (Batchenga, Ntui, Yoko, Tibati, Ngaoundal and Martap and Ngaoundere), and ensure control of all the aspects to the environment, hygiene, health and security (support of the salary inherent to the project during the construction period). The targeted profiles and hired candidates shall be experienced environmental experts holding a Master degree +5 specialized in environmental issues, with a solid knowledge of the geographical region and who can master the local languages.

At the completion of the construction, the hired engineers shall either be transferred to another road project (many of those to be launched in the near future within the Cameroon territory) or join the headquarter of MINEPDED in Yaounde to support the Head Chief of The Environment Department in its assigned functions.

On a different level, specially for such a project having a deep impact on the dense forests and on the savanna ecosystems, the institutions involved in the environmental management are not limited to the Ministry in charge of the environmental issues, but this also includes water services & drills.

In order to better involve these institutions in the environmental management of the construction site and of the road construction "Batchenga - Ntui- Yoko- Tibati- N'gaoundereil" is suggested that before the beginning of the work process, four training sessions of 5 days shall be implemented each aimed at the personnel working in those institutions carefully selected for monitoring each working progression of the infrastructures. Managers of the Public Works of the Territorial covering Ntui, Yoko and Tibati, active local NGOs in the field of environmental and other local governments can also benefit from this training.

The training will be based on the conception of EIES, its evaluation, and the tools and practical conditions related to the implementation and to the social and environmental measures in the ESMP underlying risk management of each infrastructure.

It will be used as capacity building reinforcement elaborated at the Adamaoua and Center regions scale in matters of managing environmental and social infrastructure projects from a general perspective, specifically for the road projects.

Similarly, regarding the building of the hardware capabilities aimed at preserving the natural resources, one advocates the acquisition by the Owner on behalf of the Ministry of the Waters and Forests and of the Department of the fire brigades of the Centre and Adamaoua regions specific equipment aimed at better control/monitoring of the forestry area crossed by the road construction site.

For the forest rangers placed throughout the trace route: a group of 20 guards will be provided (20 tents and 20 kits camping for equipping 20 rangers) as well as the purchase of

an all-terrain vehicle for all the water services and drills performed in each village Ntui, Yoko and Tibati which makes 3 vehicles in total.

In addition, the consultant advocates the support of 10 additional forest rangers with extra equipment as well as awareness-raising equipment aimed at reinforcing the struggle of the visitors against the poaching during the whole construction period.

Cost of the measure: cost of the measure is detailed below:

Recommended measures and actions						Monitoring/Supervising implementation of the measures			
Contents of recommended measures and actions	Measure category	Costs of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
		Unit	Quantity	Unit price (XAF)	Total price (XAF)				
Recruitment of four specialist engineers in charge of the social and environment aspects for the Environment Service Department (DIPPER)	A	H.m	112	800,000	89600000	Project Owner	Project Owner	4 months before the beginning of the construction	Management of the ESMU/Conception of the monthly reports/Assisting the Environment Service Chief in regards to the complaint's management.
Equipment used for the reinforcement of the controlling capacities/ monitoring of the Water and Drills as well as of the Fire Brigade Department of Mbam and Kim and of the Mbam and Kim parks, 20 tents and 20 camping kits aimed at equipping 20 forest guards, 20 pairs of google, 20 communication equipment kits and digital cameras.	A	F	20	2,500,000	50,000,000	Project Owner	Project Owner/ Ministry of the Environment and of the Environmental Protection (MINEPDED)	From the beginning of the construction phase	Acquisition of the equipment and progress of the monitoring/control operations
Reinforcement of the park guards number during the initial phase of the construction (10 guards)	A	U	280	200,000	56000000	Project Owner	Project Owner/ Ministry of the Environment and Environmental Protection (MINEPDED)	Starting the beginning of the construction	Acquisition of the equipment and progress of the monitoring/control operations
Required equipment for the 10 guards hired in order to reinforce the actual specialized personnel and for rising the awareness of the visitors in regards to the equipment being used.	A	F	10	2,500,000	25,000,000	Project Owner	Project Owner/ Ministry of the Environment and of the Environmental Protection (MINEPDED)	Starting the beginning of the construction	Acquisition of the equipment and progress of the monitoring/control operations

Recommended measures and actions						Monitoring/Supervising implementation of the measures			
Contents of recommended measures and actions	Measure category	Costs of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
		Unit	Quantity	Unit price (XAF)	Total price (XAF)				
Implementation of 4 training sessions of 5 days each for the administrative personnel (DIPPER and Environmental Department Service of the MINEPDED. Cantonment and brigades of the Waters and Drills of the Mbam, Kim and Adamaoué sub-division Departments in terms of social and environmental project management of the road projects and of the infrastructures from a general perspective.	A	h,j	20	800,000	16,000,000	Project Owner by an independent consultant	Project Owner/ Ministries in charge of the environment, waters and drills (MINFOF).	Four sessions of 5 days each/ Before the beginning of the construction	Number and specialties of the trained personnel/ Certificated provided by the Board or by the engineer in charge of the training session.
All roads vehicles (pick up) for the Water and Drills service Department of Ntui, Yoko and Tibati villages.	A	U	3	17,000,000	51,000,000	Project Owner	Ministry of the Environment and of the Environmental Protection.	Starting the beginning of the construction	Acquisition of equipment, progress of the monitoring and control operation

7.11.5.2 Protection measures and ambient noises

We would like to acknowledge the contractor's mandatory obligation of limiting the ambient noises susceptible of disturbing the residents in a severe way, with an unbearable intensity during an overly long work duration, by its extension outside normal working hours, or caused by more of these causes simultaneously.

All operations, noise source, must be started prior to their implementation, and are subject to the Coordination unit's agreement. This Agreement shall be given only after finding all conditions supporting the annoyance reduction (soundproof devices, limited employment duration, etc.).

The operation of the construction zones during the night will also be subordinated to the coordination unit's authorization chaired by the project owner. In case the contractor had received an authorization or an express order aimed at executing the work during the night, he will commit to perform them in a way to avoid causing trouble to the people and to the people working on the construction site living nearby. The lighting mode will also be subjected to the Coordination unit's agreement.

Cost of the measure: Measure not leading to any supplementary costs.

7.11.5.3 Limitation of atmospheric emission

The equipment of the site must be maintained and kept in good working condition. In order to avoid any exaggerated emission of air pollutants, abnormal gas emission of exhaust witnessed by the local population or by the Coordination unit must be notified to the contractor, whom will then have to repair or replace the required parts/equipment in a timely manner.

On the other hand, the zones aimed at preparing the tar (which generates a bad odor), should be placed quite far from the villages and while taking into account the direction of the prevailing winds.

Cost of the measure: Measure not leading to any supplementary costs

7.11.5.4 Limitation of sludge and dust

The contractor shall take all necessary measures to avoid any unwelcome pollution near the site of the pavement, shoulders and sidewalks soiled by dust, rubble, mud or materials coming from the working site activity.

Special provisions shall be taken in cases of demolition or masonry works in order to prevent spread of dust. Efficient watering shall be planned so that this does not cause any inconvenience for the neighborhood.

The contractor shall, during the dry periods and according to water's reserve, regularly water the tracks used for transporting the equipment in a way to avoid spreading dust and more particularly spreading it within the villages nearby crossed by the work roads.

Similarly, the dump trucks transporting materials in the furniture should be compulsorily covered with tarpaulins and the speed limitation on the work roads crossing the villages enables to reduce the issued dust.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
1.20	Dotation of the trucks transporting the equipment of the furniture coverings for the dump covers.	C	U	240	40,000	9,600,000	Company	Coordination unit	Before the beginning of the construction	Monthly reports of the Coordination unit/ Eventual complaints of the local residents and of the users (dust particles) recorded within the complaint's directory.
2.15	Systematic watering of the roads taken by the transportation trucks, of the constructions zones and of the crushing sites in order to reduce the atmospheric spreading dust.	C	Included in the services supported by the company				Company	Coordination unit	On a daily basis during the dry season	Monthly reports of the Coordination unit/ Eventual complaints of the local residents and of the users (dust particles) recorded in the complaint's directory.

7.11.5.5 Recovery of the wood from forest clearings

The recovery of the wood from the forest clearings will be used for heating for the population and will enable to produce constructions decorative and in order to stabilize the embankments, especially in the vicinity of the towns.

A portion of the recovered wood will be given to the local population in order to be used for the construction of obstacles around the schools, the markets, the playgrounds and other crowded public spaces (especially crowded by young people) located near the road and also the obstacles that enable to stop the animals crossing the road in the dangerous locations (sharp curves, severe slopes, etc.)

In addition, the local population will be asked to build bus stop shelters using the wood from forest clearing.

Thus, it is suggested that: The recovery of all the wooden materials by the local population for increasing their values (construction, obstacles, shelters, small craft objects, etc.)

The composting of the remaining plant wastes by the town services in order to use them for heating the population or in order to install decorative plants at the gates of the towns.

Cost of the measure: The measure will not generate new costs.

7.11.5.6 Repairing of the damage to the residents' properties and respect of the sacred

The company shall, under the monitoring of the coordination unit, clean and eliminate at its expenses any form of pollution due to its activities and pay compensations to those who suffer the consequences of these inconveniences. The company shall increase awareness of its staffs towards the respect of someone else properties and especially the respect of the cultural rites. This implies the respect of sacred and religious procedures and locations (readings and traffic signs, cleaning and maintenance or rehabilitation or compensation depending on the customs and respect of the PAR).

The company shall rebuild all the fences and hedges destroyed during the construction works. As much as possible, the new hedges will be created from plants recovered from the

clearing of the road right-of-ways. These plantings require then to be manipulated with care and it's preferable to proceed them at the beginning of the construction works in order to water and maintain them during the duration of the constructions.

Cost of the measure: Included in the general expenditure of the company.

7.11.5.7 Measures in order to protect the soils structure

For all the construction and maintenance operations, the responsible has to avoid damages to the neighboring lands, to anticipate mechanisms in order to stop erosion such as ramping of the embankments, tree planting of the edges and evacuation of the rain water which could cause soil erosion through runoff.

In every mining concession and every quarry, the manager shall install and maintain mechanism against erosion, to bank up or replant trees in all the lands degraded by the exploitation, avoid to damage the agricultural lands by accumulation of waste, evacuate the waste waters and other.

The protection against embankments' erosion shall be developed and implemented in order to enable longevity, the best possible, given the whole local ecological context and the techniques applicable in this context. This objective concerns both the precautions to be taken during the construction works and the final construction works for stabilization and revegetation.

A pioneer protection of the most exposed embankments, before the revegetation, is preferable. During the periods of frequent rains, the embankments the most sensitive to erosion will be covered by leafy branches or grass materials, superficially fixed on the embankment and able to ensure a certain level of protection, even temporary. These materials shall be recovered from cuts in the close environment of the road to build. This mechanism against erosion will facilitate the holding back of the plant soils that will be brought at the moment of installation of the plant material planned for the final revegetation.

Over the most sensitive areas (soils weak to erosion), a "pre-revegetation" shall be recommended under the shape of temporary leafy branches cover, mulching protecting the threatened surfaces before the planting of the living plant material. This mechanism evolving with time by decomposition will encourage the protection again erosion the young plants for revegetation that will be placed (mattress).

Particularly strict precautions shall then be taken in order to:

- Remove the excavation materials during the road construction.
- Control the runoffs and their solid flows from the areas uncovered affected by the constructions operations. It is the case in particular for the wetlands receiving the outlets and which soils are likely to be filled and asphyxiate by the solid debits from the road construction site. The remedy are using the fragmentation between several debits from the areas where the sediments come from in order to avoid the concentration of polluted wastes and their transport to long distances. Therefore, as often as possible, these debits will be directed towards the reception surfaces with grass natural vegetation.

- For the case of areas which require a specific protection (fragile wetlands, agricultural lands), a decantation and absorption mechanism shall be built.
In practice, it is the local soil context, the topography, the vegetation and the climatic erosion potential that shall be taken into account for choosing the solutions that minimize these impacts. Using together solutions that associate vegetation and “solid” infrastructures against erosion constitute the key to the management of erosion in such areas.
- Recovery and storage of the soils, especially in forest areas, and planting of legume which enrich the soil with nitrogen, constitute an adequate solution.
- Plowing the lands which endured heavy subsidence.
- Putting rocks and revegetation of the embankments with severe slopes with local species (including legumes in order to enrich the substrate with nitrogen) in order to fix the soils and attenuate erosion.
- Reforestation of the embankments will be implemented at the end of the earthworks.
- The supply of a 10 cm layer of plant soil, followed by a subsolling of the argillaceous compact soil will increase the permeability and the infiltration capacity. In principle, this should be enough in order to start quickly the vegetation however, this restart will be accelerated by sowing (manually, scattering of the seeds in order to avoid subsidence) graminaceous plant or legume constituting a dense cover.
- The monitoring of the access to the area will enable afterwards the consolidation of the plant cover and the spontaneous appearance of trees.
- Also, the use of protected species will be encouraged.

On the embankments with severe slope, a mechanism against erosion is required when the plant soils which were spread face the risk to be eroded before the planted vegetation reach a sufficient growth and cover. In the case of a particularly quick growth of the vegetation is required, a fractioned supply of fertilization shall be performed for completing the plant soil.

Cost of the measure: Included in the general expenditure of the company.

7.11.5.8 Modification of the natural flows and risks of flooding

The draining (ditches, gutters) and stabilization of the banks operations shall be included in order to ensure a good draining of the water and reduce the banks erosion.

The Company shall, in addition of these construction works:

- select installation sites outside areas liable to flooding,
- avoid any discharge of materials in the water courses,
- open materials deposit areas at a distance at least of 100 m from water courses.

Cost of the measure: Included in the general expenditure of the company.

7.11.5.9 Measures for the water preservation

Protection against the pollution due to waste water

The protection of the surface water and the aquifers against pollution is performed mainly by the interdiction of any unloading or discharge of waste water, sewage, grouts, hydrocarbons, pollutants of any nature in the wells, drilling, ground waters, water courses, natural brooks, ditches or on the ground itself.

For this purpose, the camp will be equipped with a septic tank towards which will be evacuated all the waste water generated by the workers (allowable sewage, cooking water, showers, etc.). This tank will be disinfected regularly with lime and will be discharge in a soak pit in order to avoid the water to enter into the natural environment (groundwater or water course) before receiving the minimum preliminary treatment. The soak pits shall be set away from the water exploitation sites of the local population (wells, water courses).

Similarly, the camp shall be equipped with a sedimentation tank receiving the water used for cleaning the equipment. As much as possible, this water will be used in closed-circuit in order to minimize the quantity of water used and to limit to the minimum the pollution.

This measure shall be completed with the complete interdiction to clean the construction site vehicles anywhere else and especially not in the rivers.

The choice of the locations for the sedimentation tank and the septic tank will be performed through dialog with the coordination unit.

Protection against chemical pollution

In order to minimize the risks of fuel spills during the supply of the construction site heavy equipment, the fuel tanks will be filled with pumps equipped with automatic stop system.

The maintenance and oil changes of the heavy equipment of the construction site will be performed in a waterproof area specifically prepared for this purpose. Used motor oils will be recovered and stored in leak proof tanks that shall be prepared from the beginning of the construction works and will be evacuated to a location defined with MINEPDED and designed specifically for the processing of used motor oils.

The contractor shall be aware that any discharge of filters, used parts or motor oil in the nature (especially in the water courses) will constitute a severe infraction for which the company will support accounting a fine and they shall then inform their workers that they will assume such infractions.

On the other hand, the contractor is fully and civilly responsible for any accident consecutive to the use of herbicides and insecticides regardless their nature and also the spraying and manuring devices. Moreover, any potential use of herbicides and insecticides will be submitted to the agreement of the general contractor and the coordination unit.

Cost of the measure: the cost of the measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Term Account	Cost of the measures				Responsible for implementation of the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	I measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
1.14	Equipment for the management of the solid wastes from the camp (trash, garbage track, setting of a garbage dump, etc.)	C	F/ camp	8	1,000,000	8,000,000	Company	Coordination unit	Before the beginning of the construction operations	1st coordination unit report/availability and feature of the equipment/claims from the population recorded in the claim logbook
1.15	Equipment of the camp for sanitary facilities, septic tank and soak pit	C	F/ camp	8	8,000,000	64,000,000				
1.16	Equipment of the material park with a platform in concrete equipped with ditches and leakage recovery mechanism for the fuel tanks and the motor oil change operations	C	F/ camp	8	2,500,000	20,000,000				
1.17	Equipment of the material park with a sedimentation tank for the water used for cleaning the equipment.	C	F/ camp	8	1,500,000	12,000,000				

7.11.5.10 Wildlife conservation measures

The following measures will be imposed to protect wildlife during the work:

- Supervise and sensitize the staff to the problem of poaching and prohibit consumption of wild game on the life base. **To ensure that game is in fact not consumed, the contractor is advised to set up a cafeteria where the protein sources are fish from fishing areas and meat from local farms.**
- Sensitize construction-site staff regarding Cameroon's regulations in this regard, clearly displaying excerpts of the relevant laws and the lists of animals that are partially or totally protected. Emphasize the wealth of wildlife in the area and the need to work to protect these remarkable species, especially the chimpanzees and elephants.
- It is important to heighten environmental awareness in the project area (Yoko – Tibati), and especially where the national parks meet. The topics addressed will emphasize the danger of brush fires and knowing which of the area's species are protected (especially chimpanzees and elephants). An NGO working on the construction site and in the villages and schools throughout the construction period will conduct these activities and distribute materials designed to sensitize the population, such as t-shirts, hats, etc.
- In addition, it will be important to communicate through traditional communication channels, such as by producing audiovisual aids (television documentaries using archival and sensitization images, sketches), and through local radio stations. The target population includes all area inhabitants who like wild game and encourage poaching without realizing the consequences of reducing the biodiversity in the area and the economic repercussions for the villagers. Radio programs have a wide audience in the study area. Draft agreements must be concluded with the local radio

stations to properly cover the area and have program hours in favorable time slots. These time slots will be used for:

- Live topical programs with interaction between program hosts and listeners,
- Broadcasts of interviews conducted on the ground with the various population groups,
- Broadcasts of classic rural radio programs with games, contexts, etc.,
- Live, on-the-ground broadcasts to sensitize the voices of authority, such as administrative, local, and customary authorities, during awareness days and also in the context of a regular program to reach all locations on pertinent topics,
- Programs will also be broadcast in local languages, such as those spoken the most in each area. The messages will therefore be broadcast in the most popular languages and dialects.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category*	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
2.2	Radio broadcasts about the project and the need to protect the environment, and especially on the rich array of wildlife in the national parks (TV documentary + radio broadcast + t-shirts + hats)	A	F	1	50,800,000	50,800,000	Project Owner	Project Owner	As soon as work starts	Number of radio broadcasts, number of sensitization items distributed
2.3	Sensitization campaign regarding environmental protection (wildlife and plant life) and hygiene security, with the help of an NGO that will conduct activities every 3 months and supplement its actions by distributing the sensitization materials described in 2.2	A	U	75	3,500,000	261,333,333	Project Owner	Project Owner	As soon as work starts	ESMU Management/Drafting of report at each event/activity
2.19	Strict supervision of the consumption of wild game on the life base, including by obtaining provisions from persons outside the construction site	B	Measure not generating any additional costs				Contractor/Workers	Coordination unit/Forest rangers	During the work	Monthly coordination unit reports/number of violations + Observations

7.11.5.11 Plant life conservation measures

The contractor must comply with the Forestry Law, which will be the reference text. In addition, in agricultural areas, on the savannah, or on village roads, simple protection measures may be taken:

- Prohibiting unauthorized cutting of wood and obtaining supplies of wood for the work solely from certified forestry companies;
- Installing the construction base in areas where there is already human activity or incorporating it into the natural landscape;

- Preserving large-diameter trees during clearing operations when such trees do not cause problems for the work.
- Complete rehabilitation of the destroyed habitats, estimated at 300 hectares of vegetation, is planned, as is the establishment of a nursery as soon as work begins.

On the savannah, where the forest is less abundant and above all on village roads, where certain trees play an economic (fruit trees) or sociological role, simple measures to protect the trees may be taken after the important trees have been identified:

- the trees will be protected against shocks and injury by a system of pickets and boards, easy to put together;
- all unnecessary harm shall be avoided (nails, staples);
- lighting fires or installing burners nearby shall be avoided;
- materials shall not be piled against the trees;
- branches shall not be cut.

In addition, several preventive and remedial measures may be necessary and effective.

Preventive measures include:

- Taking an inventory of all the trees likely to be cut down during the road-construction work, as well as the other species of particular interest for the local population or the wildlife. Such inventory shall preferably be taken with the help of the local population.
- Sensitizing the workers with regard to fire risks.

Remarkable trees, identified as such after consulting the villagers, will be protected by building wooden fences around the trunks and prescribing measures related to the neighboring construction site. These trees will be protected from shocks by beams roughly 2 meters long attached to the trunks and by lifting the bottom branches.

Picket fences shall be placed at the foot of embankments near the trees to avoid any harm that might be caused by blocks of stone.

Liquid products such as asphalt and gasoline shall be stored fairly far from areas populated by plant species.

The following operations shall be avoided: planting nails in tree trunks, attaching cables or chains to trees without protective measures, installing burners or other heat sources close to trees or shrubs, etc.

In addition, it is important to avoid making embankments within 2-meters of tree trunks. In the root area located more than 2 meters from the tree, embankments may be constructed of permeable materials installed beyond the root area.

The surface layer of the existing soil must first be broken up. The maximum embankment height should not exceed 30 cm for fruit trees, and 1.00 meter for hardier varieties. Measures must be taken to ensure ground ventilation for embankments higher than 30 cm (for example, a layer of stones or branches).

Surfacing in the root area (sidewalks) must be made of permeable materials such as gravel. If impermeable materials are used, an area of 4 m² at least per tree shall be left unsurfaced in the root zone.

Exposed roots must be protected immediately from the sun and from drying out, particularly if the trenches must stay open more than 3 days. Such protection must consist of canvas or strips of paper or cloth and must be kept wet at all times. Plastic sheeting is not acceptable. When backfilling the trenches, the roots shall be recovered with loose, watered topsoil.

Clearing of weeds and trees must be supervised by the water and forest services with support from MINFOF. Prior to such operations, the companies must obtain the necessary authorizations from the regional inspectorates or from the water and forest services of the Mbam and Kim division and the Adamawa region.

Remedial Measures

It is very important to repair damage quickly and correctly. The most frequent kinds of damage shall be repaired as follows:

Damaged roots: the damaged portions must be trimmed with a sharp tool and covered with an appropriate protective layer.

Damaged bark: all damaged portions of the trunks and branches must be trimmed with a sharp tool, and large wounds extending over more than one-tenth (1/10) of the trunk's circumference must be protected with a special putty or with clay and covered with a burlap bandage.

Broken branches: such branches will be sawed off cleanly to eliminate the damaged area entirely. The cut must be covered with special protective putty.

Cost of the measures: The cost of the measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category*	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
1.9	Establishment of a nursery to replace the 300 hectares of topsoil that will be destroyed. We recommend establishing the nursery as soon as construction starts and beginning to plant when the site is returned	C	F	1	250,000,000	250,000,000	Project Owner through the contractor or the division's water and forest inspectorate	Water and forest inspectorate of the Center and Adamawa regions/Water and forest cantonment of the Mbam and Kim division and the Adamawa region/MINFOF	Preferably as soon as work starts	Final status report with both parties present
1.12	Building wooden fences around trees identified by the local population as being remarkable to protect them from fire, shocks, and damage	C	Included in the services provided by the contractor				Contractor	Coordination unit	Before work starts	1st coordination unit report

7.11.5.12. Measures to mitigate the impact on the landscape

Road embankments will be covered quickly with self-propagating vegetation, which will contribute to the incorporation of these structures. However, to make sure steep embankments hold and to facilitate soil reconstruction, rudimentary grass will be laid by planting a mix of grasses and legumes belonging to the species existing on the site. To mitigate the extraction sites' effects of the landscape, we recommend:

- choosing extraction sites that are not visible from the road;
- clearing the site gradually as operations progress;
- limiting and directing the operations in "hollow extraction" form;
- laying topsoil and planting trees along the edges of the quarries (site entry, access road).

For laterite and sand quarries, landscaping to reduce the impact on the landscape must always be performed as early as possible to hide the deterioration caused by the operations as much as possible. Among other measures, we recommend:

- creating screens by raising the ground and planting appropriate plants;
- creating a landscaped embankment;
- either by laying the embankment down uniformly at 45° with flat areas 4 to 5 meters wide so they may be covered with topsoil and a balance of solid rock (in general, these embankments will support very little wildlife);
- or by creating a variety of embankments with different slopes and a deposit of loose stones making it possible to diversify the vegetation and above all obtain a biotope for certain wildlife.

Such embankments and screens should not be rectilinear with plantings in rows.

Unlike laterite quarries, solid rock is generally covered by lithosols that make planting difficult. Rock quarries have an intrinsic landscape quality due to the rock's configuration, aspect, and color. We may therefore imagine operating such quarries in attractive, tourist areas by highlighting the size. To make the quarry attractive to the public in the future, the operation must:

- leave harmonious, varied sculptural shapes;
- leave contrasts of form and atmosphere;
- secure the most dangerous parts.

The explored quarries are detailed in paragraph 6.4.5 and indicated on the maps in Appendix 8. Eleven quarries (PK 66+600; PK 66+800; PK69+800; PK 119+370; PK 124+600; PK 129+580; PK 132+770; PK 139+970; PK 137+375; PK 148+120; PK 154+870) are close to the National Park. It is important that these quarries not be used to the extent possible given the negative effects use may cause to the wildlife and plant life.

7.11.5.13 Human health prevention measures

Although this issue is not directly related to the environment, work sites are also preferred vectors of sensitization and prevention. In the context of large road-construction sites, as is the case here, preference will be given to a specialized NGO that will be responsible for prevention (every 3 months). This task could be entrusted to the region's health districts. It will train local outreach workers who will act as relays to sensitize workers employed on-site as well as the users of the road and the populations established in the project area. We highly recommend that the Ministry of Health and national and international NGOs working in this field lend their support.

As sensitization with regard to STDs does not always suffice (not all workers are sure to abstain), we recommend making condoms available to the workers.

As for preventing water-borne diseases, health and hygiene rules must be followed on the life bases, in particular when the bases are supplied with drinking water from surface wells. In such circumstances, the following requirements must be met:

- Install the septic tank (and its cesspool) and any site where waste might be buried more than 100 meters from the well, while taking care to check the direction of groundwater flow.
- Outfit the area around the well: render it impermeable and secure by installing an enclosure.
- Raise and cover the well opening.
- Prohibit use of the water within the immediate perimeter of the outfitted area surrounding the well: prohibit activities such as showering, washing clothes or dishes, etc. that are likely to pollute the well water with waste water.

Lastly, installing a health dispensary on each planned life base will undoubtedly contribute to protecting human health: quick treatment for injured or sick workers, regular checks of the workers' state of health and of hygiene conditions, screening for diseases (including STDs), etc. The contractor will be expected to enter into an agreement with the Ministry of Health or a private doctor to conduct monthly visits to the life base, check the workers' health, report on compliance with hygiene rules, and conduct voluntary screening of the workers. Such visits will also help the efforts to sensitize with regard to STDs and AIDS.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions								Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators	
			Unit	Quantity	Unit price (XAF)	Total price (XAF)					
2.11	Monthly dispensary management costs (nurses' fees, medicines, etc.)	C	F/Month/dispensary created	224	500,000	112,000,000	Contractor	Coordination unit	During the work	Monthly coordination unit reports	
2.12	Acquisition (from the PNLS) of 10 condoms/month per worker	C	U	448,000	50	22,400,000	Contractor	Coordination unit	During the work	Monthly coordination unit reports	

2.13	Campaigns to inform and sensitize the workers, residents, and the users of the road (with regard to STDs and AIDS, as well as security) every 3 months	A	U	75	5,000,000	373,333,333	Project Owner through the supervisor's office (already scheduled in the supervision of the work)	Coordination unit	Every 3 months	Coordination unit report
2.14	Agreement with the Ministry of Health or a private doctor to conduct monthly visits to the life base, check the workers' health, report on compliance with hygiene rules, and conduct voluntary screening of the workers	B	U	224	400,000	89,600,000	Contractor through a health institution	Coordination unit	Every month	Monthly reports to be drawn up by the health institution on the health and hygiene conditions on the life basis
2.18	Installing a worksite dispensary on the life base	C	F/life base	8	5,000,000	40,000,000	Contractor	Coordination unit	Before work begins	1st coordination unit report/Equipment availability and operating condition/Complaints from the population recorded in the complaint log book

7.11.5.14 Human safety prevention measures

To guarantee the safety of its workers, the local population and road users, the contractor is required to take all useful precautions to prevent any risk of accidents: road accidents, fires, explosions, careless handling of site equipment, etc.

All the recommendations concerning the protection of human security are focused on signage, access control, sensitization, fire prevention and related works. To this end, a sensitization campaign will be carried out by a specialized NGO every 3 month.

Signage

Drivers shall be trained in road safety (speed limited when crossing cities and villages) and temporary signs must be put up in critical places in sufficient numbers (entries to villages, crossings, cliffs, rivers, etc.). In addition, accident-sensitization signs must be posted every 5 km.

Controlling access

The contractor must not limit itself to signaling dangers and prohibitions but must also install a fence or at least fluorescent strips to prevent the public from accessing the work area, the life base, the sampling area and the materials- and equipment-storage sites.

The sites where dangerous products are stored (explosives, hydrocarbons, additives, etc.) must be fenced and supervised and their access reserved solely to previously appointed managers.

Informing and Sensitizing

To increase effectiveness, every road-safety activity must include communication with road users.

Sensitizing the residents to the importance of road safety and having them attend consultation meetings will increase the effectiveness of the systems installed. In addition, involving them in the process of implementing the proposed solutions will make it possible to more precisely determine where certain accommodations (provisional bush-taxi stands, for

example) should be placed and to obtain their support for and contribution to the operation's success.

Sensitization activities cannot replace signage. However, given their pedagogical impact, they help improve safety by increasing the effectiveness of these systems, such as by giving the road users more responsibility. In addition, they may have a much broader scope than the occasional sign and reach a much larger number of users.

Traditional avenues of communication shall be used in urban areas: schools, associations, transporters unions, etc.).

Experience shows that schools are an excellent avenue of communication regarding road safety.

It is possible to have transporters' unions give their drivers a simple, richly illustrated text describing the road and the specific use of the accommodations developed along it (rest areas, parking areas, etc.). This text may include a few behavioral recommendations. The main obstacle to this method of sensitization is illiteracy. The precise content of the message and this type of action must be determined in concert with the communication relays to be used (use of pictograms, for example).

The contractor and its personnel must be very vigilant and regularly inform the authorities, the population, and the road users. The project operator must contact the local authorities as often as necessary, especially during the most critical operations, such as when excavating rock using explosives. The purpose of such contact with the authorities is to:

- keep them informed of specific or risky operations so the authorities may take action if necessary (provide emergency assistance, reestablish order);
- ask them to take the necessary measures to prevent any conflicts with the residents and road users. Having the authorities inform such individuals of the minimum distance to maintain is likely to ensure everyone's compliance with the safety rules.

Lastly, systematic, mandatory bimonthly "Safety Meetings" shall be held for the contractor's personnel, and in particular the new hires, to whom the contractor shall distribute safety booklets.

Preventing fires and explosions

During the work phase, all measures must be taken to prevent fires. In particular, smoking and lighting fires on the savannah and in the forest shall be prohibited.

Remedial measures must also make it possible to fight fires quickly: water tanks, fire-fighting equipment in the camps, means for communicating quickly with the authorities (forest rangers), etc.

As regards quarries in particular, it is of the utmost importance to secure the operations area. The quarry limits and access areas must be clearly visible and their access supervised. Exits must be marked and clearly visible. The coordination unit must give the authorities and residents explosive-detonation plans. The project stakeholder must use the services of a specialist. All explosions must be scheduled and signaled by warning sounds. To ensure the

safety of schoolchildren, all schools must be fenced, because they are all located near the road. It would also be wise to fence the hospitals of Ntui, Yoko, and Tibati.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions						Monitoring/Supervising implementation of the measures			
Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
		Unit	Quantity	Unit price (XAF)	Total price (XAF)				
Fencing and/or guarding of areas to be used by the contractor (life base, extraction areas, equipment storage, etc.)	C	Included in the contractor's services				Contractor	Coordination unit	Before work begins	Recording of accidents caused by individuals unrelated to the worksite intruding on the areas being used
Fluorescent strips to delineate the other worksite areas off-limits to the public (estimated at 5000 linear meters for all unfenced areas)	C	ml	12,000	3,000	36,000,000				by contractor (monthly ESMU reports/ environmental and social parameters database (BDES) to be maintained by the MINEPDED Environmental Services
Installation of metal or wooden signs to indicate to and inform the users and resident population of how the site works (1 sign per village located along the project route)	C	U	90	250,000	22,500,000	Contractor	Coordination unit	Before work starts	1st coordination unit report
Equipping all workers with hardhats, gloves, fluorescent vests and safety shoes (including replacing the shoes once and the gloves every 3 months)	C	F/Worker	1,600	120,000	192,000,000	Contractor	Coordination unit	When work starts + replace during the work	ESMU report/Use of equipment by all workers

7.11.5.15 Sensitization and information measures

To increase effectiveness, every road-safety activity must include communication with road users.

In fact, sensitizing the residents to the importance of road safety and having them attend consultation meetings will increase the effectiveness of the systems installed. In fact, involving them in the process of implementing the proposed solutions will make it possible to more precisely determine where certain accommodations (interurban taxi stands, for example) should be placed and to obtain their support for and contribution to the operation's success.

Sensitization activities cannot replace signage. However, given their pedagogical impact, they help improve safety by increasing the effectiveness of these systems, such as by giving the road users more responsibility. In addition, they may have a much broader scope than the occasional sign and reach a much larger number of users.

The project operator must contact the local authorities as often as necessary, especially during the most critical operations, such as when excavating rock using explosives.

The purpose of contacting the authorities is to:

- keep them informed of specific or risky operations so the authorities may take action if necessary (provide emergency assistance, reestablish order);

- ask them to take the necessary measures to prevent any conflicts with the residents and road users. Having the authorities inform such individuals of the minimum distance to maintain is likely to ensure everyone's compliance with the safety rules.

In large cities, there is usually a transporters union that collects taxes related to the profession and operates a truck depot. It may be possible to have such unions give drivers a simple, richly illustrated text describing the new road and the specific uses of the accommodations developed along it (rest areas, parking areas, etc.).

Without prejudice to the contents, analysis of the project's possible effects has revealed a certain number of topics that must be given priority:

- Speed: high speeds are the primary cause of accidents. The high proportion of youth and children militates in favor of a speed limit of 50 km/hour in all urban areas.

Children: the presence of children on the road also significantly reduces safety. They must learn that the road is not a place to play, but a place to be shared wisely, while following the rules and being aware of its dangers.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
2.3	Sensitize regarding environmental protection and hygiene safety by recruiting an NGO to conduct activities every 3 months and distribute the sensitization items described in 2.2	A	U	75	3,500,000	261,333,333	Project Owner	Project Owner	As soon as work begins	ESMU Management/Drafting of reports at every event/activity

7.11.5.16 Contribution of women and children to the project in compliance with the law

All strategies for improving the condition of women require taking action to include women in economic life and to combat poverty. Women must be involved in every aspect of organizing such actions, from setting priorities to implementation and subsequent maintenance.

In the case of this road construction project, certain initiatives to include women are recommended:

Have women participate in setting priorities for carrying out the project.

Encourage the hiring of women for maintenance work, while avoiding assigning them to tasks that are dangerous or require considerable effort.

Improve the distribution of information on the road project and employment opportunities.

In addition, it is essential to comply with child-labor laws. In this regard, the Project Owner shall not allow workers below the minimum age for youth employment on its worksites (work and maintenance phases).

In the context of this worksite, given the fragility of women and children: it would be desirable to offer support to existing women's associations. This may be accomplished by having two agricultural instructors provide short, simple training sessions for 12 months to improve agricultural output. In addition, basic equipment such as shovels and wheelbarrows should be distributed. The villages must be sure to have a monthly training session for 12 months. Moreover, it is important to build manioc dryers in all the villages, as the population has heavily emphasized their need.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
2.5	Support women's associations and AGRs: recruit 2 agricultural technicians to give training sessions aiming to increase the profitability of crop production and diversification	A	H.m	24	3,500,000	84,000,000	Project Owner	Project Owner/Ministry in charge of promoting women and the family	During the work	Meeting minutes
2.6	Support women and AGRs: distribute small agricultural equipment	A	U	90	1,500,000	135,000,000	Project Owner	Project Owner/Ministry in charge of promoting women and the family	During the work	Acquisition of equipment and conduct of verification/supervision operations
4.21	Support women and AGRs: build manioc dryers	C	U	90	200,000	18,000,000	Project Owner	Project Owner/Ministry in charge of promoting women and the family	End of the work	Acquisition of equipment/presence of equipment in the villages/quarterly inventory per village

7.11.5.17 Improvement of education

Despite the high number of primary schools all along RN15, the education rate remains low, even though there are many children of school age in several villages. The low education rate may be due to the total lack of schools in some villages, as well as by the distance to school and the lack of teachers in certain schools. Several of these schools lack infrastructure, and most are dilapidated and poorly equipped. In some cases, the schools are supported by the students' parents or the village community.

The poor condition of the infrastructures and the schools' lack of equipment affects the attendance rate in these schools and the quality of the education dispensed there. During field visits, we noted that none of the schools are secured by fences and there are no latrines or even a source of drinking water. In addition, the teachers sorely lack housing.

We suggest that all the schools along the road be equipped with 2 rooms and housing for the teachers, as well as dry toilets. These buildings must be fitted out inside (tables, chairs, blackboards, etc.) and school supplies must be provided for the children (notebooks, pens, etc.).

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
4.14	Fence all schools + hospitals	C	linear meters	37,600	65,500	2,462,800,000	Project Owner	Coordination unit	End of the work	Building of equipment and local authority reports
4.16	Build 2 classrooms, a housing unit for teachers, and latrines for each school along the road	C	U	50	10,000,000	500,000,000	Project Owner	Coordination unit		Equipment and local authority reports
4.17	School supplies for the classrooms	C	U	50	1,000,000	50,000,000	Project Owner	Coordination unit	End of the work	Acquisition of equipment and local authority reports

7.11.5.18. The project's contribution to improving health

In the study area, the health industry suffers from both quantitatively and qualitatively insufficient health infrastructures and healthcare personnel. In light of the needs expressed by the authorities during meetings, the consultant recommends equipping the existing intercommunal health centers (IHCs) with:

- Birthing and Caesarean-section kits (2 per center)
- 1 solar panel per center
- Furniture such as sickbeds
- Vaccine carriers
- Ice packs

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
4.18	Equip all the IHCs existing under direct influence of the road (sickbeds, medical equipment, birthing kits, a solar panel, vaccine carriers, and ice packs)	C	U	15	20,000,000	300,000,000	Project Owner	Coordination unit		Equipment and local authority reports

7.11.5.19 Measures to mitigate the risk of a resurgence of criminal activity

To the extent possible, the contractor should opt for labor-intensive work to ensure the recruitment of a significant number of low-skilled local residents, conscious of the fact that in return, it could benefit from their knowledge of locations for certain investigations.

When the site is officially opened, the Project Owner should encourage working with the security services based in Ntui and Batschenga to ensure protection of the site. In addition, logistical support of these services should be provided to facilitate their interventions in the

field, especially by equipping them with 3 motorcycles and one vehicle per city, for a total of three all-terrain vehicles and 9 motorcycles for the police.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions						Monitoring/Supervising implementation of the measures			
Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
		Unit	Quantity	Unit price (XAF)	Total price (XAF)				
Reinforcing police capacity: 3 motorcycles and 1 car each for Ntui, Yoko, and Tibati	A	U	3	20,000,000	60,000,000	Project Owner	Coordination unit	During the work	Acquisition of the equipment and conduct of verification/supervision operations

7.11.5.20 Transhumance

Given the importance of transhumance in the study areas, it is important to create a rest area every 50 km on the road and a watering trough for cattle. Appropriate signage will also be installed; the costs are detailed in section.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
4.19	Transhumance measures: construction of a watering trough and a rest area every 50 km	C	U	11	20,000,000	220,000,000	Project Owner	Coordination unit	End of the work	Equipment and local authority's reports

7.11.6 Environment conservation measures during the operation phase

7.11.6.1 Wildlife conservation measures

During the road operation phase, wildlife may be protected by:

Installing sensitization, warning and speed-limit signs at places with poor visibility **and at animal crossing points especially in contact areas between the road and National Park in the area from Yoko to Tibati.**

Installing safety barriers or other similar obstacles (preferably made of wood to better incorporate them into the natural landscape) to prevent animals from crossing the road at places with poor visibility (curves, steep grades).

Installing speed bumps/warnings in places where animals may cross the road.

The local population and water and forest services should be involved in choosing where to install such signs and barriers, as they know the animals' movements and dangerous places better. It is therefore suggested that, in collaboration with the water and forest services and the local population, speed bumps and signage (speed limit, warning of animal crossing) be installed where animals cross the project route, especially between Yoko and Tibati.

In addition, monkeys cross by using the branches of large trees located here and there along the road. In collaboration with the water and forest services, a few large trees should therefore be kept (as a kind of bridge) here and there along the road to enable monkeys to cross the road without danger.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
4.2	Sensitization signs regarding danger in the areas where animals (wild and domestic) cross the road and nature conservation	C	U	59	1,250,000	146,250,000	Project Owner through the contractor (in the scope of the work)	Project Owner	End of the work	Final receipt report/change in the number of accidents recorded in the environmental and social parameters database (BDES) to be kept by the MINEP Environmental Service

7.11.6.2 Measure for plant life protection and conservation

The inventoried trees fall into two groups:

Trees having a circumference of more than 7 meters must be considered “Natural Historical Heritage” and must not be cut down under any circumstances. The road must be laid to avoid them to the extent possible. Trees having a circumference of less than 3 meters are considered constraints. To the extent possible, the road should be laid to avoid or limit cutting them. The road always will be widened on the side where there are fewer trees of this type.

To compensate for all of the nuisances caused to plant life, a nursery should be created to plant new trees. These trees must be advantageous for the region; the local services will decide which types will be chosen. The new trees will be planted along the road line to compensate for those that were cut down to free up space for the road and to give it sunlight. In addition, they will be aligned to the right of the main villages crossed by the road. In addition to compensating for lost plant life, this will serve to beautify the villages, provide shade, attenuate noise and dust for homes bordering on the road, fixing the soil, and minimizing the damage in the event a vehicle skids off the road.

To ensure the viability of the trees to be planted (maintenance, watering, replacement of dead trees, etc.), the water and forest service of the Center and Adamawa Regions must be assigned the task of planting and maintaining these trees in the scope of a contract entered into between the Project Owner and the supervising ministry, the MINFOF.

Cost of the measures: the cost of these measures is detailed in the previous section.

7.11.6.3 Water and soil conservation and protection measures

Water and soil conservation arrangements

Water from the road and its annexes, whether the flow is liquid or solid, must be evacuated toward the environment without harming it. This means that when such water is directed toward a natural outlet, ravine or water course, such outlet, ravine or water course must be

equipped such that the existing balance is not disrupted and the flows to be drained from the road do not cause new erosion.

When planning to have direct spillage of water from road outlets absorbed diffusely by a receiving environment, this solution may be retained only after field verification, site by site, of the ability of the environment to play such a role without suffering lasting harm. If there are risks, a sustainable anti-erosion system must be provided.

The measures envisaged to counter soil erosion include installing gutters, ditches and concrete or mason-work drainpipes in the vulnerable sectors, replanting vegetation, and choosing rain outlets wisely.

Implementing solutions that combine vegetation and “solid” anti-erosion infrastructures is key to managing erosion in such areas. The main measures recommended for this purpose are:

Riprap and planting vegetation on embankments with local species to fix the soil and attenuate erosion.

Periodic maintenance and, if necessary, irrigation of the young plants during the dry seasons.

Using local species and species suited to the climatic and soil conditions in the project area is highly recommended, whether for growing new grass, brush, or trees. Species that improve the soil quality and may be used for agro-forestry purposes, such as legumes, shall be given preference, as they enrich the subsoil with nitrogen.

Cost of the measures: the cost of these measures is set out in the technical study.

7.11.6.4 Measures to protect the air quality and limit noise pollution

To mitigate the effects of dust, smoke, exhaust from machinery and other vehicles, and noise and vibrations from earthworks equipment, the following measures shall be taken:

- speed limits;
- regular technical inspection of and visits for motors and their regular maintenance;
- compliance with labor laws on the sites;
- occasional watering of the road and deviation to limit dust emissions
- reasonable choices for sites for storing debris from clearing brush

To mitigate the nuisances related to noise pollution, the untimely use of warning sounds is prohibited and work is prohibited at night in the urban areas unless the Site Supervision Team authorizes it.

Regarding nuisances related to machine vibrations on existing constructions, priority should be given to using manual earthworks methods close to homes.

Cost of the measures: these measures do not generate any additional costs.

7.11.6.5 Measures to reduce the impact on the landscape

Quarries must be rehabilitated. The costs of such measures is set out below.

Surface-area estimates are based on the technical portions regarding the road.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No.	Contents of recommended measures and actions	Measure category	Cost of the measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
3.1	Rehabilitation of borrowed sites (slope correction, transportation and spreading of top soil, revegetation, maintenance and watering until persistent regrowth)	C	ha	302	2,000,000	604,000,000	Contractor	Coordination unit	As soon as work ends/Before final receipt	Final site condition report/Payment (separately) of related works/Conditional restitution of the performance bond
3.2	Rehabilitation of rock quarries, including possible reforestation of affected sites	C	F	8	4,000,000	32,000,000				
3.3	Rehabilitation of storage and warehouse areas	C	ha	60	10,000,000	604,000,000				

7.11.6.6 Measures relating to human health

Raising awareness of STDs and AIDS

Experience shows that raising awareness is the most effective way of combating sexually transmitted diseases and AIDS. With this in mind, and in keeping with measures already being implemented in Cameroon, it is suggested that billboards (made of metal and measuring 3 m × 4 m) are installed every 5 km, alternating awareness raising messages about these issues and road safety, particularly between Yoko and Tibati.

Furthermore, in order to prevent the risks associated with the spread of sexually transmitted infections and AIDS, national, provincial and departmental health authorities should conduct specific awareness raising campaigns with the local population and road users.

To do so, the provincial committee of the PNL (Programme National de Lutte contre le VIH/SIDA et les IST) should establish an information and awareness raising program in the Mbam-et-Kim and Adamaoua departments, in partnership with the Ministries responsible for public health and combating AIDS. The stakeholders involved should ideally be local NGOs working in the field of public health and, if possible, they should have experience of the "Information - Education - Communication" approach.

Finally, it would be desirable to involve religious authorities from the main towns in the project area. Their support for the awareness raising measures against STDs would be very beneficial.

Cost of the measure: The costs of raising awareness are set out in section 7.2.5.13, because the awareness raising campaign should be established from the beginning. The cost of the billboards, however, is set out below:

Recommended measures and actions							Monitoring/supervising implementation of measures			
No.	Contents of recommended measures and actions	Measure category	Cost of measure				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervision	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				

4.1	Billboards raising awareness of road safety, AIDS, and sexually transmitted infections (one metal billboard measuring 3 m × 4 m, with alternating messages every 5 km)	C	U	117	2,500,000	292,500,000	Project Owner through the contractor (in the scope of the work)	Project Owner	End of the work	Final receipt report/change in the number of accidents recorded in the environmental and social parameters database (BDES) to be kept by the MINEP Environmental Service.
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7.11.6.7 Measures to reduce the visual and environmental impact

To reduce the effects of traffic noise for people living in the houses alongside the road, we recommend planting tall trees, the length of the villages, at a rate of 100 trees per village.

Other measures to encourage better integration of the road into the surrounding countryside include: landscaping the entrances to Ntui, Yoko and Tibati and the new intersections. This landscaping could play the two-fold role of stabilizing the embankments and integrating the road into the surrounding environment.

Depending on technical feasibility, crash barriers will be made of wood, which will significantly contribute towards integrating the road into the natural landscape.

Abandoned roads will be replanted in order to reintegrate these areas into the natural environment. Replanting will be encouraged by sub-soiling and screeding with top soil followed by sowing grass seed and other plants.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/supervising implementation of measures			
No.	Contents of recommended measures and actions	Measure category	Cost of measure				Responsible for implementing measures (costs borne by)	Responsible for monitoring or supervision	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
4.9	Planting trees alongside each village which the road goes through	C	60	90	15,000	20,000,000	Project Owner through the contractor (in the scope of the work)	Project Owner	End of the work	Number of trees planted

7.11.6.8 Measures related to urban safety

Particular care is given to landscaping areas where the road passes through towns and villages, which are danger points both for road users and local residents. Vehicles are more likely to stop in built-up areas than on the open road. This is why the verges are designed to rise to 2 m (instead of 1.5 m) throughout the villages through which the road passes, except for areas where particular ownership constraints are in place, which will allow for a clear and safe area for pedestrians and two-wheeled vehicles. Similarly, 2 m-wide sidewalks are planned on both sides of the road through larger built-up areas.

Depending on the characteristics of each village and the available space, the main developments recommended in partnership with the team responsible for the technical study are:

- **Creating 2 m-wide sidewalks** on either side of the verges in significantly built-up areas. They will be used by pedestrians and for commercial activities by means of occasional wider areas.
- **Increasing the size of verges to 2 m** in all villages through which the road passes, other than where particularly ownership constraints are in place. This will allow for a clear and safe area for pedestrians and will provide a provisional stopping point for vehicles. It is also recommended that whenever ownership allows, verges alongside sections with reduced visibility should be made bigger, with the aim of providing more space for vehicles to stop, and particularly to avoid trucks and other heavy goods vehicles from making emergency stops in the middle of the road.
- **Developing parking lanes in each village**, particularly when lengthy stops are expected. These will be located in commercial or attractive areas (near government or religious buildings, etc.) and their dimensions will take into account the possibility of parking for heavy goods vehicles.
- **Development of steps** for certain homes which are difficult to access because of their height in relation to the road.
- **Development of pedestrian culverts near housing and premises situated** on the excavated side.
- **Development of protective measures around schools through the use of wire fences** with openings facing the direction from which vehicles are coming, as well as the construction of solid walls when schools are too close to the road. Adequate signposting and warnings on the road should be planned.
- **Developing parking areas for trucks.** Given the route, a significant number of trucks will be using the road. In addition to the safety constraints raised by the profile and nature of this traffic, a need for parking has been identified. Depending on their location on the route, drivers are used to spending the night, eating and resting in certain villages and establishments. Because there is currently a lack of appropriate verges, they currently park directly on the road, which causes significant disruption to traffic flow and endangers safety, particularly at night. It is therefore imperative to plan appropriate areas for trucks to park for both short and longer periods. These consist of designated parking areas to be planned at very specific locations. Later in the study, the specific design of these facilities will be set out, depending on topographical maps, the availability of land, the characteristics of the trucks (small turning circles) and the number of parking places, which is yet to be identified.
- **Appropriate signage and installation of traffic-calming measures/warnings** on the road at the entrance to built-up areas through which the road passes. Speed bumps oblige drivers to reduce their speed, increase visibility of both pedestrians and drivers and make it easier for pedestrians to cross the road. Speed bumps should be standard size because if they are too high or too wide they can constitute an obstacle to the smooth flow of traffic and be a source of wear and tear for vehicles. It should be possible to drive over the speed bumps without compromising the safety of users or penalizing those who are driving at moderate speed.

- **Installation of awareness-raising billboards** every 5 km, alternating road safety messages with messages about AIDS and STDs, encouraging drivers to respect the highway code, reminding farmers not to leave their animals on the road and telling pedestrians to use the verges and, if necessary, walk against the direction of traffic to avoid accidents. These consist of standard-sized (3 m × 4 m) metal billboards.
- **Reinforcing the presence of police officers** at critical areas to ensure more rigorous checks in terms of speed limits, the number of people in vehicles, the condition of vehicles (technical assessment certificates should be required for very old vehicles).
- **Requiring farmers to tether their animals** and keep them away from the road. Strict measures should prevent farmers from leaving their animals on the road, with the associated risk of accidents. This should begin by raising awareness of the dangers of leaving animals on the road or crossings once the road has been constructed, as well as of the increase in traffic and the speed of traffic and the need to tether their animals or keep them from the road with a fence. Subsequently, coercive measures should be planned.
- **Crash barriers and safety equipment:** crash barriers are an indispensable part of any road project, but can be fairly costly. The decision as to whether or not to use crash barriers and the type of barrier to use (GS2 or GS4), at any given point must be taken flexibly. Based on the recommendations in current legislation, sections where the difference in height between the carriageway and the natural ground level is more than 4 m, GS2 or GS4 type barriers should be used. Crash barriers will be installed on the 1.75-wide berm (including the curve of the embankment). The costs of these safety mechanisms are generally non-negligible, hence the need to consider whether to systematically install standard barriers or only install them at danger points and in areas where the embankments are particularly high. In the context of the present project and having analyzed the safety conditions at the point in question, this decision is based on the following three criteria: height difference between the carriageway and the natural ground level; the geometric plane of the area in question (tangent and bend radius); and the longitudinal slope profile preceding the area in question. The following principles have been applied: for very high embankments or ravines, GS2 crash barriers should be installed and for embankments which are higher than 4 m, GS4 crash barriers should be installed. If the area presents geometric constraints (reduced radius, steep slope, etc.), GS2 type crash barriers will be used. For embankments of between 2 m and 4 m in height, crash barriers will only be installed if the plane and longitudinal profiles present a constraint. If this is the case, GS4 crash barriers will be installed. In addition to crash barriers, the project plans on installing the following equipment: mileage markers every five (05) kilometers at the corresponding kilometric points; signposts for tight bends (those with a small radius; particularly dangerous bends, etc.).
- **Vertical and horizontal signage:** in addition to road markings in line with the legislation in force, road signage consists of installing signposts with a view to easing traffic and making it safer, as well as informing road users. Because signposts constitute a potential obstacle on the roadside, they are to be used (without being

overused) in areas where they can be guaranteed to be seen by road users. In the context of this project, vertical signage includes:

- triangular or circular signs providing instructions or orders relating to speed limits, marking bends, steep slopes and danger points;
- rectangular signposts providing indications and positional information, at entrances and exits from built-up areas as well as indications of significant waterways;
- directional signposts at major junctions.

In terms of choosing where to position these signposts, an analysis based on the following criteria has been conducted:

- indication of the name of a waterway at the four existing bridges;
- indication of entry to and exit from all villages and built-up areas through which the carriageway passes;
- speed limits, in line with national legislation, at the entrance to all villages through which the carriageway passes;
- indication of speed limits on homogeneous sections depending on the corresponding test speeds and reminders of speed limits;
- indication of particular points such as tight bends, series of bends and steep slopes;
- STOP signs on side roads at intersections;
- directional signage indicating the two main directions;
- directional signage indicating the three directions at intersections.

Cost of the measures: the cost of these measures is detailed below:

Recommended measures and actions							Monitoring/supervising implementation of the measures			
No.	Content of recommended measures and actions	Measure category*	Cost of measures				Responsible for implementing the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measure-implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
4.1	Installing warning measures (speed bumps) at the entrance to towns and villages located directly on the carriageway	C	U	180	500,000	90,000,000	Project Owner through the contractor (in the scope of the work)	Project Owner	End of work	Final receipt report/change in the number of accidents recorded in the environmental and social parameters database (BDES) (ESDB) to be kept by the MINEP Environmental Service.
4.2	Raised markings with reflective markers to improve night visibility in the villages at a rate of 200 per village	C	Accounted for in the technical study							
4.3	Development of parking and stopping areas by widening the verges inside built-up areas and sections with reduced visibility and developing parking areas for trucks	C	Accounted for in the technical study							

7.11.6.9 Measures relating to the human environment

Some developments which are recommended to ensure human safety may also contribute to improving the environment for the local population. In addition, developments for the benefit of local residents and road users are planned:

- **developing steps and ramps** for difficult-to-access homes which are situated on a different level from the carriageway;
- **development of pedestrian culverts** near homes and premises situated along the excavation site;
- **development of rest and parking areas** to the right of the rocky mountain in Fouy from KP162 and at the Parc Mbam and Djérem from KP250 in order to provide visiting tourists with more attracting surroundings;
- **the creation of steps for access to water supplies, which are generally situated near bridges and large bodies of water.** Stone paving should be installed at the river bank to improve day-to-day living conditions and facilitate certain domestic chores. For each water supply, these developments should be planned diagonally on each bank.

Cost of the measure: included in the accounting costs in the technical study.

7.12 Operating and maintenance program

Maintaining a terrestrial transport infrastructure is costly but unavoidable. Obviously, correctly managing the structures and equipment encourages their longevity and smooth operation. This includes both preventative and curative measures.

The Ministry for Public Works is required to carry out an operation and maintenance program for the road, and to appoint and manage monitoring staff responsible for several tasks:

- Planning and monitoring operational work on the road and its surroundings (verges, embankments, bridges, hydraulic installations, etc.).
- Clearing litter and cleaning the roadside.
- Replacing defective, stolen or damaged equipment.
- Raising awareness of vandalism (theft of public equipment such as signposts) and crime.
- Ensuring safety conditions are complied with by raising awareness of the local population and road users.
- Fighting against vehicles which are overloaded or which do not meet legal standards (trucks). One or more truck scales will be planned and explained in detail during the planning stage.
- The operation and maintenance program is important due to the length of the project and its consequences in terms of organization and ownership of stakeholders.

Protecting installations and equipment: although rare in Cameroon and in the project area, the phenomenon of vandalism has been taken into account in the project design. The discussions which were conducted as part of the framework for the technical study highlighted the following main concerns:

- Equipment must be replaced by an equivalent piece of equipment which can perform the same functions. For example, a signpost must be readable at night, be retroreflective and not constitute a potential obstacle on the roadside. This function is generally not fulfilled by prefabricated concrete signs, for example.
- Safety barriers should be protected from vandalism by systematically welding the nuts and bolts into place.
- Paving stones going over ditches to allow pedestrians to access to villages should be fixed to the road and be sufficiently heavy to not be lifted by hand.

Raising awareness among the local population of the value of the road in general and equipment in particular should be conducted during the construction phase and when the redeveloped road is operational; the objective being that local people have ownership of the project and defend it against vandalism.

Cost of the measure: included in the accounting costs in the technical study.

7.12.1. Costs of general contractual measures

Implementation of contractual measures is the responsibility of the Company in charge of work. Some of these measures have been taken into account in the cost of the work and the general costs of the Company. These include costs related to:

- regularly watering the work sites
- developing local resident access
- re-profiling and constructing riprap and water pipes on unstable embankments
- arrangements required for road signposting
- raising awareness among site staff
- removal of site material (removing material which has been deposited, leveling and reshaping the ground) and returning site facilities to their original condition.

7.12.2 Costs of specific measures

Specific measures are those to which a price has been attached. They relate to part of the contractual measures which are the responsibility of the Company and support measures which respond to the expectations and concerns of the local populations, but whose implementation is shared between the Project Owner, the Contractor, the Company and, as necessary, other local stakeholders. These actions may be entrusted by the Project Owner to other operators, in which case specific contracts will be established following a closed call to tender. The costs of each of these measures have been estimated in the preceding paragraphs.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Objectives of the ESMP

For each impact identified in the preceding chapter, the steps planned to prevent, attenuate, or compensate for the negative impacts, on the one hand, and optimize the positive impacts on the other hand have been formulated. Some of these steps are horizontal and may concern several impacts at the same time. The present Environmental and Social Management Plan (ESMP) consists of a summary and planning for implementing the steps envisioned.

This plan specifies, for each of the proposed environmental actions and planned objectives, the various tasks to be executed, the actor or actors charged with implementing them, the place where the action will be conducted, the period allocated for implementation, the objectively verifiable indicators for monitoring the action, as well as the actors who will monitor the effectiveness of the step. The costs associated with this plan are also estimated. The ESMP thus includes:

- the implementation plan for the environmental steps,
- the surveillance plan,
- the monitoring plan.

The main challenges for implementing the ESMP are to ensure:

- prevention of risks to the environment,
- respect for standards, regulations, know-how, and good practices,
- achievement of activities according to the principles of healthy management,
- implementation of the steps and monitoring them during the course of execution and beyond, in order to avoid any damaging result and to identify the causes and remedy the dysfunctions in the system.

This monitoring program envisions ensuring that steps of improvement and attenuation will be implemented that will produce the expected results or will be abandoned or modified, if they do not give convincing results. This plan consists of two parts:

- surveillance during the period of the work,
- monitoring during use of the axis of the route.

8.2 Plan for implementing the proposed steps

8.2.1 Integration of the environmental clauses into the Contractor project.

In order to study the Batchenga – Ntui-Yoko – Tibati – N'Gaoundéré route, the technical team has not presented variants, because the course of the future route repeats the current route, but with improvements in the course to avoid curves in the route. The ESIA has been realized

in close cooperation with the technical study team, and all environmental constraints due to corrections of the course have been permitted to be considered by choosing and including specific improvements to the route. It has also been possible to include certain steps to prevent impacts in all work in the design phase.

The launching of implementation of environmental steps in the execution phase of the work will necessarily include integration by the Supervisor of Works of the environmental clauses into the projects clauses of the contractors in charge of the works and by the office of the Supervisor of Works.

8.2.2 Texts of applicable laws

Within the framework of execution of the project, the Contractor will be obligated to respect, in addition to the contractual clauses connecting it to the Supervisor of Works:

- all environmental texts or directives of the ministries concerned in effect in Cameroon, including the international conventions ratified by Cameroon,
- the standards on waste emissions adopted by the country, and the standards of the Sponsors, if applicable.

The main reference texts are:

- Framework law no. 96/12 of August 5, 1996, relating to management of the environment;
- Law no. 85/09 of July 4, 1985: national legislation on matters of reinstatement and compensation;
- Law no. 98/005 of April 14, 1998, concerning the water system;
- Law no. 94/01 of January 20, 1994, concerning the system of forests, fauna, and fish;
- Law no. 96/67 of April 8, 1996, concerning protection of the heritage of national routes;
- Law no. N0 001 of April 16, 2001, concerning the mining code;
- Law no. 94/01 of January 20, 1994, concerning the system of forests, fauna, and fish, which sets the framework of conditions for cutting down trees belonging to the forest domain, whether permanent or not;
- The law on establishments classified as dangerous, such as quarries;
- Decree 90/1477 of November 9, 1990, concerning regulation of the exploitation of quarries;
- Decree no. 06/95/MNMEE/DMTNI/SDRM of April 13, 1995, setting up the exploitation of state-owned quarries by public services and contractors of the administration;
- Decree no. 2001/164/PM of May 8, 2001, concerning modalities and conditions for taking surface waters or underground waters for industrial or commercial purposes, applicable within the framework of opening and exploiting forages;

- The directive clauses – of type MINTP (circular no. 00908/MINTP/DR of August 21, 1997) that constitute the code of good practices in all its projects, their cost automatically being part of the overall costs of the contractors;
- Law no. 92/007 of August 14, 1992, concerning the Labor Code, which sets the conditions for labor employment, hygiene, and safety;
- Decree no. 2003/418/PM of February 25, 2003, setting the rates of indemnity to be allocated to victims of property destruction caused by a public utility to cultures and cultivated trees;
- The national collective convention of construction contractors, public works, and associated activities of August 25, 2004;
- Decree no. 2013/0171/PM of February 14, 2013.

8.2.3 Application of priorities to the steps

The steps planned for the impacts identified are grouped in the summary chart of the ESMP. They correspond to the specific environmental challenges of the study zone. **An estimate of the costs of each step has been made and, these are presented in Appendix 9.**

The **priority steps** are classified as a function of the seriousness of the associated impact and of the interaction between the project and the composition of the affected environment. The more serious the impact (major absolute importance), the higher the priority of the step.

Three types of steps are distinguished:

- **Attenuation steps** are planned as soon as a negative impact cannot be totally suppressed at the time of the project design. These steps decrease the negative impact on the various components of the environment;
- **Compensatory steps** are taken when residual impacts remain that cannot be reduced. Taking these steps has the purpose of offering a counterpart, especially restoring the conditions as much as possible;
- **Optimization steps** are those that are intended to give more value to the expected positive impacts of the project.

8.2.4 Persons responsible for implementing the steps

The Contractor

The contractual steps will be included in the DAO (tender documents). The Contractor should implement the plans for execution of the work in conformity with the clauses of its assignment, each foreman having to implement them. The basic principle is the prevention of effects—especially through the choice of sites and prevention of pollution—and construction to improve the worksites.

The Control Committee or the Supervisor of Works

Although the Control Committee is not responsible for the work, it is likewise necessary that its personnel respect the good environmental practices that will be included in the DAO, such

as cutting down trees surrounding the construction site, prohibiting the consumption of game or exceeding speed limits on the construction site. It can likewise intervene in the implementation of the accompanying steps not handled by the Contractor. These clauses should also appear in the contract for the job.

The Project Owner and third parties

Responsibility for implementing certain specific or associated steps that respond to concerns of the population is shared by the Project Owner, the Supervisor of Work, the Contractor, and other persons involved in the environment, if required. These actions may be assigned by the Project Owner to particular operators for whom specific contracts will be worked out following an appeal procedure for restricted bids.

8.2.5 Phasing the implementation of environmental steps

In the work phase

All steps relating to the contractor are to be taken for progress during the work. Their execution is therefore scheduled within the same period as that of the work. The effort should be phased, depending on the climate context, and the nature of the impacts and specific localities. Only the steps planned for rehabilitation of the sites are to be taken at the end of the construction.

The rainy season is to be avoided for doing certain kinds of work; it poses difficulties for accessibility and for the environmental conditions.

- Accessibility: reduced access for the contractor and risks of aggravating the circulation conditions of the river banks,
- Environmental: increased risk of erosion of the worksites and pollution of surface waters.

In the exploitation phase

The relevant environmental steps appearing in exploitation will be recognized for the various maintenance operations. Some associated environmental steps that should be implemented by operators of external intermediaries (MINFOF, MINEPDED, etc.), depend on their internal scheduling. Official information about them by the Project Owner, should, in contrast, be implemented immediately.

8.3 Surveillance and environmental monitoring

8.3.1 Objectives of environmental surveillance

This is intended to ensure that the proposed steps of improvement and attenuation have been effectively implemented during the construction phase of the Batchenga – Ntui-Yoko – Tibati – N'gaoundéré with respect to the laws and regulation in effect in matters of management of the environment and application of sanctions such as those envisioned by the Contractor contract in case of violations.

Environmental surveillance is likewise intended to guarantee to the administrative authorities and to the Supervisor of Works that the attenuation and improvement steps proposed in the Plan of Environmental and Social Management (ESMP) are implemented effectively during the construction phase of the project by the Contractor.

8.3.2 Surveillance actors and responsibilities

The workplace will be monitored by the monitoring committee and project management. The latter will serve to optimize the technical organization of the workplace, taking the problems of the environment into consideration. This committee will be composed of:

- the engineer specializing in environmental and social aspects, who will be recruited for the Environment Service of DIPPER; the ESMU will preside over it,
- one or more representatives of the contractor in charge of the work
- at least one representative of the ministry in charge of the environment and/or of the regional department of waters and forests,
- at least one representative of the departments of Mbam and Kim and of Adamawa,

The tasks of this committee include in information seminar before the start of the work. Such a framework of cooperation should necessarily involve all actors concerned (locations chosen, technicians from various ministerial departments, etc.), in order to cooperate on steps proposed and invite them to conceive programs and actions relating to their mandates. Also, this committee will have the tasks, among others, of:

- Defining more precisely the zones to be protected in cooperation with the villagers and aiding the local population to attenuate the environmental damages of the construction phase.
- Assisting in the choice of adequate setting for the base camp.
- Monitoring effective realization all steps planned to prevent and reduce the impacts of the project on the environment.

8.3.2.1 Responsible environmental and social person(s) for the work of the Contractor

Given that is not assigned directly to take environmental steps at the various worksites, it is the first actor in surveillance. It will make an internal check of the application of the planned provisions and will ensure, among other things:

- The design of the Environmental Protection Plan for the Sites (PPES), especially the conditions for choosing the technical sites and base camp, the conditions for taking materials from extraction sites, the conditions for handling solid and liquid wastes from workplaces and installations, conditions for storing hydrocarbons, conditions for restoring worksites, installation, and extraction (or possibly restoration of administrative sites), traffic conditions for workshop trucks and engines, and possibly compensatory steps assigned by the co-contractor identified for the environmental-impact study as specified by the CCTP;

- checking worksites during and at the end of exploitation and conformity of the construction operations with the contractual clauses and the status of the site;
- mediating between the Contractor and the Control Committee for social and environmental aspects.

8.3.2.2 Responsible environmental and social person(s) of the Control Committee

They will have the role of:

- validating the Environmental Protection Plan for the Sites (PPES) proposed by the contractor;
- regularly monitoring respect for the environmental prescriptions for the worksite by the contractor;
- assisting the contractor in making decisions on environmental matters;
- supervising the implementation of associated actions for which the contractor is not responsible (prevention of STDs/AIDS, etc.)
- taking all initiatives aimed at successful integration of the project into the environment.

8.3.2.3 The populations along the river

They have the right and the duty to take care to safeguard their life environment. They should assure themselves that their project activities do not degrade the framework of their life. Suggestion boxes or a notebook could be made available to them where they would come and bring their observations there on non-conformities of the workplace or make complaints. Otherwise, the environmental and social persons should stay and listen to them.

8.3.3 Tools and criteria for environmental surveillance

The persons responsible for control committees, in order to succeed in their surveillance missions, should create appropriate environmental surveillance tools. These include, among other things:

- the environmental identification card (FIE);
- the indicator card;
- the environmental panel;
- the card of preventive actions to be taken;
- the report of sensitization meetings;
- the environmental non-conformity card;
- correspondence.

Some surveillance criteria are detailed below:

- hygiene and sanitation at the level of the base camp;
- the maintenance level of engines and trucks (maintenance card);
- recycling of hydrocarbons collected at the worksite;
- use of gloves, scarves, helmets, etc., for protection of the personnel;
- performing of soil-defense and soil-restoration work;
- the schedule for placing temporary sign panels;
- the level of watering terraces of embankments;
- the level of implementation of other steps for improvement and for attenuation of negative impacts.

8.3.4 Surveillance reports

The following reports will be the object of wide circulation, and will be copied to the DIPPER and MINEPDED and the other participants, if necessary.

Monthly inspection reports

Prepared by the contractor environmentalist, these reports are made available to all participating parties on demand. These reports list all environmental actions implemented during the current month. Monthly environmental surveillance reports should be made by members of control committees responsible for the environment. These reports, which summarize their activities and the difficulties encountered should be submitted to the administration, in order to permit them to plan their monitoring activities. They should be submitted in four (04) copies to the departmental delegation of MINEPDED and DIPPER for use. The latter will be assigned to transmit the reports to other administrations concerned.

Quarterly inspection reports

These reports are prepared by the environmentalist of the control office. The latter will identify the zones of non-conformity by the contractor and will provide recommendations on corrective actions to be taken. The degree of non-conformity will likewise be noted for possible imposition of a penalty by the DGI.

Annual reports

An annual report will be produced by the DGI supervisor of works and will include:

- A summary of the status of execution of environmental steps of the ESMP;
- A review of the defined environmental indicators or any changes introduced during the course of the year;
- A summary of the environmental surveillance programs conducted during the course of the year, a discussion of the results, and an evaluation of conformity;

- A discussion any major environmental incident, as well as any amendments to the procedures of the ESMP to prevent a reappearance of this incident.

8.3.5 List of elements requiring environmental surveillance and a surveillance program.

Environmental surveillance will particularly concern the sources of the impacts and the recipients of the disturbances. The impact indicators to be surveyed here are of an indicative nature, the details are given in the ESMP (Appendix 9).

- the number of jobs created for local workers;
- the number of cracks and channels from erosion around the base camp, removal sites, quarries, and storage sites;
- turbidity and color changes of the waters in waterways;
- number of consultations per quarter for waterborne diseases at health centers of neighboring regions;
- evolution of the number of accidents connected with traffic disturbances during the work;
- number of signal signs installed;
- number of sensitizing signs installed;
- number of complaints recorded in the register of grievances at the level of the mayors;
- number of meeting with political and administrative authorities and local communities.

Analysis of these indicators constitutes a principal component of the surveillance reports and the basis for suggestions for cancellation and replacement of ineffective steps.

The following tables present the environmental and social surveillance program for the workplaces the work.

Table 75: Environmental and Social Surveillance Program for the Workplaces and Work

	Recommended measures	Frequency – and Responsibility
A. Design of the project		
Knowledge of the objectives	Verify whether the results of the participative approach can place certain components of the project in question	Before the start of the project – Project Owner
Provision for expropriation	Become aware of the data from the land audit and verify whether expulsions will be necessary and whether they can be done before the start of the work	Before the start of the project – Project Owner – regional registries
B. Organization of the workplaces		
Choice of sites for deposits of materials and base camps	Take steps to install these sites at adequate distances from waterways, forests, and nature reserves; special precautions for petroleum products. Request the required preliminary authorizations from MINEPDED	Before the start of the work Project Owner– Contractors
Installation of workplaces	Verify the protection steps for ornamental trees, anti-soil-erosion steps, verification of the adequacy of drainage, sanitary equipment, and removal of liquid and solid wastes. Evaluate the risks of pollution of soils and underground and surface water	During the installation of the work – Contractors
Disassembling the installations	Verify whether the lands that have been requisitioned or leased have been restored and whether polluted soils have been scrubbed	After the performance and acceptance of the work – Project Owner, Contractors
C. Organization of the work		
Construction of the route	Miscellaneous safety steps: verify the noise level during the work; verify the steps taken against excess exhaust gases. Verify the maintenance of engines that are not in the proximity of rivers; the handling of concrete residues—that they are not ejected onto the soil, etc.	During the work – Project Owner – Contractors – Governorates

Continuation 1 Environmental Social Surveillance Program for the Workplaces

Nature of the indicators	Recommended measures	Frequency - Responsibility
C. Organization of the work		
Construction work	Verify the closure conditions of the sites, safety steps for the workers, has carefully been taken not to pollute the soils, how wastes and effluents are removed, anti-erosion provisions, monitor the esthetics of installations on the landscape, verify storage conditions and the use of oils, etc.	During the work Project Owner – Contractors – Governorates
Tree-cutting work	Verify whether the authorizations have been granted; organize the safety steps for roads, railways and waterways; (stop traffic, safety perimeter, etc.);avoid cutting of ornamental trees	For each section of the work from start to receiving Work supervisor – Environment - NGO
Work of destroying structures after use	Require the presence of a territorial authority; verify whether expulsions of populations have been effective and the owners have been indemnified; verify good respect for the land legislation	For each section of the work before the start of the work Work supervisor – Environment - NGO
Passage to the proximity: under or over networks of groups of equipment	Verify that adequate steps have been taken so that socio-economic damage is not caused to the population (public lighting, electricity and telephone lines, rainwater drainages, removal of used water, road crossings, access to land parcels, etc. Make sure that the sites have been restored after the work to their previous state.	Before start of the work and at the time of receiving Regional administrators – Work supervisor – Contractors
Mass plan for workplace installations	Energy supply, sanitary installations, drinking-water supply, roadside signing	During the work – Contractors
Concrete center; coating-manufacturing center	Management steps: emissions and used gases, devices for drainage of stream waters accessibility for interventions by firemen, devices for waste management, anti-erosion devices	During the work – Contractors
Management of solid wastes	Presence of receptacles and/or pits Appropriate dumps for inert workplace wastes Incineration device, if needed_	During the work – Contractors
D. Exploitation phase		
Reduction of plant cover and damages to cultures; tree cuttings or prunings	Verify the conditions for replanting the sites; verify the destination of plant wastes; composition of wood for energy; fire prevention among the remnants	Annually Work supervisor – Environment – NGO
Evaluation of the growth of socio-economic activities	Indicators to be proposed to measure the economic impact of the project	Monthly progress Regional administrators

Continuation 2 Environmental and Social Monitoring Program

Nature of the indicators	Recommended measures	Frequency and Responsibilities
A. Design of the project		
Knowledge of the objectives	Verify that the comprehensive and coherent participative approach has been organized for all inhabitants of the project regions	Before the start of the project SUPERVISOR OF WORK
Provisions for expulsions	Verify good execution of the land audit and budgeting for indemnifications; confirm respect for the legislation	Before the start of the project SUPERVISOR OF WORK – Land – Register
Organization of the workplaces		
Choice of sites for deposits of waste materials and base camps	Assure yourself of good choices: avoid installations in the immediate proximity of water sources and waterways	Before the start of the work ENVIRONMENT – Hydraulics
Installation of workplaces	Avoid planning for destruction of plantations and fruit and ornamental trees. Control of levels, anti-erosion steps	Before the start of the work ENVIRONMENT
Disassembling installations	Confirm restoration of the initial state of requisitioned or leased lands and compensation of owners for occasional discharges and for land rentals	After the work is received Ministerial and territorial management
C. Organization of the work		
Terracing work	Verify the safety steps applied to the itineraries of the work; Assure yourself that the police have taken the required steps. Verify the conditions under which the populations are indemnified	During the period of the work
Tree-cutting work, especially in the towns	Verify whether the authorizations have been granted, including safety steps on roads, railways, and waterways (stop traffic, safety perimeter, etc.)	For each section of the work, from start to receiving ENVIRONMENT-NGO
Hygiene and safety of personnel and installations; management of dangerous objects	Number and list of strictly prohibited items, safety steps for using products, placement and storage of products, frequency of maintenance of sanitary installations and air ventilation	During the period of the work ENVIRONMENT
Equipment for the personnel	Wearing of helmets by workers, the contractor's medical center, health personnel at the workplace	During the period of the work ENVIRONMENT
Air control: control of dust, engine emissions, noise control	Frequency of watering of clearing sites, limiting the speed of traffic, number of workers having earmuffs	During the period of the work ENVIRONMENT
Soil management: Plant land, cleared materials, clearing sites	Launch: number of the zone agreed on for deposits, erosion level	During the period of the work ENVIRONMENT
Flora	Control of removals by the project, number of types of trees cut down, verification of tree planting	During the period of the work ENVIRONMENT
Fauna	Number of accidents to the fauna, consumption of game by the personnel	During the period of the work ENVIRONMENT

Continuation 3 Environmental and Social Monitoring Program

Nature of the indicators	Recommended measures	Frequency
C1. Organization of the work		
Destruction of structures along the route	Verify whether the owners have been indemnified; Verify whether relocations have been accomplished or should be organized	For each step of the work: before starting the work SUPERVISOR OF WORK – Land – DG register of forests
Destruction of trees and cultures, along the route	Verify whether the owners have been indemnified; Verify whether relocations should be organized	
Passage to the proximity, under of over the networks of collective groups	Verify whether displacement of collective groups has been organized in parallel with the work and has not caused socio-economic damage to the population (public lighting, electric and telephone lines, fiber-optic networks, rainwater drainage, removal of used water, road crossings, access to land parcels, etc.)	Before the start of the work and at the time of receiving regional administrators, ministerial team
Choice of sites	Verify that the teams do not cause too large social and ecological disturbances and take the recommendations of the ESIA into account.	Before the start of the work ENVIRONMENT – ministerial team
Impacts on the physical environment	Verify whether the international anti-pollution standards have been respected for air, surface underground water, and soils	Before the start of the work ENVIRONMENT – Ministry of the Environment
Ecological disturbances	Verify that protected ecosystems will not be affected by the work; Verify the appropriateness of proposed the attenuation steps	Before the start of the work ENVIRONMENT – Ministry of the Environment
Socio-economic disturbances	Verify whether damage to the populations has been taken into account	Before the start of the work regional administrators
Exploitation phase		
Equipment maintenance in conformity with the standards of the contractors	Respect for the standards of the contractors	Every six months SUPERVISOR OF WORK – Builders
Presence of the works; landscape impacts	Integration of the works into the landscape; esthetics of the buildings	At the start and once a year: ENVIRONMENT – Ministry of Cultural Affairs
State of the vegetation, reforestation in the concessions SUPERVISOR OF WORK	Verify the status of the ecosystems	Annually ENVIRONMENT – NGO – Ministry of Forests

8.3.6 Cost of surveillance

The provisional costs of placing a person responsible for the environment under the Supervisor of Work and the Contractor will include, in addition to the compensation cost, all costs relating to the logistics of the latter in order to achieve his mission (liaison vehicle, means of communication, means of printing, etc.). He can intervene at the workplace during the entire period of the work on the various sites. for a total of 224 hours/month with a total cost of 672,000,000 XAF, without taxes.

Recommended measures and actions							Monitoring/Supervising implementation of the measures			
No	Contents of recommended measures and actions	Category of the measures	Costs of the measures				Responsible for implementation of the measures (costs borne by)	Responsible for monitoring or surveillance	Measures implemented when/how often	Measures' implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)				
2.9	Monitoring the implementation of the Environmental and Social Management Plan (ESMP)	B	Hours per month	224	3,000,000	672,000,000	Project owner on behalf of the Control Office	Project owner	during the period of work	Report established by the environmentalist from the Control Office

8.4 Plan for environmental monitoring

8.4.1 Objectives of the environmental monitoring

The monitoring activities will be intended to evaluate effective implementation of the recommended measures and their effectiveness. They will likewise permit any unforeseen environmental or social impact to be detected that could be produced during the execution of the project operations and, consequently, correction of the project activities.

8.4.2 Monitoring activities

The environmental monitoring of the workplace is done, in principle, by the Project owner through the Department of Investments and Environmental Protection for Roads/Section for Environmental Road Protection, which has personnel who are competent in this field.

The environmental engineer under the Project owner will supervise the environmental control done by the Control Mission. He will also be assigned to:

- write the reference terms for activities to be performed by third parties;
- approve environmental services
- approve environmental protection and site-protection plans (PPES) submitted by the contractor (after notification by the Supervisor of Work)

8.4.3 Procedures to be followed by the Project owner

8.4.3.1 Obtaining the DUP at the MINCAF level

In order to facilitate acquisition by the Contractor(s) of the properties and spaces necessary for the installations of the workplace, the Project owner should submit to the Ministry of Domains and Land Affairs a request for a declaration of public utility (DUP), specifying clearly

the limits of the properties requested, including potential sites for taking laterite [adobe] and for quarries that can be exploited for execution of the work.

Taking this step in advance will permit (i) possible litigations or misunderstandings with other administrations concerned with managing national domains or forests (particularly, MINFOF, MINEPDED) to be avoided and (ii) loss of time and periods of delay at the time of execution of work to be avoided.

8.4.3.2 Expropriation procedure

Art. 7 of ordinance no. 74-3 of July 6, 1974, stipulates that expropriation of lands and damages to cultures and other assets open a right to financial indemnification that can be replaced by lands or a compensation in kind of a similar value. Within the framework of the present project, a large number of habitations or plantations are involved. A report of expropriation will be presented in the APD phase once the chosen techniques have been decided on. After this report has been validated, the MINTP should:

- publish the DUP, as well as the limits of the lands affected by the project;
- set up a prefect or department administrative commission in view of implementing the expropriation procedure. This commission will be in charge of publishing the decree relating to the indemnifications, in order to ensure transparency within the regulations, identification of the owners of the lands to be expropriated, and evaluation of the cultures and assets to be destroyed;
- make available to the commission the funds necessary for the indemnifications.

The payment of compensations should be made at least six months before the start of the work, in cash (with signed receipts), to the persons who will be victims of the destructions. The indemnifications will be calculated on the basis of the laws and regulations in effect in Cameroon. In case of complaints deriving from affected persons and communities, a claims commission will be set up.

8.4.2.3.3 Approval of removal sites and quarries according to the regulations in effect

Several removal sites and quarries have been identified within the framework of the present study, presented in Appendix 8 and detailed in paragraph 6.4.5. However, it is not easy at this stage of the study to state with precision the sites that will actually be exploited in the work phase. For this reason, it seems important that the MINTP anticipate, before the work, the procedures, the list of potential sites, and a charge booklet (procedures to be followed, main forms of construction, and purpose of the exploitation) that will be implemented by the project team at the time of their exploitation, in order to monitor respect for environmental concerns.

This step, in addition to the DUP, will permit better management of the question of delays in the execution phase of the work, and the costs connected with opening and exploiting said sites to be added, which, according to the applicable texts of framework law 96/12 of August 5, 1996, should be the object of an environmental evaluation, which involves the validation procedures of the TDR, the report by the MINEPDD, and the costs.

8.4.4 Institutional provisions

Institutional provisions

Integrating the services of the MINEPDD and the MINFOF, the NGOs, and the populations of the project zones is indispensable in this monitoring phase. The modalities for their participation will be defined in cooperation between the supervisor of environmental work and the DPPER/MINTP.

In fact, framework law no. 96/12 of August 5, 1996, relating to management of the environment, underscores the necessity of having these institutions and other actors involved in this field of the environment participate in all sector plans and programs in relation to the environment, in view of permitting the application of Cameroon's international undertakings to be monitored and redefining the modalities of their integration into the national legislation and policies in this matter.

8.4.5 Monitoring indicators

Below is a non-exhaustive list of the monitoring indicators:

- the number of expropriated families that have been indemnified (including the indemnification periods and the adequacy of the indemnification received with respect to the valued of the expropriated asset);
- the number of sensitizing signs installed;
- the number signs indicating crossings for wild and domesticated animals;
- the rate of prevalence of illnesses connected with dust and gas emissions;
- the number of cases of waterborne disease or HIV/AIDS and other infectious diseases recorded by the health centers since the start of the project and their treatment;
- The regeneration rate for deforested spaces.
- the success rates of the species planted;
- the number of cases of accidents, the number of cases of collision with wild animals, etc.

Cost of internal monitoring by the DPPER/CPE of the MINTP

The provisional costs for environmental monitoring by the DPPER/MINTP will include the costs relating to the logistics of the monitoring engineer to accomplish his mission (liaison vehicle, means of communication, per diems, means of printing, etc.).

Cost of external monitoring by the administration

Participation of other actors (MINEPDED, MINFOF, etc.) in the monitoring activities will be under the direction of their respective services.

The cost of monitoring by the administration is included in the costs of the functioning of the coordination team. A budget of 28,000,000 XAF without taxes has been allocated.

Recommended measures and actions								Monitoring/Supervising implementation of the measures		
No	Contents of the Recommended measures	Category of the measures	Costs of the measures					Responsible for monitoring or surveillance	Measures implemented when/how often	Measures' implementation indicators
			Unit	Quantity	Unit price (XAF)	Total price (XAF)	Responsible for implementation of the measures (costs borne by)			
2.8	Functioning of the coordination and workplace-programming unit, including management of the personnel of the administration and the DIPER in charge of the environmental monitoring and surveillance of the workplace	B	Times per month	28	1,000,000	28,000,000	Contractor	Project owner	During the work	Actions + monthly report signed by the members of the unit

8.4.6 Estimating the cost of the ESMP

The Plan for Environmental and Social Management (ESMP) consists of a practical and operational program of environmental monitoring and surveillance, the objectives of which are to implement appropriate steps for better protection of the human and natural environment.

It constitutes the booklet of environmental and social specifications for the project and includes:

- a summary of the main steps and actions planned in the ESIA;
- identification of the institutions responsible for implementing the steps;
- determination of the monitoring, surveillance, and control structures involved;
- specification of the period and/or frequency with which the steps should be implemented;
- definition of the monitoring and surveillance tools, methods, and indicators permitting the effectiveness of the recommended measures to be evaluated;
- Estimation of the cost of implementing each of the recommended measures.

The ESMP of this project is detailed in Appendix 9.

The total cost of the environmental and social steps amounts to 9,324,250,000 XAF, equivalent to 2.3% of the total cost of the project in the basis solution or 2.4% of the total cost of the project in a two-layer solution (table below).

Table 76: Total cost of the basis and two-layer solutions of the project and estimation of the environmental and social steps

	BASIC SOLUTION	TWO-LAYER SOLUTION
TOTAL COST OF THE PROJECT (without miscellaneous and unforeseen costs) (XAF HTTD)	400,647,510,000	395,886,110,000
ESTIMATION OF THE ENVIRONMENTAL AND SOCIAL STEPS (technical part) (XAF HTTD)	8,947,050,000 or 2.23% of the total cost of the project	8,947,050,000 or 2.26% of the total cost of the project

The cost of the ESMP is detailed below

Recapitulation table of the phases of the project

Phases of the project	Costs (XAF)
1—Preparatory phase of workplace rehabilitation	1,160,450,000
2—Realization phase of construction of the route	2,104,800,000
3—Post-construction phase – Receiving the work – Restoration of the sites	1,525,000,000
4—Exploitation phase of the rehabilitated route	4,191,050,000
Overall total	8,981,300,000

(*) Recapitulation table by category of the measures

Category of the measurers	Costs (XAF)
A Steps of reinforcing capacities – Training sessions – Sensitization campaigns – Informing and consulting the population	1,374,066,667
B Performing additional studies and research – Control operations – Financing research work – Monitoring environmental and social parameters	1,134,933,333
C Setting up installations and equipment or implementing additional services or work	6,472,300,000
Overall total	8,981,300,000

Recapitulation table by person in charge

Category of the measurers	Costs (XAF)
i—Steps for which the Project owner is in charge	6,442,116,667
ii—Steps for which the Contractor is in charge	2,539,183,333
Overall total	8,981,300,000

1. Note that certain steps are not of an optional nature, and they will be taken only in case of an agreement with the Project owner, knowing that their results could contribute significantly to optimizing the expected positive impacts due to the project.

8.4.7 Summary table of the ESMP

The following table presents the implementation and control of the environmental steps. In addition to the prescriptions made in the ESMP, all environmental texts in effect in Cameroon, including the Labor Code and the international treaties that have been ratified should be taken into account.

- **It is important to specify that that ESMP is repeated in Appendix 11 in BAD format**

Recipients of the impacts	Specific objectives	Recommended measures	Implementation period	Supervising and monitoring Indicators	Supervising means and criteria
Air quality	Reducing air pollution Reducing sound disturbances during the work	Regular watering of the workplace Placing the sites of asphalt preparation outside urban areas Regular verification of exhausts coming from vehicles and engines and regular regulation of the motors Places of tar preparation chosen far from villages	Start of and during the work	The workplaces will be watered during the work Investigation among the local residents along the route	The reports of the technical services and of the environmental unit
Water quality	Combating water pollution if surface and underground water by petroleum products	Opening zones of removal and deposit at least 500 meters from water points Base-camp sanitary equipment, septic tanks and cesspools Equipment of the material park of concrete in plate form provided with leak-recovery devices for fuel tanks Equipment of the material park of the decantation basin for waters for washing the equipment Regularly collecting solid and liquid wastes from the workplace in view of their removal	Start of and during the work	Receiving report	The reports of the technical services and of the environmental unit
Soils	Combating esthetic modifications and physical properties of the soils and combating erosion	Restoring the soil in removal, deposit, and parking zones and in the base camp Installing devices to combat erosion	After withdrawal of the workplace After exploitation of the removal zones	Land with vegetation is treated, appropriate plant species are planted	The reports of the technical services and of the environmental unit

Recipients of the impacts	Specific objectives	Recommended measures	Implementation period	Supervising and monitoring Indicators	Supervising means and criteria
	Combat the risks of soil pollution, especially by hydrocarbons	Collect solid and liquid wastes from the workplace regularly in view of their removal Remove engines and vehicles from the appropriated areas Install a tank for hydrocarbons or any other classified installation in conformity with the legislation of the MINEPDED	During the work	Absence of contaminated sites The base camp and the parking areas are cleaned of solid deposits and traces of hydrocarbon stains	The reports of the technical services and the environmental unit
Flora	Reduce the rate of destruction of natural vegetation	Planting trees Planting alignment trees	Before and after the work	The alignment trees have been planted The appropriate tree species have been planted	The reports of the technical services and the environmental unit
Fauna	Reduce the impact of the project on the animals and animal habitats Combat against poaching and brush fires	Reforest and rehabilitate the removal zones Reinforce the capacities of the foresters and the technical services Monitor the taking of animals Install signs in areas of passage of wild animals Radio communication on the project Mission of sensitization to environmental preservation Rigorous control of the of wild-game consumption	Before and after the work	The minimum surface for the base camp has been cleared, leaving the protected species in place Equipment for water and forest guards Number of communication radios and sensitization missions Number of signs installed	The reports of the technical services and the environmental unit
Health, safety, sound environment, vibrations	Reduce the risks of propagation of HIV/AIDS Increase the security of the inhabitants along the route	Install signs in the areas of the work sections Equip all workers with helmets, gloves, and vests Organize sensitization campaigns and install a distribution network for preservatives Install an infirmary or dispensary at the workplace to make HIV checks regularly	Starting with the beginning of the work and during the work	Number of preservatives distributed Statistics on STDs/HIV Number of accidents Observed Equipment for the workers Number of signs installed	The reports of the technical services and the environmental unit
Employment	Job creation	Recruit workers coming from urban areas along the route	During the work	Number of persons hired	The reports of the technical services and the environmental unit
Circulation	Ensure circulation	Finish the project and maintain the infrastructures	Work and exploitation	Number of users of the route	The reports of the technical services and the environmental units

Recipients of the impacts	Specific objectives	Recommended measures	Implementation period	Supervising and monitoring Indicators	Supervising means and criteria
Commerce/industry	Development of the commerce and industry sectors	Finish the project and maintain the infrastructures, in order to perpetuate the gains	After the work	Growth rates of the volume of exchanges of assets and travelers Number of PME's [small and medium businesses]/PMIs [small and medium-size industries] installed	Reports of the technical services and the environmental unit
Tourism and cultural activities	Development of tourism and cultural activities	Keep the route moving, in order to perpetuate the gains	In the exploitation phase	Statistics on tourist entrances and cultural activities	Statistics on tourists registered Number of cultural activities Number of visitors
Craftsmanship	Distribution of products of craftsmanship	Keep the route moving, in order to perpetuate the gains	In the exploitation phase	Growth rate of craftsmanship production	Quantity/value/volume of craftsmanship products distributed
Landscape and panoramic view	Reduce the visual impact on the environment	Plant alignment trees along the route in the two segments	After the work	Number of trees planted and success rate	Reports of the technical services and the environmental unit
Conditions of life for women and vulnerable groups	Improve the conditions of women	Increase the income of women in restoration, commercial, and craftsmanship activities during the work Maintain associations of women and AGRs [income-generating activities], recruitment of 2 agricultural technicians to perform training aimed at increasing the profitability and diversification of their products Support the distribution of small agricultural items for women and AGRs	During and after the work	Number of projects initiated in favor of women Number of micro-projects set up	Activity reports Report of micro-projects set up
Education	Increase the rate of education and respond to expectations of villagers for better integration of the project	Construction of two classroom, teachers' lodging, and restrooms for each school along the route School materials for the classrooms	During and after the work	Number of structures Number of schools equipped with school materials provided	Reports of the technical services and the environmental unit
Health	Improve health management in the zone	Equipping all CSIs present that are directly influenced by the route	After the work	Number of centers equipped	Reports of the technical services and the environmental unit

Recipients of the impacts	Specific objectives	Recommended measures	Implementation period	Supervising and monitoring Indicators	Supervising means and criteria
Seasonal migration	Avoid deterioration of the route and accidents with cattle	Measures for seasonal migration, construction of a water fountains and rest areas every 50 km and signs signaling the passages for cattle	During and after the work	Water fountains and rest areas completed Number of installed plates	Reports of the technical services and the environmental unit
Quality of life	Improve the quality of life of the benefitting populations	Reinforce wellbeing by environmental training, and sensitization, and education of the inhabitants along the route Initiate micro-projects to combat against migration Reinforce the capacities of the staff for ordering the acquisition of motors and vehicles.	During and after the work	Statistics on the level of local development Number and types of basic infrastructures installed at the local level Number of vehicles and motorcycles for forces at a ratio of 3 motorcycles to 1 vehicle for the municipalities of Ntui, Yoko, and Tibati	Report of technical services Number of persons trained in environmental education Reports of technical services and environmental unit

8.5 THE ENVIRONMENTAL ITINERYPLAN

The Consultant will work out an itinerary plan reflecting the environmental considerations. This plan will contain especially the following data:

- The location of sources of impacts from the project: places for extractable materials, water sources, workplace installations, and hydraulic works;
- Data on the environment of the route: zones crossing territories of villages, classic or cultural sites, existing extraction sites, valuable sites, eroded or erodible zones, zones suitable for the creation of retention basins, socio-cultural establishments, etc.;
- Exact location of the impacts identified:
- Location of proposed steps: especially those concerning: accident-causing zones, rehabilitation of sites used, rehabilitations proposed to improve the living conditions of the inhabiting populations, etc.

8.6 MANAGEMENT OF IMPACTS NOT IDENTIFIED DURING THE STUDY

Based on the surveillance reports and environmental monitoring, additional corrective steps can be adopted by the administrations in charge of the environment after notifying the CIE, in order to take unidentified impacts or additional information uncovered in the APD stage of the study and during the execution of the work into account.

8.7 PUBLIC PARTICIPATION

8.7.1 In implementing the ESMP

The routes are perceived by the authorities and the local population as indispensable for the economic and social development of the regions. Thus their rehabilitation and their maintenance will remain primary for the groups whose consultation and involvement in making decisions will be a guarantee of success in the projects.

From the methodological point of view, the process of consulting the population will be supported by the Environmental and Social Management Plan (ESMP).

It will envision, first of all, an explanation of all the identified potential impacts and the steps planned to attenuate them or improve them. It will then envision involving the population and sensitizing them for implementation of the ESMP.

In fact, involvement of the population in implementing the steps relating to route security, for example, is indispensable during the work period. It will be made easier to the extent that they will feel responsible and directly involved in the later maintenance work.

The process of working together will follow the plan of actions foreseen in the ESMP, and it will be implemented in three large steps:

- **A preparatory step** having the objective of presenting the project and becoming aware of the needs of the actors, their sensitivity with respect to the project

(acceptance, reticence, nature of fears and requirements). This first step will take the form of a “launch forum” or an information meeting and making contact to permit all actors to meet together: local administrations, NGOs, associations and groups of associations, populations, resource persons at the community, level, etc.

During this meeting, the following will be presented:

- the work envisaged and the planning for its realization;
- the work of workplace installation and places of heavy intervention;
- the plan for economic and social management;
- and the nature of the expected collaboration with the population.

Furthermore, as a result of this forum, it is planned to reach a consensus concerning the responsibilities of the various partners and the formulation of mutual engagements and also the constitution of coordination and programming cell for the construction site.

- **A step of establishing the workplace and performing the work.** At the end of the first step, which will have permitted all persons involved to become aware of the nature of the work, a phase of collaboration and exchanges will take place within the framework of the ESMP.

This latter phase in fact foresees periodic meetings with the local authorities and representatives of the population (within the framework of quarterly sensitizing campaigns), in order to examine the problems encountered, the solutions applied or to be applied, the steps to be taken to avoid this or that slip-up. Informing the population of the decisions and steps taken and/or, in case of a slip-up, will be organized locally after each large follow-up meeting.

At the time of these meetings, it is recommended to use pedagogical tools for better communication of information on the progress of the work and the nature of the difficulties encountered, the dangers/disturbances that risk occurring to the environment, to economic activities, and/or to the health of the population, the means for circumventing them or attenuating them planned in the ESMP, etc.

- **A step of closing the work** and participative planning of the passage to the “exploitation” phase of the ESMP. Once the work has been completed, a meeting with the local actors is required, in order to permit a balance made between the first phase of the ESMP and planning the exploitation phase, especially the maintenance work, with the population.

8.7.2 Cooperation plan and dialog accompanying the PAR

Within the framework of the present construction project of the Batchenga – Ntui-Yoko – Tibati – N’gaoundéré route, other public meetings will be held at the time of implementation of the Cooperation and Dialog Plan (PCD) in preparation for and accompanying the complete reinstallation plan. These consultations will be held in two phases:

- A public consultation phase through general meetings. They will present, in particular, the path of the route as defined by the APD study. Several current inhabitants will be with this due to the potential enlargement

due to rectification of curves or the paths. Others located along the current route may find themselves right in the middle. It is good to specify the future PAPs, in order to raise any object of future controversies that will explode at the time of the work.

- A phase of individual consultation will be included in the implementation of the PCR for indemnification of those have rights.

The participative approach will be used in order to involve all populations concerned, especially the heads of households, the heads of businesses, and the owners, as well as the professional associations, the civilian society, and the local authorities. These activities take place along each section of the route.

Community participation is important, because it offers the populations concerned an opportunity to participate in the implementation of the PCR and the ESMP and to ensure their transparency.

The population to be displaced and the assets affected have previously been the object an investigation at the time of the start of the APS studies of the project. The PCD envisions involvement, according to a participative approach of the populations, local authorities, and institutional and social actors.

The main objective of the PCD is informing the populations and involving them in the implementation of the PCR and the Environmental and Social Management Plan (ESMP) with respect to national procedures and the BAD in matters of involuntary displacement of populations and environmental and social evaluations.

Thus the Plan for Cooperation and Dialogue (PCD) envisions making the public aware of the project, and informing them of its utility and about the potential impacts that it may entail, collecting their complaints, and involving them in the implementation of the PAR.

In fact, participation of the community in the planning and implementation of the project should be encouraged and reinforced.

A choice to rebuild residences as close as possible to the zone affected by the project would already permit communities in place not to be disturbed too much and then an easy reintegration of the displaced population into the new site. Moreover, the reinstallation plan includes a program of accompaniment based on a strategy of developing a sensitization package that aims to ameliorate, or at least to maintain the economic basis for the displaced population.

The PCD will be worked out in close collaboration with the local administration and population, for the purpose of taking into consideration their advice, concerns, and expectations, as well as those of the authorities and the beneficiaries of the project. It constitutes the preamble to implementing the PCR and the ESMP, and it will permit the negative impacts connected with the project to be circumscribed in a general manner, and in particular, the displaced populations.

In a concern about transparency and consolidation of efforts, the PCD involves practically of the parties concerned:

- Central services of the state,
- Local authorities,
- Civil society (associations and NGOs),
- Beneficiaries (PAPs),
- General public (local population, users of the route, etc.).

The last three parties, especially the beneficiaries, should be informed and sensitized sufficiently about all the processes of the design and execution of the activities, including identifying and taking into account the attenuation measures proposed for the potential economic, social, and environmental impacts.

Those having a right to indemnification or resettlement will be the object of particular attention through a special program of sensitization and accompaniment being adopted for a certain period, in order to ensure their reinstallation. In fact, they should be prepared to recover the same level or an improved level compared to their initial life conditions without this affecting the environment surrounding them adversely.

At the time the PCD is implemented, the operator will take care to ensure a fruitful exchange among the various actors who are playing an important role in the processes of diffusion of information, relying on the principle of transparency to permit the populations to contribute positively to making decisions concerning them:

- providing programmed actions,
- designing economic, social, and environmental attenuation, monitoring, and management steps,
- analysis and choice of alternative solutions.

Within the framework of implementing the PCD, two types of facilitation and support structures will be created:

- the facilitation committee (COFAC)
- the local committees (COLOC)

2 Facilitation committee

The facilitation committee (COFAC) will consists of local representatives of the institutional and administrative actors, as well as representatives of the local authorities who share the holdings along the route. The COFAC, which will be created at the initiative of those in charge of the project, namely the ministry, and will include representatives of the local administrations and authorities. For example, here is a list of the representatives to be assembled for this committee:

- A representative of the ministry (coordinator);
- A representative of the contractor;

- A representative of the Office of Control Studies (BE) (facilitator);
- A representative of the development partner;
- Each of the mayors of the districts and collectivities, with representatives of the departments;
- An assigned delegate representing the directors of the school establishments long the route;
- A person responsible for public health;
- A representative of the order-keeping forces and a representative of the defense forces (state police);
- A representative of the Department of Justice;
- A high representative of commercial activities (Ministry of Small and Medium-size Contractors and Craftsmanship);
- A high representative of the Department of Land Transportation.

These persons will be named by their respective administrators, as will their deputies. It is suggested their address be transmitted as soon as possible.

- Local committees

The local committees (COLOC) will consist of representatives of the civilian society (socio-professional organizations, NGOs for development and environment, etc.) for each city, which are the cities of Ntui, Yoko, Tibati, and Ngaoundéré. The formation of the COLOCs will take place during public meetings under the supervision of members of the COFAC.

It is expected that at best the following will be members of each COLOC:

- Two notable persons and/or opinion leaders (or their wives);
- Two representatives of NGOs and/or the civilian society;
- Two representatives of socio-professional associations.

Monitoring implementation of the PCD on the ground.

Implementation of the PCS presupposes making means and personnel available at the level of the magnitude of the project. The experts in charge of the PCR and the ESMP will be actively involved in implementing the PCD.

Meetings will be held with the members of the COFAC and the COLOCs will be held regularly, in order to keep themselves up to date and discuss the conditions of development public and individual consultations, as well as to collect their advice and counsel.

Relay persons within the population will likewise be identified, in order to reach the maximum number of individuals. For this purpose, they will transmit feedback on the perceptions of the populations and their degree of mobilization. These will be as associated as far as possible with all phases of implementation of the PCD and afterwards with implementation of the PCR and the ESMP, including defining the actions.

9 CONCLUSION

The main conclusions that came out of this study of environmental and social impact are:

- The population is very favorable to starting the project, and the results of the consultation sessions have put forward several points that should be integrated into it, such as the security and employment of the local population.
- The first consequence of the planning and construction of the route is reinforcement of the central corridor between Cameroon and the neighboring countries (especially Chad and the CRA) and an increase in traffic between the Center region and Adamawa, with improvement of the conditions of movement, especially in terms of safety and comfort.
- The construction of the route, an important factor in improving the traffic conditions, will be translated into a positive overall impact on the framework of life of the villagers (opening by a sure and permanent service road in rainy periods, easier access to social services, etc.), and on the regional and national economies (making rural development dynamic, reduction of transportation costs, reinforcement of national communication, etc.)
- This project, which is judged to be very important by the local population, will present them with only overall positive impacts if the environmental steps are strictly respected: it is considered to be feasible and of great importance.
- Disturbances during the workplace period may be reduced considerably by entering planned environmental-protection steps into the booklet of specifications for the Contractors and putting in place management structures for environmental monitoring of the work.
- An equivalent (at least) to the forest area destroyed should be replanted, and strict monitoring should be performed.
- The quarries and other workplace sites should be restored to their previous state.
- Since the risks to the health and safety on the inhabitants and the workers during the workplace period are great, the steps mentioned for this purpose should be applied.
- Organization of the workplaces and monitoring the minimum rules for respecting the environment during the work will permit tolerable impacts on the natural and human environment to be guaranteed.
- Measures for the population, such as support for women and vulnerable persons during the reinstallations, improving the school and sanitary infrastructures are indispensable to good integration of the project and its acceptance by the populations. A restoration of the agricultural practices and framing agricultural, pastoral, touristic activities and forest exploitation are essential, in order to be able to face new pressures to which they will be subjected when the project is opened.

10 ANNEXES

REPUBLIC OF CAMEROON
Peace – Work – Fatherland

MINISTRY OF PUBLIC WORKS

SECRETARIAT GENERAL

DEPARTMENT OF ROAD INVESTMENTS
AND ENVIRONMENT PROTECTION

ENVIRONMENTAL PROTECTION UNIT

DIPER23

REPUBLIC OF CAMEROON
Peace – Work – Fatherland

MINISTRY OF PUBLIC WORKS

SECRETARIAT GENERAL

DEPARTMENT OF ROAD INVESTMENTS AND
ENVIRONMENT PROTECTION

ENVIRONMENTAL PROTECTION UNIT

Yaoundé on May 11th, 2012

LETTER NO **3348** /L/MINTP/SG/DIPER/DIPER20

FROM THE MINISTER OF PUBLIC WORKS
TO
**MISTER THE MINISTER OF ENVIRONMENT
NATURE CONSERVATION AND
SUSTAINABLE DEVELOPMENT
YAOUNDE**

Object: Request to perform an *Environmental and Social Impact
Assessment of the development scheme of the road
BATCHENGA – NTUI – TIBATI – NGAOUNDERE*

Pursuant to article 7 paragraph 1 of the decree No. 2005/0577/PM of February 23rd, 2005 setting the implementation clauses of the environmental impact assessment,

I have the honor to transmit for consideration and approbation the terms of reference of the Environmental and Social Impact Assessment of the project mentioned in the margin.

According to the order No. 0070/MINEP of April 22nd, 2005 setting the different operation categories which implementation required an Environmental Impact Assessment in its article 4, section IV, the planned activity shall be subjected to a Detailed Environmental Impact Assessment (DEIA). In order to take into account the demands of some development partners, the assessment will integrate a social section and will eventually take the form of an Environmental and Social Impact Assessment (ESIA).

Attachments: -3 copies of the project Terms of Reference
-1 check of 2,000,000 xaf (examination fee of the TOF)

TWO MILLION CFA FRANCS-

AGENT COMPTABLE FONDS
DEVEL.FORESTIER (accounting officer
of the forest development fund)

SCB Cameroun
 5396246 Payez contre ce chèque non endossable sauf au profit d'une banque ou d'un établissement de crédit.
 Pay against this cheque not endorsable except to a Bank or a financial institution

2000000

DEUX MILLIONS DE FRANCS CFA.-
Écrire la somme en toutes lettres / amount in letters

6

4 A L'ORDRE DE **AGENT COMPTABLE FONDS DEVEL. FORESTIER** XAF = 2.000.000. =

1 To the order of

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FOREST DEVELOPMENT SPECIAL FUND

Government Printing Office - 44 - 99

EXERCICE :
FINANCIAL YEAR :

2012

FONDS SPECIAL DE DEVELOPPEMENT FORESTIER

Imprimerie Nationale - 44-99

DATE	PARTIE VERSANTE DEBTOR	NATURE DE LA RECETTE NATURE OF REVENUE	MONTANT AMOUNT
18/01/12	Vente de produits forestiers Publics	EIES du projet d'amélioration de la route Bakelenga - NTU TIBATI - Yaoundé	En lettres/In letters Deux millions de francs
TOTAL 2 000 000			En chiffres/In figures

Cache/Stamp
Signature

N° 4917

A Quittance
Receipt
Numéraire/Cash
Banque/Bank
C.C.P./Postal

la Banque ISBA
Studi International
n° 5396245 au
10/04/2012 à yde

TERMS OF REFERENCE

1. INTRODUCTION

1.1. Justification of the assessment

In the framework of its strategy for sub-regional integration and balance between regions, the Government of Cameroon, assisted by the African Development Fund (ADF), undertakes the realization of the development assessments for the road BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE which constitute a link of the integration roads between Cameroon and Chad and also the Central African Republic. This road is a part of the national road No. 15 (RN15) which connects Batchenga (intersection with the national road No. 1 (RN1)) to Ngaoudéré, railway terminal to the North and Chad, past Ntui, Yoko and Tibati, which are the quintessential areas for agriculture, forestry, fish farming and pastoralism.

Also, the road BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE constitutes the natural extension of the national corridors in direction of Nigeria (Yaoundé-Bamenda-Enugu) or Gabon-Guinea (Yaoundé-Ebolowa-Ambam-Eking or Ambam-Kye Ossi) and constitutes the shorter route in order to connect the Northern and Southern parts of Cameroon and thus to Chad and Central African Republic. Regarding the legislation in force, especially Law 96/012 of August 5th, 1996, and the framework law relative to the management of the environment in its chapter II, these assessments shall integrate an Environmental and Social Impact Assessment (ESIA).

1.2. Purpose of the terms of reference and objective of the assessment

The goal of the current terms of reference is to guide the environmental and social impact assessment preliminary to the project which constitute an assessment of the project feasibility from the environmental point of view and which objectives are to identify and analyze the environmental constraint and potential impacts of the project. Its goal is also to assess the direct or indirect incidences of the project development activities on the ecological balance of the implantation area or any other region, the living environment and quality of life of the populations and on the environment in general in order to ensure its harmonious insertion in its host environment. In addition, attenuation measures will be proposed in order to compensate these environmental and social effects.

1.3. Presentation of the promoter

The promoter is the Government of the Republic of Cameroon through the Ministry of Public Works.

1.4. Agreements in order to perform the Environmental and Social Impact Assessment of the project

For the project implementation, the Government, in accordance with the regulation in force, intends to call on a consulting firm or a registered NGO in order to perform the EIA in Cameroon.

1.5. Presentation of the project

The development of the BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE road is a part of the strategy for modernization and update of the sectors supporting the economical development adopted by the Cameroon State and which aims to implement a transportation system that enables the reduction of the transportation costs, the development of exchanges and the regional economical integration.

The modernization of the project road will fill the insufficiency of the Cameroonian road network which has been revealed by several documents concerning the transports development and planning strategy: the “Plan Directeur Routier du Cameroun, 2004” (Cameroon Road Master Plan, 2004) and the “Stratégie Sectorielle des Transport, 2004” (Transportation Sector Strategy, 2009) which focus on the three following elements:

- The limited cover of the road network underlying of a pronounced enclosing of several regions;
- The small proportion of asphalt, 15% of the total linear of the network;
- The usually very bad state of the roads, which constitute a huge handicap for the development of the economical potential of several regions and a disincentive for the increase of their populations' income.

The BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE road vocation is an important north-south exchange axis connecting the capital city of Yaoundé and the central and southern regions to the Adamaoua, northern and extreme northern regions while connecting, directly or through a network of trails connected to the road, several cities, towns and village on a distance of 560 km.

Besides this national servicing road vocation, the project road constitutes one of the Cameroonian links of the connections between Central African Countries. The road offers a new transit alternative towards Chad and, to a lesser extent, to the Central African Republic, two countries of the sub region which are enclosed, which get supplies from the port of Douala.

Its upgrade should enable the reduction of the length of this corridor, which will contribute to strengthen the Cameroonian way competitiveness compared to the other alternatives for opening-up used by the two countries. The road will strengthen the transit function of the country, the international radiation of its transportation infrastructures and its positioning as commercial exchanges hub in Central Africa.

2. BACKGROUND OF THE ASSESSMENT

2.1. LEGAL AND INSTITUTIONAL BACKGROUND

From a legal point of view, the Law No. 96/012 of August 5th, 1996 stipulates in its article 17 that “the promoter or the project owner of any development project, work, equipment or facility which, due to its size, nature or incidence of the activities exerted on the natural environment, might adversely damage the environment, has to perform, according to the prescriptions of the specifications, an impact assessment which enables to assess the direct or indirect incidences of this project on the environmental balance of the implantation area or any other region, the living environment and quality of life of the populations and the incidences on the environment in general.”

The decree No. 2005/0577/PM/ of February 23rd, 2005 specifies the implementation procedures of the above mentioned Law. As a result it requires the deposit of the terms of reference information for the implementation of the Environment Impact Assessment in the competent administrations (ministry in charge of the environment) the law No. 85/09 of July 4th, 1985 relative to the expropriation due to public interest and the modalities of compensations.

The order No. 0070/MINEP of April 22nd, 2005 is setting the different operation categories which implementation required an Environmental Impact Assessment. In its article 3, the law classifies the project in study in the infrastructure sector, and especially in the category of construction and rehabilitation of the roads.

This assessment will also be controlled by several legal texts relative to the environment among which are:

- The law No. 85/09 of July 4th, 1985 relative to the expropriation due to public interest and the modalities of compensations;
- The law No. 94/01 of January 20th, 1994 relative to the forest, wildlife and fishery regulation;
- The law No. 98/005 of April 14th, 1998 relative to the expropriation due to the water regulation;
- The law No. 2001/001 of April 16th, 2001 relative to the expropriation due to the mining code;
- The decree No. 95/678/PM of December 18th, 1995 instituting the relative to the indicative framework for the land use in the southern forest area;
- The decree No. 95/466/PM of July 2nd, 1995 setting the modalities of the wildlife regulation;
- The decree No. 95/531/PM of August 23rd, 1995 setting the implementation procedures of the forest regulation;
- The decree No. 2008.064 of February 4th, 2008 setting the management procedures of the National Fund for the Environment and the Sustainable Development;
- The order No. 00001/MINEP of February 13th, 2007 defining the general contents of the terms of reference for the Environmental Impact Assessments;
- The order No. 00004/MINEP of July 3rd, 2007 setting the conditions for approval for consulting offices to perform Impact Assessments and Environmental Audits;
- The decree No. 0108/D/MINEF/CAB of February 9th, 1998 setting the implementation of intervention standards in forest environment;
- The Guide for implementation and assessment of the Environmental Impacts Assessments in Cameroon dated of May 2008 and also the indicative appendix canvas.

From the institutional point of view, the ministerial departments directly concerned by this assessment are the Ministry of Public Works, the Ministry of Forests and Wildlife, the Ministry of Environment and Nature Conservation and the Ministry of Mining Industry and Technological Development.

2.2. Geographical and ecological background

This road is located in the Center and Adamaoua regions, more specifically in the departments of Mbam and Kim (county town Ntui) and Djérem (county town Tibati) and spread on two global climatic zones: the equatorial zone and the tropical zone; the vegetation related to these huge climatic zones is: the forest until the north of Yoko (between Yoko and Tibati) and the savanna from Tibati to Ngaoundéré.

3. GENERAL METHODOLOGY AND PRINCIPLES THAT SHALL DIRECT THE ASSESSMENT

3.1. General methodology of the assessment

The Consultant is asked to describe in an accurate and clear manner every methods and tools he or she will use for both the data collection and their treatment. The Consultant will examine the interactions between the project nuisances' emitters and the environment receptors suffering the corresponding interferences while excluding the aspects which are not or little relevance with the environmental impacts of the proposed action. The Consultant will identify the biophysical, social, traditional and cultural which may be affected by the project and for which a public and/or professional concern is emerging.

The Consultant will identify all the potential impacts of the project of the environment and will evaluate them by using appropriate method which will enable to classify them by rank of significance. Only the significant impacts will be subjects to a detailed review. The Consultant will then propose for these realistic and feasible attenuation or improvement measures and a monitoring program.

The assessment will propose a management plan of the project facilities, the borrow sites and the quarries. It will also propose a management plan of the wastes generated by the project activities and a compensation or relocation plan for the populations. A particular attention will be dedicated to awareness-raising and training for the population located in the project area and the heavy equipment and construction site vehicles drivers concerning the aspects relative to the protection of the environment and the security. The Consultant will perform an assessment of the risks related to the project and will propose measures to be taken in case of emergency. The Consultant will propose elements of response concerning the project feasibility from the environmental point of view.

It is recommended to the Consultant to use the Rapid Rural Appraisal (RRA) in order to collect the environmental information.

3.2. Principles that shall direct the assessment

The environmental impact assessment will be performed based upon some principles among which the most important are:

- *The principles of sustainable development:* Sustainable development objective is to meet the essential needs of the present without compromise the future generations' capacity to meet their own. It is thus based upon the principles of fairness, not only towards the future generations but also towards the living generations, regardless their place of origin.
- *The precautionary principle* according to which the lack of certitudes, considering the scientific and technical knowledge at this time, shall not delay the adoption of efficient and proportionate measures aiming to prevent severe and irreversible damage risk to the environment at an economically acceptable cost.
- *The polluter pays principle* according to which the costs generated by the prevention, pollution reduction measures, and the countermeasures against this pollution and the restoration of the polluted sites shall be supported by the polluter.
- *The responsibility principle*, according to which any person who, by his or her action creates such conditions which nature may adversely affect human health or the environment must ensure or ask to ensure the disposal in proper conditions in order to avoid these effects.
- The participation principle according to which:
 - Every citizen shall be granted access to the information related to the environment, including those relative to the hazardous substances and activities;
 - Every citizen has the duty to attend to the preservation of the environment and to contribute to protect it;
 - All the public and private persons have to, in all their activities, conform to the same demands;
 - The decision relative to the environment shall be taken after dialog with the activity sectors or the concerned groups or after a public debate when they have a general span.
- *The principle of subsidiarity*, according to which, without written legal rule, general or specific, concerning the protection of the environment, the identified custom standard of a specific land and established as the most effective for the protection of the environment shall be applied.

3.3. The assessment creation approach

The assessment will be performed according to the assessment procedures of the environmental impact assessments developed by the State of Cameroon. The methodology adopted by the Consultant shall be rigorous and imply a brief assessment of the initial state, the identification of all the potential impacts, the assessment of the direct impacts, the identification of the inclusion measures. To achieve this, the Consultant will travel by all means (on foot, with a vehicle) the whole length of the project.

4. CONTENT OF THE ASSESSMENT

4.1. LEGAL AND INSTITUTIONAL BACKGROUND

The Consultant shall present the legal and institutional background in which the assessment is performed. The Consultant shall justify the project. A brief presentation of the promoter and the sector of activities of the project shall be done and also a presentation of the inclusion background of the project in order to situate it within its environment.

This presentation shall enable to bring out the environmental, socio-economical, cultural and technical issues of the project at the local and regional level and also national and international level.

4.2. Description of the project

The Consultant will present, among others:

- The main technologies available and the criteria that lead to choose the preferred technology;
- The location of the infrastructures that need to be set up;
- The technical characteristics of the project;
- The waste and nuisances which are likely to be generated by the project;
- A complete description of the project phases;
- The deadlines for each activity;
- The number, types and origin of the labor force required and also the procedures of hiring;
- The types and amount of all the materials that will be included in the projects, their origin and the method to obtain them.

4.3. Description of the initial state

This section will delimit the assessment area and will describe the components of the natural and human environment.

a) Delimitation of the assessment area

In order to limit the amount of information that shall be collected and analyzed to a level easy to handle, to focus on the most relevant issues and to provide concrete and realistic propositions, the Consultant shall set up limits. These limits shall be based upon the potential maximal interaction part between the project and the environment. The assessment shall justify the selected limits and distinguish the direct impacts areas and the indirect impacts areas on the natural and human environment. The main limits that shall be established are: the spatial, temporal and legal limits, the elements of the ecosystem and the social elements.

b) Description of the relevant components of the environment

Based upon the data available, completed, if necessary, by quantitative and qualitative relevant inventories, the assessment will describe in the most possible factual manner the relevant components of the environment compared to the issues and impacts of the project.

This description will highlight:

- The state of the environment at the time the assessment is performed;
- The relevant information concerning the modification likely to happen during the whole lifetime of the project;
- The relevant information concerning the evolution of the environment without the project.

For information purpose, the following points will be covered:

- *Physical Environment*
Geology, topography, soils, climate and meteorology, surface and ground hydrology, hydrodynamic, current atmospheric pollution sources, liquid pollution loads, water quality (physical and chemical parameters, suspended matters, etc.) in the receiving environment. A particular significance will be given to the wetlands crossed by the project.
- *Biological Environment*
Plant life, wildlife, rare species, sensitive habitats, natural sites of particular interest, commercial important species and potentially harmful species directly or as vector.
- *Socio-economical and cultural environment*
Demography, population, ethnic groups, local minorities, languages, activities, community structure, employment, know-how, soils usage, distribution of the incomes from the goods and services, traditions, cultural properties, planned or on-going development activities and the socio-economical infrastructures.

4.4. The expected impacts on the environment

The goal of the identification of the impact is to determine how the project can affect the elements of the environment. This part will necessarily be discussed with all the shareholders.

a) Identification

The assessment will determine the most significant impacts. At this stage, it is recommended to use identification matrix for impacts and control checklists.

These impacts concern:

- The deterioration of the living environment and living conditions of the population living near the construction works area;
- The deterioration of the vegetation and the increasing pressure on the natural resources, the social infrastructures and the biophysical and socio-economical environment;
- The decrease of terrestrial and aquatic biodiversity, the deterioration of the ecosystem and the modification of the hydrodynamics of the environment;

- The encroachment on protected areas;
- The improvement of the location populations' quality of life.

b) Characterization

Once the assessment will establish that an impact is likely to happen, it shall be characterized. In this context, the assessment will consider the positive and negative, the direct and indirect impacts and, if required, the cumulative, synergistic, delayed and irreversible impacts related to the expected construction works.

In order to characterize the impacts, the Consultant will use the following characters (the list is not exhaustive):

- The nature of the impact;
- The interaction;
- The intensity or the extent of the impact;
- The scale of the impact;
- The duration of the impact;
- The frequency of the impact;
- The occurrence;
- The knock-on effect, the cumulative effect (connection between the project and the other projects with similar or synergistic impacts), the residual effect (the connection between the impact and the attenuation measure recommended).

c) Evaluation of the impacts significance

The assessment will assess the significance of the impacts by using any appropriate method. The assessment will deal only with the significant impacts. For this purpose, it is recommended to the Consultant to determine in advance the valued components of the environment (VCEs).

d) Impacts indicators

The assessment will provide for each impact indicators and the manner these indicators will be measured and followed (methods, techniques, protocols, tools).

Concerning the impacts that cannot be quantified, the assessment will provide a detailed description reporting their expression.

e) Environmental impact sheet

For each identified impact, the Consultant will take care to establish an impact sheet presenting the following information:

- Identification of the project;
- The designation and localization of the identified impact;
- The activity source of the impact;
- A synthetic description of the causes and expression of the impact;
- The characterization of the impact;

- The assessment of the significance (absolute and relative) of the impact;
- The adequate environmental measure (type, effectiveness and principle);
- The evaluation of the residual impact.

4.5. Measures of attenuation, compensation and optimization

The assessment will specify the actions and works, corrective actions and additions scheduled during the different phases of implementation including the project ending in order to, on one hand, eliminate or reduce the negative impacts of the project and, on the other hand, will propose the measures considered in order to encourage or optimize the positive impacts. It will propose specific clauses to be included in the specifications of the company in order to limit the trouble caused to the populations and the deterioration of the environment in general.

It will also present an assessment of the efficiency of the proposed attenuation, compensation and optimization measures and will provide an estimation of their costs.

The assessment will estimate the residual impacts by performing a projection of the attenuation measures. In the case of unavoidable and insurmountable residual impacts, the assessment will propose compensation measures for the affected biota or concerned communities.

4.6. Environmental and social management plan

The consultant will prepare as a separate document an Environmental and Social Management Plan (ESMP) for the project including the environmental actions to be implemented, the budget estimations, the implementation agenda, the needs in term of staff and any other support required for the implementation of the attenuation or compensation measures.

Will also be described the follow-up measures that have been recommended but that may not have been approved by the applicants. The reasons for which these measures would not have been accepted will be exposed and justified. The secondary effects of these measures on the environment will be assessed.

a) Institutional needs for the implementation of the ESMP

The Consultant will examine the mandates and the institutions at the local, provincial and national level and will prescribe the necessary steps in order to strengthen or spread its capacities to enable the implementation of the management and follow-up plans.

b) Follow-up and monitoring program:

The assessment will indicate parameters to monitor by the organizations or the players in charge of the monitoring and the cost of the operation. The assessment will also specify the other required inputs (training, material and institutional reinforcement) to enable the implementation of the plan. The proposed follow-up program shall integrate the populations, the local institutions and the NGOs, if needed.

c) Implementation program of the measures:

The Consultant will propose an implementation program of the measures. For this purpose, the Consultant will perform a classification of the measures created by priority order. Priority will be granted to the measures related to direct and short termed impacts. The Consultant will identify and

characterize the players and institutions able to implement the proposed actions. The Consultant will define, if needed, the necessary phases in order to strengthen or spread them.

d) The environmental route scheme

The Consultant will create a route scheme that reflects the environmental considerations. This scheme will include, in particular, the following data:

- The localization of the impacts sources of the project: exploitable borrows, water intake, construction works facilities and waterworks;
- The data concerning the environment of the road: right-of-ways areas of the villages crossed, classified or cultural sites, existing borrow areas, valorized sites, areas eroded or subject to erosion, favorable areas to create retention basins, social and cultural facilities, etc.
- The exact localization of the identified impacts;
- The localization of the proposed measures, in particular concerning: the areas where accident may occur, the rearrangement of the sites in use, the developments proposed in order to improve the living conditions of the resident populations, etc.

4.7. Estimation of the costs

In order to enable the implementation of the ESMP, the assessment will proceed to an estimation of the costs for the recommended attenuation and compensation measures.

4.8. Involvement of the public

The involvement of the various public administrations, the NGOs and the populations constitutes an important component of the current assessment. The ESMP will necessarily be discussed with all the shareholders. The Consultant shall conform to the public consultations and hearings procedure as prescribed by section III of decree No. 2005/0577/PM of February 23rd, 2005 setting the implementation modalities for the environmental impact assessments. The Consultant will recommend the promoter to organize or not the public hearing required by the regulation in force.

4.9. Relocation plan

In case of involuntary forced movement of populations, the Consultant will create a separate document, a relocation plan for the displaced populations.

5. OBLIGATIONS OF THE PROMOTER

The Promoter will make available for free to the Consultant the plans and any study or information available related to the project. In particular, the results of the technical assessments performed, the localization of the quarries and the borrow sites and also the geotechnical data related to these, the created sample survey plans.

6. OBLIGATIONS OF THE CONSULTANT

6.1. Documents

The Consultant will proceed an inventory of all the document made available to him or her by the Promoter or provided during the mission for the needs of the assessment. These documents which the Consultant will be responsible shall be given back at the end of the mission. The Consultant will analyze and interpret the provided data that shall be considered as confidential.

6.2. Composition of the assessment team

The Consultant will set up the necessary human resources on quantity and quality levels in order to perform a job of excellent quality. The team composition and the duration of the intervention of each member are left to the Consultant discretion. However, the following minimum competences are required in the team of a maximum duration of five (5) months:

- One Head of Mission, expert in environment management, proving the competences and a good experience in the participative management. It is imperative the head of mission had performed at least three (3) environmental impact assessments of identical significance in Cameroon. The head of mission shall justify at least five (5) years of general experience;
- A civil engineering engineer with at least five (5) year of experience in projects environmental management;
- An expert in natural resources management (wildlife, plant life) with at least five (5) years of experience;
- A sociologist with a general experience of five (5) years and justifying a good experience in environmental impact studies;
- A cartographer with at least three (3) years of experience;
- Two interns, they will be young people in training, in a state institution in Environment and in internship at the Road Environment Protection Unit of the Direction of the Investments and Protection of the Road Environment (DIPER 20/DIPER) of the Ministry of Public Works. They will justify their status with a certificate of scholarship, an intern placement by the School and an internship duly signed by the Minister of Public Works. They will also be covered for a price.

N.B:

On the other hand, we would like to draw the Consultant attention to the fact that at least half the provision time of each expert shall be dedicated to field work.

6.3. Office and accommodation

The office and accommodation costs for the team members are covered by the Consultant.

6.4. Professional secrecy

The Consultant will be required to professional secrecy during and after the mission.

6.5. Relationship with the other shareholders

The Consultant will ensure to work in close collaboration with all the shareholders involved in the Environmental Impact Assessment, especially the central and external services of the Ministry of Environment, Nature Protection and Sustainable Development, the Road Environment Protection Unit of the Direction of the Investments and Protection of the Road Environment (DIPER 20/DIPER) of the Ministry of Public Works and the services of the Ministry of Forests and Wildlife.

6.6. Responsibilities

The Consultant remains responsible of the assessment development. The final approbation of all the documents by the Administration does not release the Consultant from the responsibility towards the consequences of the Consultant potential errors. The Consultant is supposed to be insured for his or her risks.

6.7. Survey and awareness-raising

The Consultant will stay in the villages located in the area to be assessed and likely to be affected by the project. The Consultant will organize working sessions with the farmers in order to identify in a participative manner the impacts of the construction works, evaluate their needs in terms of development and their know-how.

For this purpose, the Consultant will ensure that the populations are informed of the public consultation program at least one week before the date of the first meeting, in accordance to the regulation in force. The minutes of the various meetings will become appendix to the impact assessment report.

7. SCHEDULE OF THE ASSESSMENT

The maximum duration for the assessment implementation is five months. And the assessment report shall be delivered according to the following procedure:

- T₀ + 02 weeks: three copies of the starting report;
- T₀ + 18 weeks: ten copies of the provisional report with one electronic version;
- T₀ + 20 weeks: twenty five (25) copies of the final report including all the comments and remarks from the promoter with one electronic version.

8. ASSESSEMENT RAPPORT

The reports will be written in French. Two weeks after the public consultations, the Consultant will deliver to the Promoter one (01) copy of the report in paper format and one electronic version. The report will be submitted in a brief manner and will be limited to the most significant environmental issues. The main text shall focus on the results obtained, the conclusions and the recommended actions of the assessment and also of the ESMP. The Promoter will take in charge to create the required number of copies and to send it to the competent authorities.

9. STRUCTURE OF THE FINAL REPORT

The report will include the following elements:

- Assessment summary written in a simple language in French and in English;
- Introduction and justification of the assessment;
- Legal and regulatory framework;
- Description of the project;
- Presentation and analysis of the alternatives;
- The reason to choose the project among the other possible solutions;
- Description and analysis of the initial state of the site and its physical, biological, socio-economical and human environment;
- Description and analysis of all the socio-cultural elements and natural resources likely to be affected by the project;
- The reason to choose the site;
- Identification and assessment of the possible effects of the project implementation on the natural and human environment;

- Identification of the measures planned in order to avoid, reduce or eliminate the damaging effects of the project on the environment;
- The Environmental and Social Management Plan including the monitoring mechanisms of the project and its environmental follow-up;
- Relocation plan if needed;
- Environmental file highlighting the main environmental issues of the project. This file will be added to the Tender Documents for Companies (TDC).
- Appendix:
 - Awareness raising and information program and also the minutes of the meetings with the populations, the nongovernmental organizations, the unions, the opinion leaders and other organized groups concerned by the project;
 - List of the persons consulted;
 - Terms of reference of the assessment;
 - Bibliographic references;
 - Name of the persons who carried out the assessment.

In addition, the synthetic tables of the collected data and the appropriate references, and also any information that may facilitate the understanding or the interpretation of the data such as the inventory methodologies will be presented in appendix.

The Consultant will also establish an Environmental Notice to be attached to the TDC. This notice shall include: (i) a synthesis of the main environmental issues of the project; (ii) specific environmental prescription the Consultant will estimate useful to remind to the companies that shall submit a tender. This Environmental Notice will enable the tenders to establish more objectively the Organizational Scheme of the Environmental Action Plan (OSEAP).



A/EIE-AE N° 00000012 du 24 AVR 2009

AGREMENT A LA REALISATION DES ETUDES D'IMPACT ET AUDITS ENVIRONNEMENTAUX

Le Ministre de l'Environnement et de la Protection de la Nature,

- Vu la loi N° 96/12 du 5 août 1996 portant loi cadre relative à la gestion de l'Environnement ;
 - Vu le décret N° 2005/0577/PM du 23 février 2005 fixant les modalités de réalisation des Etudes d'Impact Environnemental ;
 - Vu l'arrêté n° 0004/MINEP du 03 juillet 2007 fixant les conditions d'agrément des bureaux d'études à la réalisation des études d'impact et audits environnementaux ;
 - Vu la demande d'agrément à la réalisation des études d'impact et audits environnementaux de l'intéressé en date du 28 novembre 2008
 - Vu le rapport du Comité Interministériel de l'Environnement ;
- Considérant les nécessités de service,

AGREE

LE BUREAU D'ETUDES ECTA- BTP BP. 785 – YAOUNDE, CAMEROON

pour la réalisation des études d'impact et audits environnementaux.

23 AVR 2014

Le présent agrément délivré pour servir et valoir ce que de droit, expire le _____

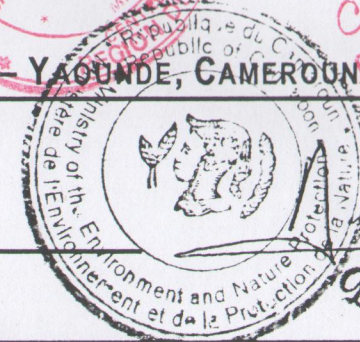
Pour Protocole Certifié
Conforme à l'Original
L'Adjoint

2 DEC 2010



Ankoumbel René-Blaise
Secrétaire d'Administration

Le Ministre Délégué



[Signature]
Dr. Nana Abouba Diouf

SYNTHESIS OF THE PUBLIC CONSULTATIONS

Date	Department	Region/town	Village	Total number of participants	Number of women	Expectations	Priority needs	Major concerns highlighted
Feb. 17, 2012	MBAM AND KIM	NTUI	NATCHINGAL	25	8	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, the local development	Construction of a water drilling; construction of an integrated health center	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 17, 2012	MBAM AND KIM	NTUI	EHONDO	24	8	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities	Finalization of the youth hostel currently under construction by the village youth organization with their own money, rehabilitation of the drilling, the health center, reorganization and opening of the training center for farmers	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 17, 2012	MBAM AND KIM	NTUI	NDJAME	14	4	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities. Improvement of the economic exchanges development between the different regions of the country, integration of the local economy in the subregion	Better health coverage	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 17, 2012	MBAM AND KIM	NTUI	BIATSOTA 2	3	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities	the construction of a water drilling; an integrated health center and a school.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 20, 2012	MBAM AND KIM	NTUI	Town of NTUI	49	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities	<p>Health of the mother and the child: Childbirth boxes 2 per center and cesarean section boxes 2 per center 3 motor bikes 2 CINI type mixed refrigerators vaccine holder cooling accumulators 1 center for women and family promotion equipped 1 ambulance for Ntui hospital</p> <p>Hospital: Construction of the hospital fence, 1 drilling, construction of a building for observation rooms and the appropriate equipment</p> <p>Education: 1 school (3 buildings of 2 classrooms, administrative block, teachers room, one equipped laboratory, fence, drilling), 1 preschool</p> <p>Commercial equipment: Construction of a market, a bus station Security: One vehicle for the police</p>	<p>the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands,</p> <p>the risks of accidents during the construction and exploitation of the road, the noise nuisances.</p>
Feb. 17, 2012	MBAM AND KIM	NTUI	BINDANNENGUE	6	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, economic development.	Improvement of the infrastructures, installation of drinking water and electricity networks	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 20, 2012	MBAM AND KIM	NTUI	BINDALIMA 2	33	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities	construction of a youth hostel, improvement of the drinking water supply, construction of a chapel	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 21, 2012	MBAM AND KIM	NTUI	BILANGA KOMBE	25	1	the opening up of the villages located along the RN15, facilitation of the transfer of agricultural products in the big urban centers. Creation of job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities.	Electricity supply, construction of school infrastructures, a junior high school, help for the agriculture	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 19, 2012	MBAM AND KIM	NTUI	BIVOUNA	13	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, facilitated mobility, development of socio-economical activities	Construction of a drilling and a CSI	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 20, 2012	MBAM AND KIM	NTUI	SALAKOUNOU	50	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a CSI; a drilling and a school.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances
Feb. 17, 2012	MBAM AND KIM	NTUI	OSSOMBE	6	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a school building in sustainable material, improvement of the playground (soccer ground)	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 21, 2012	MBAM AND KIM	NTUI	NDIMI	39	13	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of the agricultural post, a storage warehouse, a cattle market, a slaughterhouse, a playground (soccer ground) and a mosque, protection of the tombs and the forest, installation of drinking fountain	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 22, 2012	MBAM AND KIM	NTUI	BIAGNIMI	25	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a storage warehouse and a youth hostel.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 17, 2012	MBAM AND KIM	NTUI	YALONGO	36	5	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of the country	Help for the farmers, mechanization of agriculture, construction of a health center, help for palm oil manufacturing, help for agriculture and security training.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 21, 2012	MBAM AND KIM	NTUI	KOMBE BENGUE	10	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a school and a drilling.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 19, 2012	MBAM AND KIM	NTUI	NGUILA HAOUSSA	20	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	None	The destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 19, 2012	MBAM AND KIM	NTUI	NGUILA	11	1	the opening up of the area, the implication of local populations in construction works as job offers creation (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, improvement of the economy of the region, limitation of the accidents.	Achievement of agricultural trails close to the villages near the central village in order to open them up	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
	MBAM AND KIM	NTUI	17 village(s)	389	50			

Feb. 21, 2012	MBAM AND KIM	YOKO	AMEWONG	5	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a school building, a drilling and a CSI	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 22, 2012	MBAM AND KIM	YOKO	NGOUEYOU	23	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities.	Help for the women child delivery, construction of a health center, improvement of the marketplace, improvement of the playground (soccer, handball ground, etc.), resolution of the high school draining issues, mosquitoes and security issues, support for the elder people.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 21, 2012	MBAM AND KIM	YOKO	ISSANDJA	16	1	the opening up of the area and job offers creation for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, improvement of the economy of the region.	Construction of the new buildings for the school, a drilling and a CSI	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 22, 2012	MBAM AND KIM	YOKO	NYEM	10	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of the new buildings for the school, a drilling and a CSI.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 22, 2012	MBAM AND KIM	YOKO	GANDOUNG	19	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	None	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 22, 2012	MBAM AND KIM	YOKO	DONGA	15	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a drilling, new buildings for the school, electricity supply	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 21, 2012	MBAM AND KIM	YOKO	MELOKO	4	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, improvement of the economic exchanges between the different departments of the country.	Construction of the buildings for the school and a drilling	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 22, 2012	MBAM AND KIM	YOKO	YANGOULA	6	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility	Construction of a health center, rehabilitation of a water intake.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 21, 2012	MBAM AND KIM	YOKO	YASSEM	9	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities	Construction of a health center and a school building.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 17, 2012	MBAM AND KIM	YOKO	NJOLE	8	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, the development of the economy of the region.	Construction of a preschool, a health center, a market, a playground (soccer ground), help for the agriculture, achievement of an urbanization plan for the village, help for the GIC, improvement of the agricultural techniques for women	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 23, 2012	MBAM AND KIM	YOKO	GEURVOUM	23	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, the improvement of the economy of the region.	Construction of a health center, a school building and a drilling.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 23, 2012	MBAM AND KIM	YOKO	DONG	8	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, the facilitation of mobility for agricultural products in the big urban centers of the country.	Construction of health and school infrastructures	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 22, 2012	MBAM AND KIM	YOKO	MBEMBEING	11	1	the opening up of the villages located along the RN15, the job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities; facilitation of the transfer of agricultural products in the big urban centers, development of the socio-economical activities	Electricity supply, industrialization and help for agricultural credit	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.

Feb. 22, 2012	MBAM AND KIM	YOKO	MEKOASSIM	21	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a propharmacy and a youth hostel, help for agriculture, earthworks for the playground (soccer)	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 22, 2012	MBAM AND KIM	YOKO	MENGOING	23	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, the improvement of the economy of the region, maintain the security.	Drinking water supply, construction of a school, help for GIC, better organization of the communities	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 22, 2012	MBAM AND KIM	YOKO	MANKIM	49	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Electricity and drinking water supply, help for agriculture	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 25, 2012	MBAM AND KIM	YOKO	DOUME	19	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Equipment for the school, construction of a preschool and a health center, help for GIC, construction of the Mbam headquarters, help for beekeeping, reevaluation of ecotourism, earthworks of the playground	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 23, 2012	MBAM AND KIM	YOKO	MANGAÏ	42	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, the development of the economic growth.	Construction of drillings, a school building and an agricultural training center, earthworks of the playground (soccer ground), development of agricultural trails in the forest, strengthening of the GIC capacities, help for beekeeping with the NGO	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 23, 2012	MBAM AND KIM	YOKO	FOUY	33	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of an agricultural training school, help for GIC, domestic health training for young and old people, help for cattle breeding, job and touristic sites creation.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 17, 2012	MBAM AND KIM	YOKO	MBIMBIM	31	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, the improvement of the economy of the region, minimize the number of accidents.	Help to buy gasoline for the generator, construction of a health center, strengthening of the teaching staff	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 23, 2012	MBAM AND KIM	YOKO	FOUFOUENG	18	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Rehabilitation of the school buildings, construction of two water intakes, construction of an equipped chiefdom, help for the vulnerable people	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 23, 2012	MBAM AND KIM	YOKO	MATSARI	28	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a school, a health center and a drilling - drinking water supply, help for agriculture, help for GIC	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 24, 2012	MBAM AND KIM	YOKO	Town of YOKO	36	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	<p>Health of the mother and the child: Childbirth boxes 2 per center and cesarean section boxes 2 per center 3 motor bikes, 2 CINI type mixed refrigerators vaccine holder cooling accumulators 1 center for women and family promotion equipped 1 orphanage</p> <p>Health: Construction of the CSI: 5 observation rooms, delivery room and information communication room</p> <p>Hospital: 1 ambulance</p> <p>Education: 2 schools with 3 buildings, 1 preschool, for the high school: one building of 2 classrooms and a laboratory, boarding school of 30 rooms</p> <p>Tourism promotion: Fence of Yoko's chief</p> <p>Management des Wastes: 1 dump truck</p> <p>Agriculture: Tractors, one cold chamber for fish storage, strengthening of drinking water capacity in Yoko</p> <p>Commercial equipment: Construction of a market, bus station</p> <p>Security: One vehicle for the police</p>	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 26, 2012	MBAM AND KIM	YOKO	NGOUM	9	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a water intake, help for agriculture and cattle breeding, construction of a health center, electricity supply	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 24, 2012	MBAM AND KIM	YOKO	LENA	16	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a school building with 3 classrooms made in sustainable materials, a drilling and a health center, school supplies, help for GIC, help for the honey project	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 25, 2012	MBAM AND KIM	YOKO	MBA'AM	13	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a drilling, rehabilitation of a school building and a health center, road improvement, construction of the school toilets, help for agricultural development (cattle breeding, etc.), help for GICs	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
	MBAM AND KIM	YOKO	26 village(s)	495	26			

Feb. 26, 2012	DJEREM	TIBATI	MBANGTI MBANG	28	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a health center, a school (building with 2 classrooms), one village drilling, one playground, one youth hostel and a church, drinking water and electricity supply, help for cattle breeding on 4 pastures, help for an ecotourism project, creation of a community fund system	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 26, 2012	DJEREM	TIBATI	GONGONTOUA	25	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, the development of socio-economical activities between the various regions of the country.	Construction of a health center, a school (building with three classrooms made in sustainable materials), a drilling, a drying area and a cassava and corn mill, electricity supply, help for agriculture, help for GIC, tools for agriculture (wheelbarrows, shovels, chopper).	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 26, 2012	DJEREM	TIBATI	LOUH	8	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Construction of a water well, a health center, drying area, cassava and corn mill, equipment of a sewing workshop for the women, electricity supply, tools	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 26, 2012	DJEREM	TIBATI	NYAJIDA	6	1	the opening up of the area and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Corrugated iron for houses, school equipment (books, supplies, etc.), a drilling, a school building made in sustainable materials and an accommodation for teachers, agricultural equipment, electricity supply	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 26, 2012	DJEREM	TIBATI	MBITOM	18	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Help for the 4 GIC, water supply, construction of a drilling, a school and a corn mill, construction of a cassava dryer,	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 26, 2012	DJEREM	TIBATI	MANG LEY	18	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities,	Construction of a drilling, a CSI, electricity supply, construction of a dryer, fund for the village development, construction of a building of 3 classrooms made in sustainable materials, a mill, a community store and a drinking trough for cattle,	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 27, 2012	DJEREM	TIBATI	BITOM KASSA	12	1	the opening up of the villages located along the RN15 and the job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities; facilitation of the transportation of agricultural products in the big urban centers	Construction of a drilling, a CSI and a school in sustainable materials, agricultural tools, electricity supply	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 26, 2012	DJEREM	TIBATI	SOLA	7	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economic activities	Construction of a drilling, two school building, a corn dryer and a mill, electricity supply (generator), school toilets,	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 26, 2012	DJEREM	TIBATI	DANG HAOUSSA	17	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economic activities	Help for beekeeping (enhanced bee hives), construction of a CSI, a water drilling, a mill and a youth hostel, electricity supply, help for agriculture	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 28, 2012	DJEREM	TIBATI	MEDJAMBA	9	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economic activities, ensure security	Construction of a drilling, grant the village solar panels, construction of a building with two classrooms, a drilling for the junior high school, construction of a market, help for the GICs, construction of a chiefdom	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 27, 2012	DJEREM	TIBATI	TOWN OF TIBATI	14	4	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economic activities, ensure security	<p>Tibati health of the mother and the child: Childbirth boxes 2 per center and cesarean section boxes 2 per center</p> <p>Tibati health: CSI: 5 observation rooms and delivery room and information communication room</p> <p>Hospital Tibati: 1 mortuary, 1 hospital waste incinerator, 2 ambulances</p> <p>Education Tibati: One nurse in every school, fence, building for the teachers 3 buildings, 2 classrooms, 4 schools (5 buildings for each school with 2 classrooms), restoration of 15 classrooms, administrative block, 3 teachers rooms, 2 classrooms for the high school, 2 libraries, 2 laboratories, playground in every school infrastructure, 50 bed boarding school, 1 preschool, 1 town library, 1 cultural center and equipment for discussions and meetings</p> <p>Tibati jail: Construction and equipment of a CSI and library with a generator per CSI, help for agriculture (equipment, mill, motor powered pumps), classrooms</p> <p>Tourism promotion: botanical garden, fence and front of lamido</p> <p>Cattle breeding: Construction of a cattle market in Medjamaba, Tibati, Ngatt, Danfili, Beta kotto (pen and veterinary office), resting area every 50 km on the road and drinking trough for cattle, 5 mixed refrigerators for every village: Medjamaba, Tibati, Ngatt, Danfili, Beta kotto, slaughterhouses for each village: Medjamaba, Tibati, Ngatt, Danfili, Beta kotto</p> <p>Fishing: Tibati (1 ice manufacturing unit), fish sells hall in Danfili and freezer, help for fishermen's GICs/one cold chamber in Yoko district in Tibati</p> <p>Wastes Management: 2 dump trucks</p> <p>Agriculture: 4 storage warehouses Medjamba/Tibati/Nguila/Beka Kotto, 10 tractors, 8 agricultural posts (1 accommodation, 1 office and 1 store), help for the GICs, help for beekeeping, buildings for agricultural and training center (1 tractor, a dormitory for 70 persons, 1 laboratory and various equipment), a building for education center and community action</p> <p>Commercial equipment: 1 market, 1 bus station</p> <p>Security: one vehicle for the police</p>	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.

Feb. 28, 2012	DJEREM	TIBATI	BELLO	24	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economic activities, ensure security	Construction of a building of three classrooms, construction of a drilling, a CSI, a chiefdom and a mill, agricultural equipment (chopper, file, etc.), installation of solar panels,	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 28, 2012	DJEREM	TIBATI	MAKOU	6	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economic activities,	Construction of a school with two buildings and a mill, electricity and water supply, help for agriculture and cattle breeding	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 28, 2012	DJEREM	TIBATI	DJAOURO GARGA	5	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economic activities,	construction of a school building (three classrooms), a drilling, toilets, small equipment for harvesting honey, help for agriculture	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 27, 2012	DJEREM	TIBATI	KOFFA MANDOU	3	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of the local economy	Grant of agricultural funds, construction of a drilling, a school (building with three classrooms)	are represented the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 28, 2012	DJEREM	TIBATI	NGATT	14	4	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of the local economy	Electricity supply, construction of a market and a festival place, equipment of a health center, agricultural equipment (device for honey refining), help for agriculture	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 28, 2012	DJEREM	TIBATI	KANDJE	25	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of the local economy	Construction of a school building with two classrooms, accommodation for teachers, a fence, health center and toilets, electricity and water supply, help for beekeeping, cattle breeding and agriculture	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 28, 2012	DJEREM	TIBATI	DOUMBAL	6	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of the local economy	Construction of a school building with three classrooms, toilets and a fence, installation of solar panels, help for agriculture	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 29, 2012	DJEREM	TIBATI	MANDJARA	21	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of the local economy	Construction of water drillings, a school building with three classrooms, help for agriculture, school supplies, help for agriculture micro credits	are represented the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
	DJEREM	TIBATI	19 village(s)	266	25			

Feb. 29, 2012	DJEREM	NGAOUNDAL	DANFILI	28	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of both the national and regional economies	Construction of 7 new drillings, electricity supply, rehabilitation of the CSI, Construction of a market, a slaughterhouse, a health center, a playground, help for agriculture, construction of a new school, enhanced seeds, drinking trough for cattle.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 29, 2012	DJEREM	NGAOUNDAL	GOMMANA	8	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of the local economy	Construction of a school (1 building with 2 classrooms, toilets and a fence), a CSI and a mill, supplies and equipment for the school, electricity supply, road, help for agriculture, beekeeping, 10 drying areas	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 29, 2012	DJEREM	NGAOUNDAL	FEBADJI	17	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of the local economy	Construction of a CSI, a new drilling, electricity supply, installation of solar panels, help for beekeeping, agriculture and cattle breeding.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 29, 2012	DJEREM	NGAOUNDAL	BELLA ASSOM	7	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, the development the economic exchanges between the various regions of the country	Construction of a drilling, a school, a CSI, a market, a mill, a chiefdom and touristic attraction, help for agriculture and beekeeping,	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 29, 2012	DJEREM	NGAOUNDAL	YANGA	18	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Construction of another building with 4 classrooms, a CSI, a drying area, a drilling in the school and a fence in the school, help for beekeeping, micro credits, help for the PAM project, help for the disabled.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Feb. 29, 2012	DJEREM	NGAOUNDAL	MBONG	7	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Equipment for the CSI and for the school, recruitment of a local office for the environment, construction of a market, a hall for the chiefdom, a school and a drilling, restoration of the borrow quarries	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
	DJEREM	NGAOUNDAL	6 village(s)	85	6			
Feb. 29, 2012	DJEREM	NGAOUNDAL	BEKA KOTTO	13	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Equipment for the CSI and for the school, recruitment of a local office for the environment, construction of a market, a hall for the chiefdom, a school and a drilling, restoration of the borrow quarries	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
	DJEREM	NGAOUNDAL	1 village(s)	13	1			

Feb. 29, 2012	VINA	MARTAP	TEKEL	8	1	the opening up of the villages located along the RN15 and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Construction of a CSI, a building (3 classrooms for EP), toilets, a drilling, a fence and a cultural center, help for agriculture and cattle breeding, electricity supply, installation of solar panels, rehabilitation of the chiefdom.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	MARTAP	LEWA	17	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Construction of an hospital (CSI), a new building, 5 drillings, a storage warehouse, a water dam, toilets for the school, a fence for the school, a warehouse for the market, installation of solar panels,	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	MARTAP	BIRSOCK	4	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Construction of a building with 4 classrooms, a chiefdom, a drilling in the school, toilets and a CSI, installation of solar panels,	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	MARTAP	DJABE FOULBE	12	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities	Construction of a market, a school (2 buildings 2 classrooms, one fence, one building for the teachers), a drilling, a health center, a water trough for the cattle, electricity, a mill and a drying area, acquisition of agricultural devices	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	MARTAP	MBISSOUNA HORE MANANG	12	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure the security	Construction of a CSI, construction of a building with two classrooms, drilling and toilets, help for agriculture and cattle breeding, help for schoolboys and schoolgirls supplies.	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	MARTAP	LOUGGA TABADI	9	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure the security	Construction of a school with 5 building with 2 classrooms and a fence, construction of a CSI, a market, a drilling, a farmers warehouse, electricity supply	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 03, 2012	VINA	MARTAP	AMAN	11	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure the security	construction of a drilling and a CSI, construction of a building with three classrooms, drilling, toilets and a school fence, help for agriculture and cattle breeding	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	MARTAP	LYCEE LEOU	2 (chief of the village and a local dignitary)	1	the opening up of the region and job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure security	Construction of a building with three classrooms for the school, drilling and toilets	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	MARTAP	LIKOK	7	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure the security	Equipment of the CSI, construction of a school (1 building 2 classrooms), construction of a junior high school, help for agriculture, help for cattle breeding and beekeeping, pay to the teachers	are represented the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	MARTAP	TOUBOUROUM	3	0	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure the security	Construction of a CSI, construction of a building with 2 classrooms, construction of teachers' accommodation, help for women education, help for GICs and micro agriculture, help for cattle breeding	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	MARTAP	SELBE DARANG	5	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure the security	Construction of a school (toilets + drilling + fence + teachers' accommodation), village drilling, mill, help for agriculture, help for beekeeping,	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
	VINA	MARTAP	11 village(s)	90	10			
Mar. 01, 2012	VINA	N'GAOUNDERE	AMPANA ADAMOU	3 (chief of the village and two local dignitaries)	0	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure the security	Construction of a building with three classrooms for the school, a drilling and teachers' accommodation, help for agriculture, fish-breeding, mill	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	N'GAOUNDERE	MAYODANEL	6	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure the security	Rehabilitation of the school, water supply, help for agriculture and cattle breeding, community mill, help for women, construction of a CSI	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
Mar. 01, 2012	VINA	N'GAOUNDERE	SIERE	5	1	the opening up of the villages located along the RN15, job opportunities for local populations (qualified, semi-qualified, not qualified) with the implication of the traditional authorities, development of socio-economical activities, facilitation of the mobility, development of socio-economical activities, ensure the security	Construction of a school and a fence, help for agriculture and cattle breeding, electricity and drinking water supply, construction of a CSI	the destruction of vegetation and plant life, the disturbance of the animals' habitat, the loss of material assets and lands, the risks of accidents during the construction and exploitation of the road, the noise nuisances.
	VINA	N'GAOUNDERE	3 village(s)	14	2			

Questionnaire ménage

1. Identification

- ◆ N° du questionnaire :
- ◆ Jour de l'enquête :
- ◆ Nom de la région :
- ◆ Nom du village :

2. Profil :

- Age : [][]
- Sexe : Masculin [] Féminin célibataire []
- Etat matrimonial : Mariage traditionnel [] Mariage d'état civil [] Célibataire []
Veuf (ve) [] Divorcé(e) []
- Nombre d'enfants : [][] dont moins de 12 ans [][] Plus de 12 ans [][]
- Situation des enfants : scolarisé [] Actif hors ménage [] Actif aide familial []
- Niveau d'instruction : Analphabète [] Primaire [] Secondaire [] Supérieur []
- Niveau d'instruction du conjoint : Analphabète [] Primaire [] Secondaire [] Supérieur []
- Activité du conjoint :
- Régularité de l'activité : Plein temps [] Occasionne [] Saisonnier []

3. Activité :

- Secteur : Agriculture [] Industrie [] commerce [] Autre situation [] :
- Type : [.....
- Statut : Patron [] Salarié [] Associé [] Autre situation [] :
- Revenu mensuel [][][][]
- Nombre d'heures de travail par jour [][]
- Nombre de mois de travail par an [][]
- Activité secondaire OUI [] NON []
- Autre source de revenu OUI [] NON []

Disposez –vous d'une terre agricole

- OUI en propriété [] :
- OUI en Location [] Superficie : [.....
- OUI en association []
- NON []
-

Possédez-vous des animaux d'élevage,

- OUI en propriété personnelle ou du ménage []
- Type :
- Nombre : [.....
- OUI en propriété partagée avec un parent proche []
- OUI en association []
- NON []

4. Composition du ménage :

- Nombre de ménages vivant sous le même toit : [][]
- Nombre total de personnes dans le logement : [][]
- Nombre de personnes contribuant à l'activité et au revenu du ménage : [][]
- Nombre de personnes à charge : [][]

5. Activité, et charges quotidiennes :

Charges quotidiennes (relations et obligations sociales):

Nature	Niveau de contrainte				Perspectives d'amélioration avec la route			
	++++	+++	++	+	++++	+++	++	+
1[]								
2[]								
3[]								
4[]								

Charges domestiques (rôles et obligations familiales):

Nature	Niveau de contrainte				Perspectives d'amélioration avec la route			
	++++	+++	++	+	++++	+++	++	+
1[]								
2[]								
3[]								
4[]								

Charge de travail : (obligations professionnelles)

Nature	Niveau de contrainte				Perspectives d'amélioration avec la route			
	++++	+++	++	+	++++	+++	++	+
1[]								
2[]								
3[]								
4[]								

Patrimoine

6. Mode et Conditions de logement :

Le ménage occupe t-il le logement

En propriété Location hébergé gratuitement

Matériau principal du plancher de l'habitation :

terre/sable Matériau moderne vinyle ou lino/asphalte Carreaux Ciment autre (préciser) _____

Nombre de pièces dans l'habitation [] []

D'où provient principalement l'eau que boivent les membres de votre ménage ?

Eau du robinet dans logement robinet public eau en bouteille camion citerne puits ouvert puits couvert ou forage Eau de surface : source fleuve/rivière mare/lac barrage eau de pluie autre _____

De quel genre de toilettes dispose votre ménage ?

chasse branchée à l'égout Chasse branchée à fosse fosse/latrines Rudimentaires fosse/latrines Améliorées Pas de toilettes /nature autre (préciser)

Dans votre ménage, y a-t-il : (cocher si OUI) ?

l'électricité radio télévision téléphone fixe téléphone cellulaire machine à laver réfrigérateur réchaud/cuisinière à gaz/électrique foyer amélioré vidéo/lecteur climatiseur ordinateur internet

Dans votre ménage, quel genre de combustible utilisez-vous principalement pour la cuisine ?

Electricité Gaz Butane charbon de bois bois à brûler paille Bouse Autre (Préciser)

Dans votre ménage, y a-t-il quelqu'un qui possède:? (cocher si OUI)

Bicyclettes Motocyclettes Voiture personnelle

Voitures ou camions à titre commercial Charrette Charrues Bœufs

Moutons/chèvres pirogues/filets de pêche Volaille

7. Accessibilité et contraintes

Quel est le Temps d'accessibilité a l'endroit (mentionné) le plus proche ?

	sur place	moins de 30 minutes	entre 30 et une-heure	plus d'une heure	ne sait pas
l'eau de boisson					
l'Ecole primaire					
l'Ecole secondaire					
Le Dispensaire					
La maternité					
Le cyber café					
Le bureau de poste					
Le lieu d'embarquement du transport public					
Le lieu d'approvisionnement des produits de première nécessité					
bureau de poste la plus proche					
poste de police le plus proche					

8. Perspectives

Pensez-vous que l'aménagement de la RN15 va permettre d'améliorer votre situation?

Dans quelles mesures ?

Au niveau de l'activité et du revenu :

Au niveau des conditions de vie

Au niveau des charges familiales et professionnelles de la femme

Ces points constituent le canevas des focus groups

- Les partenariats dans les relations familiales, les échanges au sein des groupes de travail, les groupes informels, les groupes formels, les relations patron/clients, etc ;
- Les systèmes et les stratégies relatives aux moyens d'existence des ménages ;
- Les risques et la vulnérabilité (fréquence des chocs, répercussions des chocs sur les systèmes relatifs aux moyens d'existence, les biens et le bien-être, les mécanismes pour s'en sortir, les stratégies pour affronter les risques) ;
- L'impact sur les moyens d'existence (niveau de richesse et de bien-être) ;
- La perception des problèmes relatifs aux moyens d'existence/possibilités/priorités ;
- Le retour d'information sur le projet - intérêt pour/familiarité avec le projet et ce qu'il offre ;
- La perception de l'importance, de l'utilité et de l'accessibilité de ce que le projet offre ;
- Les raisons pour participer/ne pas participer ;
- des partenaires et systèmes de livraison préférés: à qui les villageois font-ils confiance? Pourquoi?;
- Rapports sociaux (dignité, activités sociales et soutien social) ;
- les activités agricoles chez les femmes, les jeunes, les hommes ;
- les activités de promotion de la femme ;
- Les données ou contraintes socio culturelles qui entravent l'émancipation des femmes ou des jeunes;
- les données sanitaires, éducatives, hydrauliques ;
- Le temps que les hommes et les femmes consacrent dans les différentes activités;
- Le volume de travail des femmes et des hommes ;
- Les rôles dévolus aux femmes, aux hommes et aux enfants ;
- Les déséquilibres existants dans la prise de décision ;
- La représentativité des femmes, hommes, jeunes, handicapés dans les institutions ainsi que la qualité de leurs interventions ;
- Le statut social et économique des femmes

Questionnaire Village

1. Identification

- ◆ N° du questionnaire :
- ◆ Jour de l'enquête :
- ◆ Nom de la région :
- ◆ Nom du département :
- ◆ Nom de la sous préfecture/ CR :
- ◆ Nom du village : PK : par rapport à
- ◆ Coordonnées géographiques: (si le village n'existe pas sur les levés matricules :
 ◆ X ; Y : Z :

2. Caractéristiques socio-économiques du village

- ◆ Nombre d'habitants du village :
- ◆ Nombre d'hommes :
- ◆ Nombre de femmes :
- ◆ Principales tribus, langues et religions du village

Tribus	%	Langue	Religion
1			
2			
3			

Nombre de logements (ou ménages) du village	
Nombre d'écoles primaires	
Nb de salles de classe	
Université la plus proche (nom de la ville) :	
Effectif scolarisé : filles garçons :	
Nombre de centres de formation : Spécialités :	
	:

En cas d'absence, dans quelle école vont les élèves du village :

- ◆ Village :; Distance km
- ◆ Empruntent l'axe du projet Oui Non
 - ◆ Infrastructures de santé (spécifier / Nombre) :

En cas d'absence, vers quel établissement de santé se soignent les habitants du village :

- ◆ Village :; Distance : km ;
- ◆ En empruntant l'axe du projet Oui Non

Equipements du villag

- Alimentation en eau potable : Forage Puits individuels Puits collectifs (Nombre / profondeur) Robinets publics Robinets à domicile (Réseau)
- Source d'énergie : Réseau électrique Générateurs Panneaux solaires Bois Lampes à pétrole Autre (spécifier)

Lieu d'approvisionnement en carburant : Village : ; Distance : km

Communication :

- Téléphone : Fixe ; Mobile ; Internet

Lieux de culte : Mosquée Eglise Autres (spécifier)En cas d'absence, vers quel lieu de culte se déplacent les habitants :

Village : ; Distance(km)..... empruntant l'axe du projet Oui Non

♦ Patrimoine particulier du village (spécifier la localité)

- Site archéologique
- Site sacré
- Zone sensible ou protégée

Marché :	<input type="checkbox"/> Quotidien <input type="checkbox"/> Hebdomadaire <input type="checkbox"/> Mensuel (préciser le jour :
Quels sont les équipements des marchés :	
Nombre de camions et tonnages transportant les marchandises :	
Que transportent les camions ?	
Quel est la destination des produits transportés ?	

3. Antécédents du village en matière de développement

Citez les 5 derniers projets les plus importants dont a bénéficié le village :

	Nature du projet	Date début	Date fin	Montant	Bailleur de Fonds	Opérateur National	Nombre de Bénéf.	Impact/ Réussite	Durabilité/ Continuité
Projet 1									
Projet 2									
Projet 3									

4. Caractériser le degré d'importance des différentes activités économique du village

Classer par ordre d'importance (du plus important (1) au marginal (5)) les activités économiques du village :

	++++	+++	++	+	Sans importance
Agriculture					
Elevage					
Commerce					
Services ...					
Pêche					
Industrie					
Autres (spécifier)					
.....					

Activités agricoles

- Superficie agricole totale exploitée par le village :
- Dont superficie irriguée :
- ♦ Dont superficie « cultures de rente » :
- ♦ Principales cultures pratiquées : 1-.....2-.....3-.....
- ♦ Taille globale du cheptel bovin du village :
- ♦ Taille globale du cheptel ovin/caprin du village :
- ♦ Autre élevage pratiqué et taille de cheptel :
- ♦ Autres marchés fréquentés par les habitants du village
- ♦ Village :..... ; Distance : km ;

Activités de chasse et de cueillette

- ◆ Région de cueillette ou territoire de chasse.....
- ◆ (Localisation sur la carte)
- ◆ Période d'exercice de l'activité :.....
- ◆ Part de l'activité dans le revenu
- ◆ ou la subsistance.....
- ◆ Principales contraintes à l'exercice des activités

.....;

.....

- Impacts de la route sur l'activité.....

Activités industrielles ou de transformation

Usines opérationnelles dans le village et nombre d'employés

- 1.....
- 2.....
- 3.....

5. Conditions des femmes et des enfants

- ◆ Distance moyenne parcourue par une femme pour atteindre une infrastructure sanitaire : km
- ◆ Distance moyenne parcourue par les enfants pour atteindre une infrastructure scolaire : km
- ◆ Organismes ou institutions de développement local, intervenant dans la zone :
Noms des ONG et domaines d'activités :
- 1.....
- 2.....
- 3..... 4 :.....

Type d'assistance accordée aux femmes par ces organismes :

Alphabétisation Accès aux micro-crédits Appui aux groupements féminins Santé
Autres (spécifier)

- ◆ Les femmes bénéficient-elles d'une assistance au cours de la grossesse et pendant et après l'accouchement : Oui Non
- ◆ Si non, pour quelles raisons ? :
Accès difficile Autres (à préciser) :
- ◆ Si oui, de qui elles reçoivent cette assistance : sage femme agent de santé Autres :

Emploi des femmes : Pourcentage de femme travaillant dans l'entretien routier%

- ◆ Activités de production relevant des femmes : Classer par ordre d'importance (du plus important (++++)) au marginal (+) les activités :

	++++	+++	++	+
Agriculture vivrière				
Elevage ovin/caprin				
Elevage bovin				
Commerce				
Artisanat				
Autres (spécifier)				

6. Place du projet dans l'ordre de priorité du village

Quelles sont selon vous le niveau de priorité de chacun des équipements suivants :

niveau de priorité	++++	+++	++	+
Alimentation en eau potable :				
Alimentation en électricité				
Aménagement de la route				
Réhabilitation de l'Etablissement de santé				
Réhabilitation de l'Etablissement scolaire				
Alimentation en électricité				
Aménagement de la route				
Autre : (citer)				

7. Attentes vis-à-vis du projet : Caractériser le niveau d'importance des attentes de la réhabilitation de la Route :

	++++	+++	++	+
Plus de croissance de la production				
Meilleure qualité des services publics				
Amélioration du revenu global				
Amélioration de la santé				
Amélioration de l'accès à l'éducation				
Amélioration du contact avec les opérateurs de développement				
Autre : (citer)				

Classer par ordre d'importance (du plus important (1) au marginal (5)) les contraintes actuelles résultant de l'état actuel de la route

8. Niveau de Contraintes actuelles résultant de l'état actuel de la route

	++++	+++	++	+
Enclavement du village				
Isolement pendant une période de l'année (indiquer la durée)				
Coût élevé de transport				
Difficulté d'accès aux services d'urgence				
Difficultés d'accès aux services du centre urbain le plus proche				

9. Prédisposition du village à l'effort d'entretien courant de la route

	OUI	NON	Commentaires
Capacité de participation de la main d'œuvre (travaux communautaires)			
Capacité de participation pour l'organisation, la gestion et le suivi de l'entretien courant			

10. PROBLEMES ACTUELS DANS LA ZONE ET LEURS DEGRES D'IMPORTANCE (niveau de gravité extrême :++++)

	Type de problème	++++	+++	++	+
1	Inondation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Incendie	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Assainissement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Insécurité	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Coupure d'eau	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Coupure d'électricité	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Bruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Poussière	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Moustiques	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Autre à préciser	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. Autres informations générales sur le village

- ◆ Existence de transport en commun : Si oui : estimation du nombre de voitures, motos et coût de transport
 Nombre :

Cout :

- ◆ Rupture de la circulation sur la route pendant une période de l'année ? OUI NON
- ◆ Si oui, spécifier ya t il un rapport avec l'état dégradé de la route :

.....

- ◆ Etat des routes ou pistes reliant le village et les villages voisins :

Village voisin	Etat de la route menant au village voisin	Usagers (Voitures, motos, vélos, piétons) / Fréquence
1.....		
2..... ;		
3.....		

- ◆ Existe-t-il une zone de transhumance des animaux dans l'environnement du village ? Si oui, spécifier (Espèces, Période de transhumance, Origine/Destination, Jour/Nuit, Parallèle/Perpendiculaire à la route, Accidents, etc.)

.....

- ◆ Pensez vous avoir des problèmes dans le village à cause de la transhumance, OUI NON
- ◆ quel est son impact sur votre vie ?
- ◆ Précisez :

.....

- ◆ Existe il des problèmes (ou conflits) dûs à la transhumance ? OUI NON

Précisez :

- ◆ Existe-t-il des conflits avec les villages avoisinants ou avec d'autres ethnies proches ? OUI NON

◆ **Rivières voisines du village :**

- ◆ , distance :
- ◆ , utilisation par les habitants : OUI NON
- ◆ , accès par l'axe du projet : OUI NON

◆ **Points d'eau du village :** OUI NON

- ◆ distance,
- ◆ utilisation par les habitants ,OUI NON
- ◆ accès par l'axe du projet OUI NON

Nom du Puits, forage ou source	Profondeur	Qualité des eaux	Exploitation (eau potable, irrigation)

12. Chasse

Période de chasse	Espèce chassée	Nombre/jour	Instruments de chasse	Espèce protégée	Non protégée

13. Ressources ligneuses

Espèce	Consommation du fruit	Consommation des feuilles	Bois	Energie

Quelle est la distance par rapport aux villages des zones d'exploitation

.....

Quel est l'impact sur les activités du village et sur l'emploi et les revenus ?

.....

Existe-t-il des problèmes dûs au transit des grumiers par le village ?

.....

14. Problèmes fonciers, d'occupation du sol et de déplacement de la population

- ◆ Existe-t-il des monuments historiques, religieux et culturels situés dans l'emprise de la route ? Si oui spécifier (nom et situation par rapport à la route).....
- ◆ Existe-t-il des lieux sacrés dans la zone du projet ?
- ◆ Si oui : Nom du lieu :
- ◆ Distance à la route :..... km

Foncier :

- Foncier des terrains situés de part et d'autre de la route :
 - Domaine public Domaine privé Autre (spécifier).....
- Valeur approximative par construction dans la zone du projet :
 - Habitation : deà.....FC/Unité
 - Commerce : deà.....FC/Unité
 - Autre (spécifier) : deà.....FC/Unité
- Valeur approximative du terrain dans la zone du projet :FC/ha
- Prix des matériaux de construction : 1 sac de ciment :
- Feuille de tôle :
- Autres : (spécifiez) :

- Valeur approximative du pied pour les principales cultures arboricoles du village et distance d'implantation des arbres

Espèce (Age)	Valeur (FC/pied)	Distance d'implantation
..... m
..... m
..... m
..... m
..... m

15. Etes-vous au courant du projet de réhabilitation de la route Oui ; Non

Si oui, depuis quand ? : Longtemps Cette année Il y a quelques mois Il y a quelques jours

Par : Médias Animateur Parents/amis/voisins Affiches/dépliants
 Autorités Comité local Comité Facilitation Autres

16. Quelles sont vos attentes du projet de la route et vos recommandations

.....
.....
.....
.....

Remarques de l'enquêteur :

.....
.....
.....
.....
.....
.....
.....
.....

Province	Département	Commune	Village	Population	Composition ethnique	École	Centre de santé	
Centre	Lékié	Batchenga	Emana Batchenga	200	Sanaga	1 lycée	-	
			M'bassa	700	Sanaga	-	-	
			Otibili	700	Sanaga	1	1	
	Mbam et Kim	Ntui	Natchigal	600	Sanaga	2		
			Ehondo	1900	Sanaga, Eton	1	CSI	
			Ndjame	600	Sanaga	1		
			Biatsota 2	300	Sanaga, Eton	0		
			Biatsota 1	2500	Mvelé	3		
			Ntui	20000	Sanaga	3	Hôpital	
			Bindannengue	400	Sanaga, Eton	1		
			Bindalima 2	350	Sanaga	1		
			Bilanga kombe	500	Mvelé	0		
			Bivouna	2500	Etong,	1		
			Salakounou	2200	Etong,	0		
			Ossombe	3500	Lékié	1		
			Ndimi	5000	Baveuck,	1	CSI	
			Biagnimi	400	Baveuck	0		
			Yalongo	5000	Baveuck,	1		
			Kombe Bengue	600	Baveuck, Eton	0		
			Ngoula Haoussa	800	Haoussa,	0		
			Ngoula	7000	Haoussa	3	CSI	
			Mewong	140	Vuté,	0		
			Ngouetou	480	Vuté, Foulbé	1		
			Ndim	124	Babauté	0		
		Issandja	3000	Baveuck, Eton	1			
		Nyem	130	Vuté	1			
		Gandoung	160	Vuté	0			
		Donga	500	Baveuck, Vuté	1			
		Sengbe	1500	Baveuck	1			
		Meloko	80	Baveuck	0			
		Yangoula	60	Baveuck	0			
		Yassem	50	Baveuck	0			
		Njolé	3000	Baveuck,	1	CSI		
		Geurvoum	200	Vuté	1			
		Dong	192	Vuté	0			
		Mbembeing	365	Vuté	1			
		Mekoassim	800	Vuté	1			
		Mengoing	300	Vuté, Baya	0			
		Mankim	500	Vuté	1	CSI		
		Doumé	1200	Vuté	1			
		Mangai	950	Vuté	1	CSI		
		Ngaong	150	Vuté	0			
		Fouy	290	Vuté	0			
		Mbimbim	200	vuté	1			
		Foufoueng	160	Vuté	1			
		Matsari	450	Vuté, Foulbé	1			
		Yoko	3780	Vuté, autres	0	Hôpital		
Ngoum		135	Vuté	1				
Lena		400	Baveuck,	1				
Mbaam		127	Babauté	1				
Adamaoua	Djerem	Tibati	Mbangti Mbang	800	Foulbé	1		
			Gongontoua	1060	Baya	1		
			Louh	120	Baya	0		
			Nyajida	500	Vouté	1	CSI	
			Mbitom	300	Baya	1		
			Mang_lei	194	Baya	0		
			Bitom_kassa	57	Baya	0		
			Sola	80	Baya	1		
			Dang_haoussa	210	Baya	0		
			Medjamba	580	Baya	1	CSI	
			Tibati	28318	Baya	5	Hôpital	
			Bello	110	Baya	1		
			Makoup	200	Baya	1		
			Djaouro_Garga	320	Foulbé	1		
			Koffa_Mandoum	103	Baya	0		
			Ngatt	3000	Baya	1	CSI	
			Kandje	590	Foulbé	1		
			Doumbal	100	Baya	1		
			Mandjara	400	Baya	0		
			Ngaoundal	Danfili	6800	Baya, Peuls	3	CSI
				Gommana	447	Peuls, Baya	0	
		Febadji		785	Baya, Foulbé	1		
		Bella_Assom		2000	Baya, Mboum	1		
		Bamyanga		1000	Foulbé	1		
		Mbong		400	Baya, Mboum	1		
		Vina	Martap	Beka_Kotto	17000	Baya, Foulbé	5	CSI
				Tekel	5000	Baya, Mboum	1	
				Lewa	500	Foulbé, Baya	1	
				Birsock	500	Foulbé	1	
				Djabe_Foulbé	600	Foulbé,	1	
				Mbissouna_Hore_Manang	1200	Foulbé	1	
				Lougga_Tabadi	5000	Foulbé	1	
				Aman	150	Foulbé,	1	
	lycée Leou				Foulbé	1		
	Ikossampa			50	Foulbé	0		
	Likok			3000	Foulbé, Baya	1	CSI	
	N'Gaoundéré		Beka_Mangari	260	Foulbé	1		
			Toumbouroum	635	Foulbé	1		
			Ampana_Adamou	160	Mboum	1		
			Mayodanel	300	Foulbé	1		
			Siere	100	Foulbé	1		
			Selbe_Darang	180	Foulbé	1		

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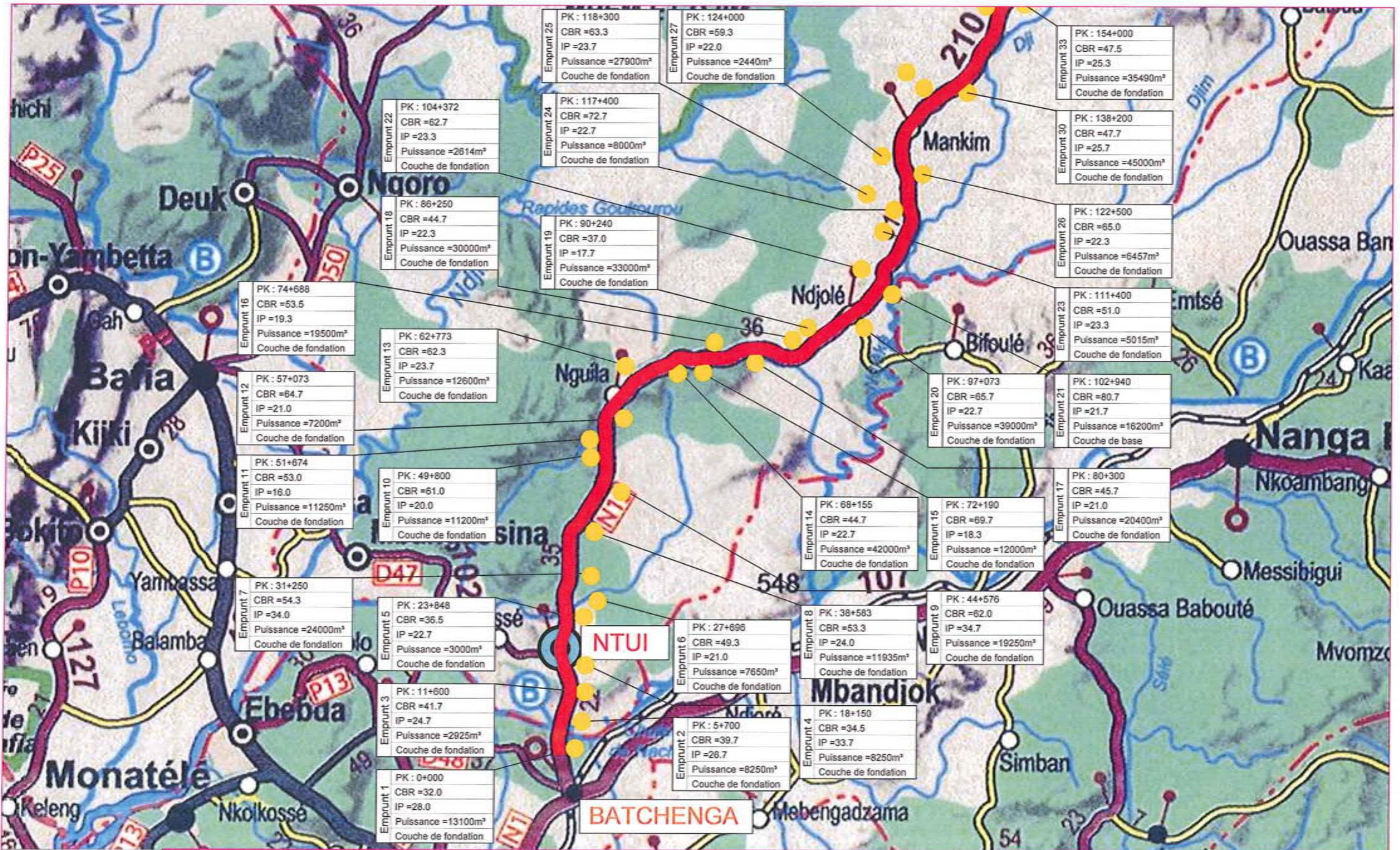
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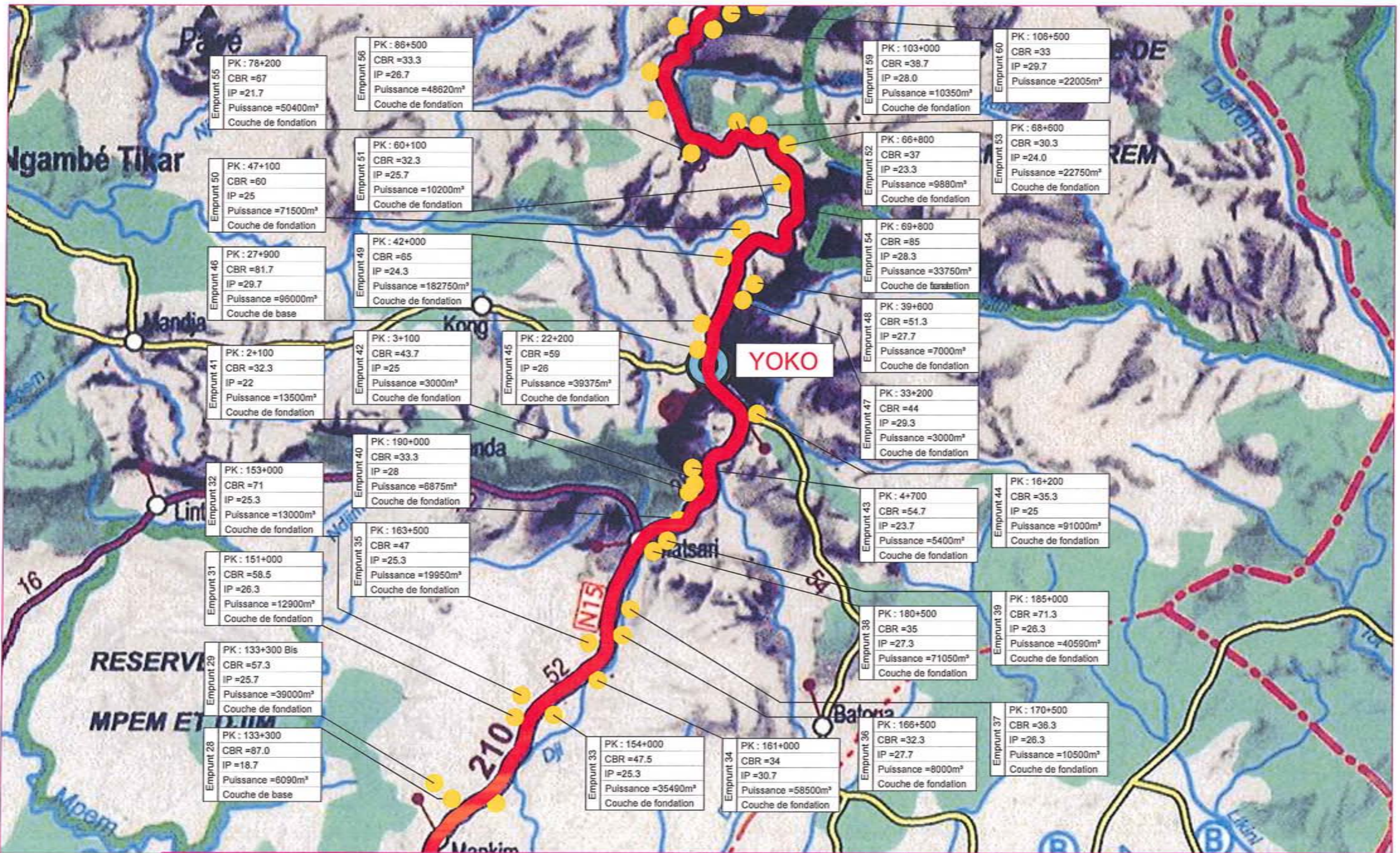
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		Rev.	Date	VISA	VISA	VISA	VISA	Nature de la Modification	Echelle(s): 1/500 000
ETUDE D'AMENAGEMENT DE LA ROUTE BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE		PRESENTATION DES GITES PLANCHE 1/4		PHASE: APS LOT: 1		N° AFFAIRE PAYS A.CONTRAT 100.ITAC.RTEO	PLAN N° PL.000.001	REVISION A	



Emprunt 55
 PK : 78+200
 CBR =67
 IP =21.7
 Puissance =50400m³
 Couche de fondation

Emprunt 56
 PK : 86+500
 CBR =33.3
 IP =26.7
 Puissance =48620m³
 Couche de fondation

Emprunt 59
 PK : 103+000
 CBR =38.7
 IP =28.0
 Puissance =10350m³
 Couche de fondation

Emprunt 60
 PK : 108+500
 CBR =33
 IP =29.7
 Puissance =22005m³

Emprunt 50
 PK : 47+100
 CBR =60
 IP =25
 Puissance =71500m³
 Couche de fondation

Emprunt 51
 PK : 60+100
 CBR =32.3
 IP =25.7
 Puissance =10200m³
 Couche de fondation

Emprunt 52
 PK : 66+800
 CBR =37
 IP =23.3
 Puissance =9880m³
 Couche de fondation

Emprunt 53
 PK : 68+600
 CBR =30.3
 IP =24.0
 Puissance =22750m³
 Couche de fondation

Emprunt 46
 PK : 27+900
 CBR =81.7
 IP =29.7
 Puissance =96000m³
 Couche de base

Emprunt 49
 PK : 42+000
 CBR =65
 IP =24.3
 Puissance =182750m³
 Couche de fondation

Emprunt 54
 PK : 69+800
 CBR =85
 IP =28.3
 Puissance =33750m³
 Couche de fondation

Emprunt 41
 PK : 2+100
 CBR =32.3
 IP =22
 Puissance =13500m³
 Couche de fondation

Emprunt 42
 PK : 3+100
 CBR =43.7
 IP =25
 Puissance =3000m³
 Couche de fondation

Emprunt 45
 PK : 22+200
 CBR =59
 IP =26
 Puissance =39375m³
 Couche de fondation

Emprunt 48
 PK : 39+600
 CBR =51.3
 IP =27.7
 Puissance =7000m³
 Couche de fondation

Emprunt 47
 PK : 33+200
 CBR =44
 IP =29.3
 Puissance =3000m³
 Couche de fondation

Emprunt 32
 PK : 153+000
 CBR =71
 IP =25.3
 Puissance =13000m³
 Couche de fondation

Emprunt 40
 PK : 190+000
 CBR =33.3
 IP =28
 Puissance =6675m³
 Couche de fondation

Emprunt 43
 PK : 4+700
 CBR =54.7
 IP =23.7
 Puissance =5400m³
 Couche de fondation

Emprunt 44
 PK : 16+200
 CBR =35.3
 IP =25
 Puissance =91000m³
 Couche de fondation

Emprunt 31
 PK : 151+000
 CBR =58.5
 IP =26.3
 Puissance =12900m³
 Couche de fondation

Emprunt 35
 PK : 163+500
 CBR =47
 IP =25.3
 Puissance =19950m³
 Couche de fondation

Emprunt 38
 PK : 180+500
 CBR =35
 IP =27.3
 Puissance =71050m³
 Couche de fondation

Emprunt 39
 PK : 185+000
 CBR =71.3
 IP =26.3
 Puissance =40590m³
 Couche de fondation

Emprunt 29
 PK : 133+300 Bis
 CBR =57.3
 IP =25.7
 Puissance =39000m³
 Couche de fondation

Emprunt 28
 PK : 133+300
 CBR =87.0
 IP =18.7
 Puissance =6090m³
 Couche de base

Emprunt 33
 PK : 154+000
 CBR =47.5
 IP =25.3
 Puissance =35490m³
 Couche de fondation

Emprunt 34
 PK : 161+000
 CBR =34
 IP =30.7
 Puissance =58500m³
 Couche de fondation

Emprunt 36
 PK : 166+500
 CBR =32.3
 IP =27.7
 Puissance =8000m³
 Couche de fondation

Emprunt 37
 PK : 170+500
 CBR =36.3
 IP =26.3
 Puissance =10500m³
 Couche de fondation

NOTA:
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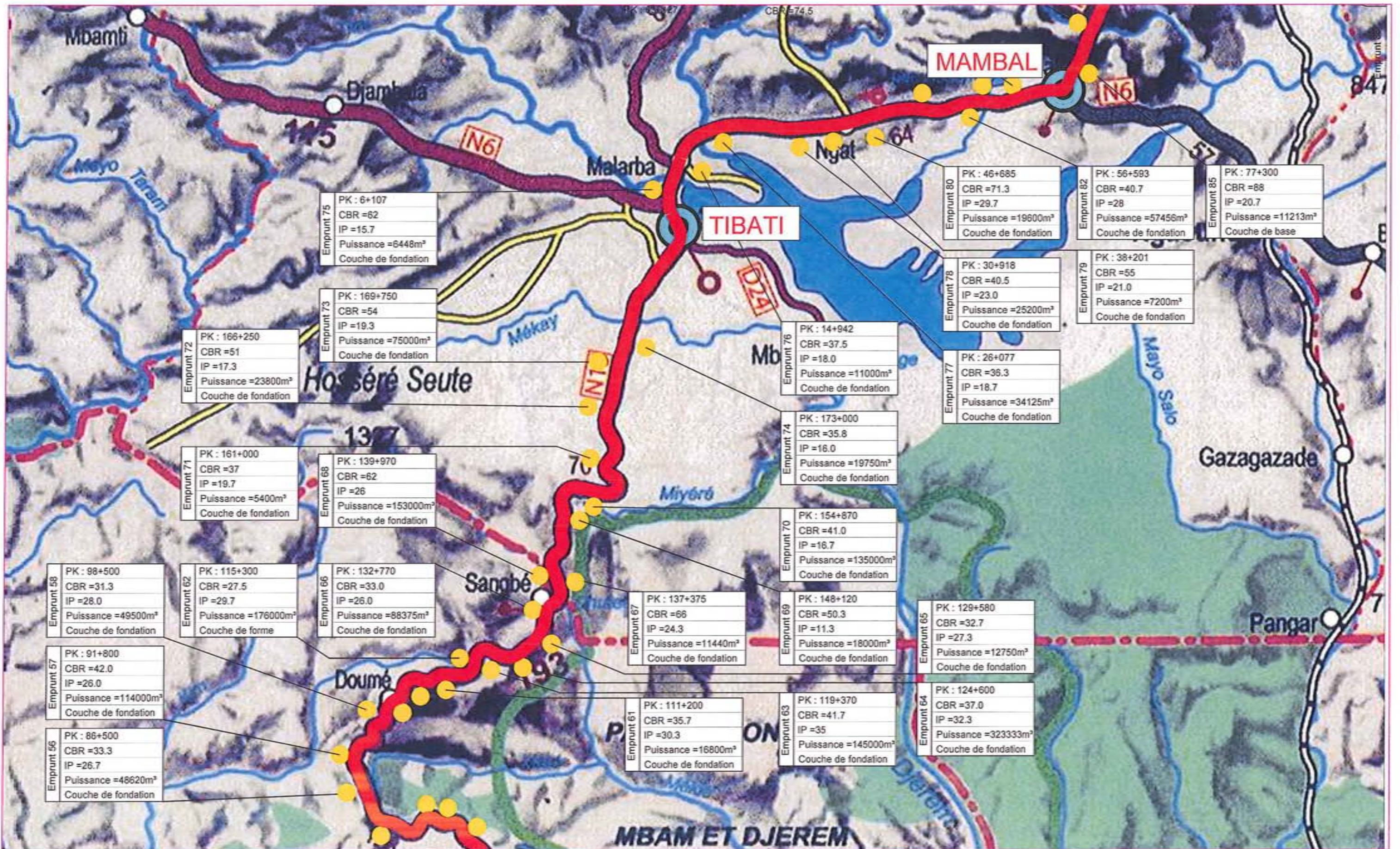
Rev.	Date	Dessiné par	VISA	Vérifié par	VISA	Approuvé par	VISA	Nature de la Modification	STATUT
A	Octobre 2012	LAN		MBA		MMB		Première émission	

ETUDE D'AMENAGEMENT DE LA ROUTE
 BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE

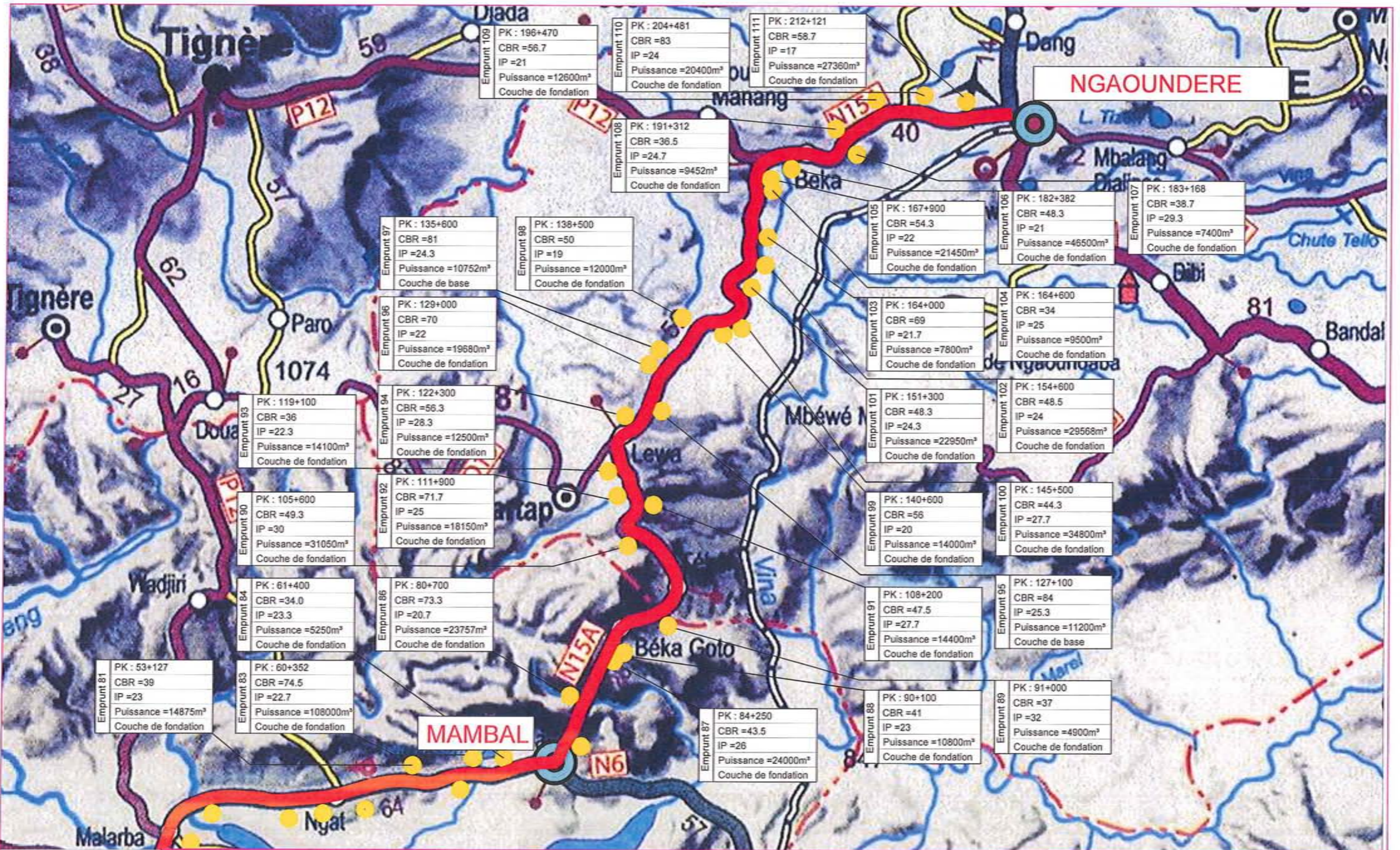
PRESENTATION DES GITES
 PLANCHE 2/4

PHASE: APS
 LOT: 1

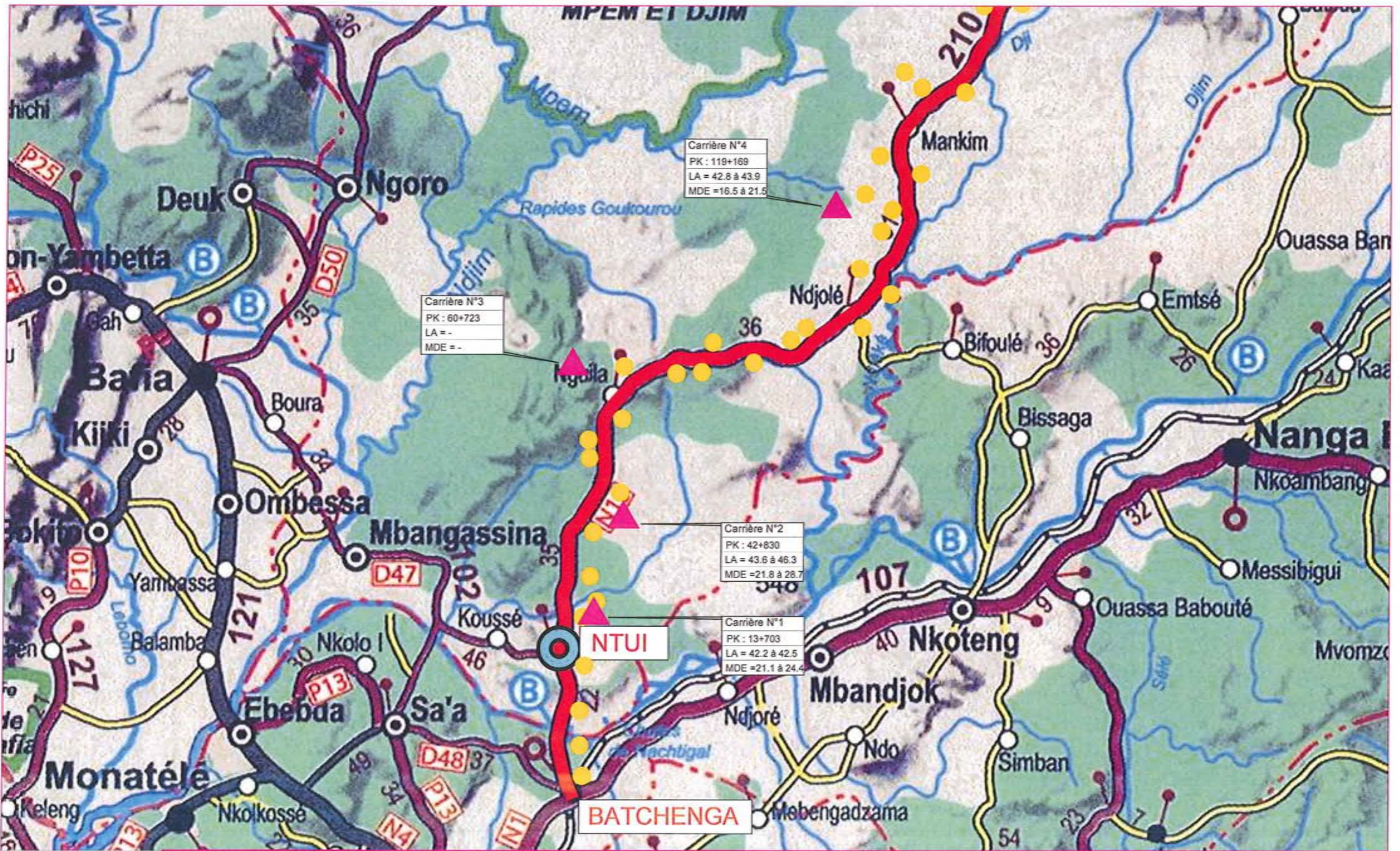
N° AFFAIRE PAYS A.CONTRAT	A1829CM11	Echelle(s):	1/500 000	FORMAT:	A3
PHASE ET LOT DEPA. PRODU. SP. ET S. SP.	100.ITAC.RTEO	PLAN N°	PL 000 002	Feuille N° :	REVISION A



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		Rev.	Date	Dessiné par	VISA	Vérifié par	VISA	Approuvé par	VISA	Nature de la Modification
ETUDE D'AMENAGEMENT DE LA ROUTE BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE		PRESENTATION DES GITES PLANCHE 3/4		PHASE: APS		LOT: 1		N° AFFAIRE PAYS A.CONTRAT 100.ITAC.RTEO	PLAN N° PL.000.003	REMISION A



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		Rev.	Date	Dessiné par	VISA	Vérifié par	VISA	Approuvé par	VISA	Nature de la Modification
ETUDE D'AMENAGEMENT DE LA ROUTE BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE		PRESENTATION DES GITES PLANCHE 4/4		PHASE: APS LOT: 1		N° AFFAIRE PAYS A.CONTRAT 100.ITAC.RTEO		Echelle(s): 1/500 000		FORMAT: A3 Feuille N° :
						PHASE ET LOT DEPA. PRODU. SP. ET S. SP.		PLAN N° PL 000 004		REVISION A



Carrière N°4
 PK : 119+169
 LA = 42.8 à 43.9
 MDE = 16.5 à 21.5

Carrière N°3
 PK : 60+723
 LA = -
 MDE = -

Carrière N°2
 PK : 42+830
 LA = 43.6 à 46.3
 MDE = 21.8 à 28.7

Carrière N°1
 PK : 13+703
 LA = 42.2 à 42.5
 MDE = 21.1 à 24.4

NOTA:
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 tous les plans avant exécution.
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 erreurs ou omissions qu'il n'aura pas
 signalé en temps utile.



REPUBLIQUE DU CAMEROUN
 MINISTERE DES TRAVAUX PUBLICS

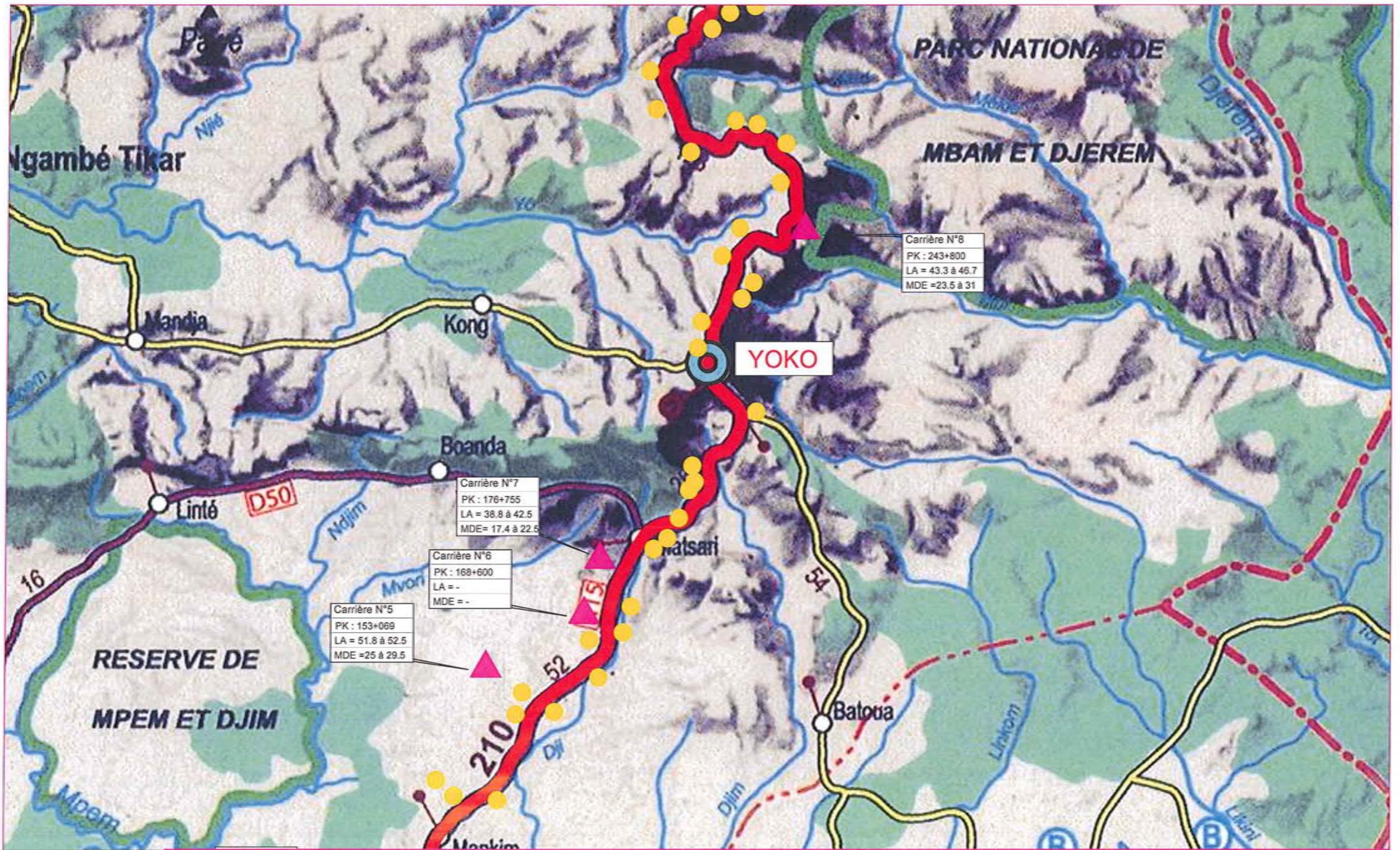
ETUDE D'AMENAGEMENT DE LA ROUTE
 BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE

PRESENTATION DES CARRIERES
 PLANCHE 1/4

À	SEP 2012	SJR		MAT		MMB		Première émission	
Rev.	Date	Dessiné par	VISA	Vérifié par	VISA	Approuvé par	VISA	Nature de la Modification	STATUT

PHASE: APS
 LOT: 1

N° AFFAIRE PAYS A.CONTRAT	A1829CM11	Echelle(s):	1/500 000	FORMAT:	A3
PHASE ET LOT DEPA. PRODU. SP. ET S. SP.	100.ITAC RTEO	PLAN N°	PL TPL 150	REVISION	A



Carrière N°8
 PK : 243+800
 LA = 43.3 à 46.7
 MDE = 23.5 à 31

Carrière N°7
 PK : 176+755
 LA = 38.8 à 42.5
 MDE = 17.4 à 22.5

Carrière N°6
 PK : 168+600
 LA = -
 MDE = -

Carrière N°5
 PK : 153+069
 LA = 51.8 à 52.5
 MDE = 25 à 29.5

NOTA:
 L'entrepreneur est tenu de vérifier tous les plans avant exécution. Il sera rendu responsable des erreurs ou omissions qu'il n'aura pas signalé en temps utile.



REPUBLIQUE DU CAMEROUN
 MINISTERE DES TRAVAUX PUBLICS

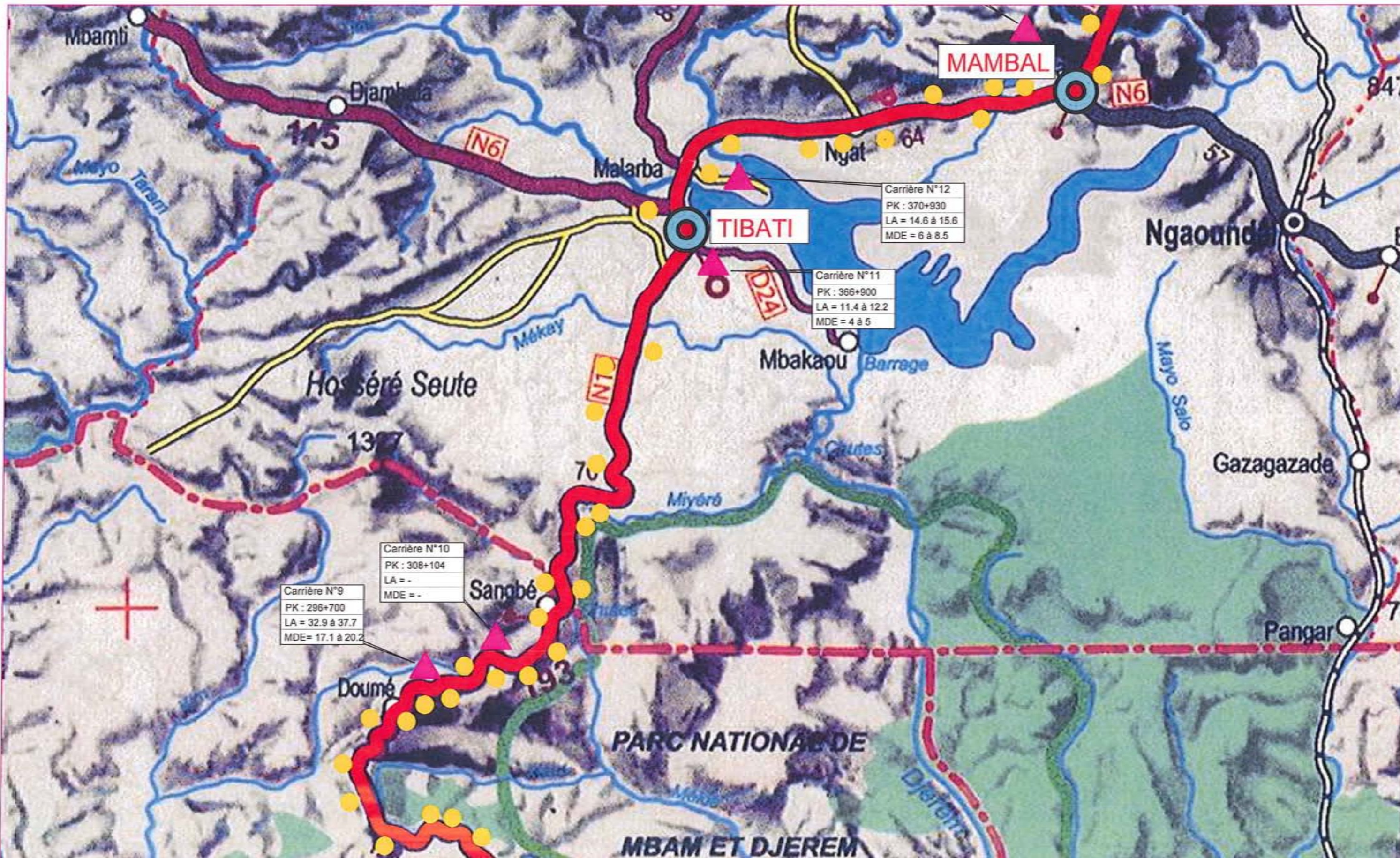
ETUDE D'AMENAGEMENT DE LA ROUTE
 BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE

PRESENTATION DES CARRIERES
 PLANCHE 2/4

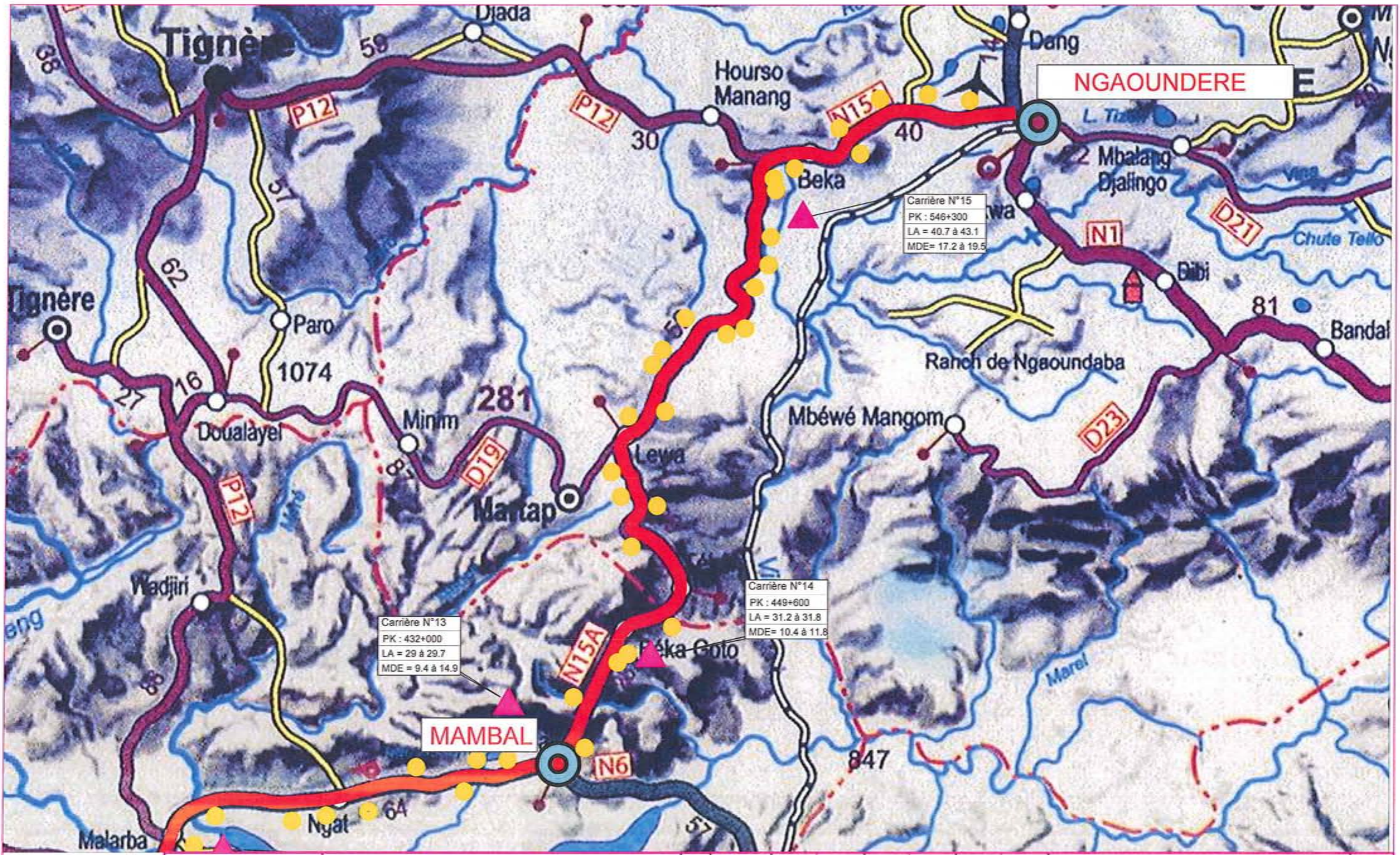
A	SEP 2012	SJR		MAT		MMB		Première émission	
Rev.	Date	Dessiné par	VISA	Vérifié par	VISA	Approuvé par	VISA	Nature de la Modification	STATUT

PHASE: APS
 LOT: 1

N° AFFAIRE PAYS A.CONTRAT	A1829CM11	Echelle(s):	1/500 000	FORMAT:	A3
PHASE ET LOT DEPA. PRODU. SP. ET S. SP.	100.ITAC.RTEO	PLAN N°	PL TPL 150	REVISION	A



NOTA: L'entrepreneur est tenu de vérifier tous les plans avant exécution. Il sera rendu responsable des erreurs ou omissions qu'il n'aura pas signalé en temps utile.		REPUBLIQUE DU CAMEROUN MINISTERE DES TRAVAUX PUBLICS		A	SEP 2012	SJR	MAT	MMB	Première émission	STATUT	
		Rev.	Date	Dessiné par	VISA	Vérifié par	VISA	Approuvé par	VISA	Nature de la Modification	STATUT
ETUDE D'AMENAGEMENT DE LA ROUTE BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE		PRESENTATION DES CARRIERES PLANCHE 3/4			PHASE: APS		LOT: 1		N° AFFAIRE PAYS A.CONTRAT PHASE ET LOT DEPA. PRODU. SP. ET S. SP.	A1829CM11 Echelle(s): 1/500 000	FORMAT: A3 Feuille N° :
									100.ITAC.RTEO	PLAN N° PL TPL 150	REVISION A



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REPUBLIQUE DU CAMEROUN
MINISTRE DES TRAVAUX PUBLICS

ETUDE D'AMENAGEMENT DE LA ROUTE
BATCHENGA-NTUI-YOKO-TIBATI-NGAOUNDERE

PRESENTATION DES CARRIERES
PLANCHE 4/4

PHASE: APS
LOT: 1

À	SEP 2012	SJR	MAT	MMB	Première émission
Rev.	Date	Dessiné par	VISA	Vérifié par	VISA
				Approuvé par	VISA
					Nature de la Modification
					STATUT
		N° AFFAIRE PAYS A.CONTRAT		A1829CM11	Echelle(s): 1/500 000
		PHASE ET LOT DEPA. PRODU. SP. ET S. SP.		100.ITAC.R.TEO	PLAN N° PL TPL 150
					FORMAT: A3
					Feuille N° :
					REVISION A

Environmental and social management plan and related costs

Phases or cycles of the project	Recommended measures and actions							Monitoring/Supervising implementation of the measures			
	N°	Contents of recommended measures and actions	Category of the measure*	Cost of the measures			Responsible for implementation of the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measures implementation indicators	
				Unit	Quantity	Unit price (XAF)					Total price (XAF)
1- Preparation phase of the improvement construction works	1.1	Choice and agreement of the contractors: selective criteria in favor of those who will provide the services the most environmentally friendly and the earlier possible (availability of human and material means)	A					Project owner/Consulting firm	Project owner	Preparation of the CAD and study of the tenders	Selection of the company
	1.2	Constitution of an Environmental and Social Management Plan (ESMP)	A					The company/Project owner	Project owner	Before the beginning of the construction works operations	Monthly minutes for the construction site follow-up written by the cell
	1.3	Publication of the PRC and the ESMP and creation of a claim logbook at the level of the towns of Ntui, Yoko and Tibati	A					Project owner/town of Ntui, Yoko and Tibati and Adamaoua and Center regions	Project owner	From the beginning of the construction works operations/To be continued in exploitation phase	The fact that the logbook exists/ The speed of claims proceeding by the environment service of the MINEP
	1.4	Submission to the project owner by the company of the planned construction works organization program and the implementation program of the environmental measures	A					The company	Project owner/ Coordination unit	Before the beginning of the construction works operations	Existence and relevance of the programs
	1.5	Establishment of an Environment Management System (EMS) by a consultant on behalf of the company	B	F/ the company	8	2,000,000	16,000,000	The company through independent consultant	Project owner	No later than the beginning of the construction works operations	Document of the SME/ Certification/minutes of the audits
	1.6	Preliminary investigations prior to the selection of the areas intended to be used by the company (selection of the installation sites for the camp, the storage of the material, the grinding and coating borrow and deposit areas, possible garbage dump, etc.)	B	F/ the company	8	4,000,000	32,000,000	The company through independent consultant	Coordination unit	Before the beginning of the construction works operations	Starting minutes
	1.7	Establishment of the initial contradictory inventory (before the operation start) by an independent consultant, including the plant species of particular interest for the local population or the wildlife	B	F/ the company	8	15,000,000	120,000,000	The company through independent consultant/local population	Project owner/ Coordination unit	Before the beginning of the construction works operations	Minutes of the inventory established by a certified consultant and approved by the coordination unit
	1.8	Launch forum of the operations or first information meeting and establishing contact with all the shareholders (local administrations, NGOs, associations, populations and staff resources at the community level, etc.) in order to present the project and take note about the players' needs, their sensitivity concerning the project (acceptance, reluctance, nature of their fears and demands).	A	F/ the company	8	5,000,000	40,000,000	The company	Coordination unit	Before the beginning of the construction works operations	Minutes of the forum/Number of people who participated to the forum
	1.9	Installation of a plant nursery in order to replace 300 hectares of forest that will be destroyed; it is recommended to set up the nursery at the beginning of the construction works operations and to start planting at the end of the operations.	C	F	1	250,000,000	250,000,000	Project owner through the company or the Water and Forest agency of the department	Water and Forest control agency from the Center and Adamaoua regions/ Water and Forest control agency from the department of Mbam and Kim and Adamaoua/ MINFOF	Preferably, from the beginning of the construction works operations	Final contradictory inventory
	1.10	Fencing and/or security protection of the areas intended for the company's use (camp, extraction zones, material storage, etc.)	C					The company	Coordination unit	Before the beginning of the construction works operations	Records of the accidents caused by the intrusion of unauthorized persons from outside the construction site in the areas used by the company (monthly reports of the ESMP)/ Environmental and Social Parameters Database (ESPD) to be maintained by the environment service of the MINEP
	4.20	Consultation and dialog plan	A	U	90	600,000	54,000,000	Project owner	Coordination unit	Before and until the end of the construction works operations	Minutes from the authorities
1.11	Fluorescent stripes in order to delimit the other areas that are off limit to the public (estimated about 5000 ml for all the non-fenced areas)	C	ml	12,000	3,000	36,000,000					

Environmental and social management plan and related costs

Phases or cycles of the project	Recommended measures and actions							Monitoring/Supervising implementation of the measures			
	N°	Contents of recommended measures and actions	Category of the measure*	Cost of the measures			Responsible for implementation of the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measures implementation indicators	
				Unit	Quantity	Unit price (XAF)					Total price (XAF)
1- Preparation phase of the improvement construction works (continue)	1.12	Construction of wooden fences around the trunks of the trees identified as remarkable by the local population in order to protect them against fire, chocks and damages	C	Included in the services covered by the company			The company	Coordination unit	Before the beginning of the construction works operations	1st minutes of the coordination unit	
	1.13	Installation of indication panels (metallic or wooden) to inform the users and the resident population of the progress of the operations (1 panel per village located in the axe of the project)	C	U	93	250,000	23,250,000	The company	Coordination unit	Before the beginning of the construction works operations	1st minutes of the coordination unit
	1.14	Equipment for the management of solid wastes in the camp (trash, garbage track, setting of a garbage dump, etc.)	C	F/camp	8	1,000,000	8,000,000	The company	Coordination unit	Before the beginning of the construction works operations	1st minutes of the coordination unit/Availability and functions of the equipment/Claims from the population recorded in the claims logbook
	1.15	Equipment of the camp for sanitary facilities, septic tank and soak pit	C	F/camp	8	8,000,000	64,000,000				
	1.16	Equipment of the material park with a platform in concrete equipped with ditches and leakage recovery mechanism for the fuel tanks and the motor oil change operations	C	F/camp	8	2,500,000	20,000,000				
	1.17	Equipment of the material park with a sedimentation tank for the waters used for cleaning the equipment.	C	F/camp	8	1,500,000	12,000,000				
	1.18	Installation of a health center in the camp	C	F/camp	8	5,000,000	40,000,000				
	1.19	Equipment for all the workers with helmets, gloves, fluorescent jacket and security shoes (including new shoes once and new gloves every 3 months)	C	F/Workers	1 600	120,000	192,000,000	The company	Coordination unit	Beginning of the construction works operations + renewal in progress of the construction works	ESMP minutes/Usage of the equipment by all the workers
	1.20	Providing tarp for the trucks transporting mobile materials in order to cover the tippers	C	U	240	40,000	9,600,000	The company	Coordination unit	Before the beginning of the construction works operations	Monthly minutes of the coordination unit/Possible claims from the residents and the users (dust) recorded in the claim logbook
	1.21	Recruitment of four engineers experts of environmental and social aspects for the environment service	A	h.m	112	800,000	89,600,000	Project owner	Project owner	4 months before the beginning of the construction works operations	Direction of the ESMP/Redaction of the monthly minutes/Assistance to the head of environment service for proceeding the claims
	1.22	Equipment for the strengthening of the control/monitoring capacities of the Waters and Forests Agency and the squads of Mabm and Kim department and the Park Mbam and Kim: 20 tents, 20 rifles et 20 camping sets in order to equip 20 rangers, 20 pairs of binoculars, 20 kits of communication device, digital cameras	A	F	20	2,500,000	50,000,000	Project owner	Project owner/Ministry of Environment, Nature Protection and Sustainable Development (MINEP)	From the beginning of the construction works operations	Acquisition of the equipment and progress of the control/monitoring operations
	1.23	Increase of the number of guards in the park during the construction works phase (10 guards)	A	U	280	200,000	56,000,000	Project owner	Project owner/Ministry of Environment, Nature Protection and Sustainable Development (MINEP)	From the beginning of the construction works operations	Acquisition of the equipment and progress of the control/monitoring operations
	1.24	Material necessary for the 10 guards hires in order to help the current guards and equipment of awareness raising for the visitors	A	F	10	800,000	8,000,000	Project owner	Project owner/Ministry of Environment, Nature Protection and Sustainable Development (MINEP)	From the beginning of the construction works operations	Acquisition of the equipment and progress of the control/monitoring operations
1.25	Accompanying actions for reconversion of the activities lost due to the construction of the bridge over the Sanaga River (pirogues, ferries and other services)	A	F	1	40,000,000	40,000,000	Project owner	Project owner/Ministry of Environment, Nature Protection and Sustainable Development (MINEP)	During the construction works of the bridge	Number of beneficiaries	

Environmental and social management plan and related costs

Phases or cycles of the project	Recommended measures and actions							Monitoring/Supervising implementation of the measures			
	N°	Contents of recommended measures and actions	Category of the measure*	Cost of the measures			Responsible for implementation of the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measures implementation indicators	
				Unit	Quantity	Unit price (XAF)					Total price (XAF)
2- Implementation phase of the road construction works	2.1	Organization of 4 training sessions of 5 days each for the staff of the Administration (Environment service of the DIPER and the MINEPDED, quarters and squads of the Waters and Forests Agency of the departments of Mbam and Kim and Adamaoua territorial subdivision of the public works) in matters of environmental and social management of the road projects and the infrastructures in general	A	h,j	20	800,000	16,000,000	Project owner through an independent consultant	Project owner/Ministries in charge of the environment and Waters and Forests (MINFOF)	Four session of 5 days each/Before the beginning of the construction works operations	Number and specializations of the persons trained/Attestations provided by the office or the engineer consultant who ensures the training
	2.2	Radio communication on the project and necessity to protect the environment and especially the National Park of Mbam and Kim (television documentary + radio communication + t shirt + caps)	A	F	1	50,800,000	50,800,000	Project owner	Project owner	From the beginning of the construction works operations	Number of radio communications and number of communication devices distributed
	2.3	Awareness raising mission for the environmental protection (wildlife and plant life) and security and hygiene by hiring a NGO that will intervene every 3 months and will complete its actions with the distribution of the awareness raising material detailed in 2.2	A	U	75	3,500,000	261,333,333	Project owner	Project owner	From the beginning of the construction works operations	Direction of the ESMP/ Redaction of the minutes for each event
	2.4	All-terrain vehicles (pick up) for the Waters and Forests services of the towns of Ntui, Yoko and Tibati	A	U	3	17,000,000	51,000,000	Project owner	Ministry of Environment, Nature Protection and Sustainable Development	From the beginning of the construction works operations	Acquisition of the equipment and progress of the control/monitoring operations
	2.5	Support for the women associations and the Income Generating Activities: hiring of 2 agricultural technicians in order to perform the trainings aiming to increase the profitability of their production and its diversification	A	H,m	24	3,500,000	84,000,000	Project owner	Project owner/Ministry of Women and Family Promotion	During the construction works operations	Minutes of the meeting
	2.6	Support for the women and the Income Generating Activities: distribution of agricultural tools of small size	A	U	90	1,500,000	135,000,000	Project owner	Ministry of Women and Family Promotion	During the construction works operations	Acquisition of the equipment and progress of the control/monitoring operations
	2.7	Strengthening of the police capacities: 3 motorbikes and 1 car for the towns of Ntui, Yoko, Tibati	A	U	3	20,000,000	60,000,000	Project owner	Coordination unit	During the construction works operations	Acquisition of the equipment and progress of the control/monitoring operations

Environmental and social management plan and related costs

Phases or cycles of the project	Recommended measures and actions							Monitoring/Supervising implementation of the measures			
	N°	Contents of recommended measures and actions	Category of the measure*	Cost of the measures			Responsible for implementation of the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measures implementation indicators	
				Unit	Quantity	Unit price (XAF)					Total price (XAF)
2- Implementation phase of the road construction works	2.8	Operation of the coordination and programming cell of the construction site, including the care of Administration staff's and DIPER, is in charge of the environmental follow-up and monitoring of the construction site	B	F/Months	28	1,000,000	28,000,000	The company	Project owner	During the construction works operations	Actions + monthly minutes signed by the members of the cell
	2.9	Follow-up of the implementation of the Environmental and Social Management Plan (ENMP) during the construction works operations	B	H.M	224	3,000,000	672,000,000	Project owner though the control office	Project owner	During the construction works operations	Minutes established by the environmentalist of the control office
	2.10	Follow-up missions every 3 months by a consultant from the Environment Management System (EMS) of the company	B	U	75	500,000	37,333,333	The company through independent consultant	Coordination unit	Every 3 months	Minutes of the audits performed every three months
	2.11	Monthly management fees of the health center (nurse fees, medicines, etc.)	C	F/Month/health center created	224	500,000	112,000,000	The company	Coordination unit	During the construction works operations	Monthly minutes of the coordination unit
	2.12	Condoms acquisition (from the PNLS) for the workers for a total of 10 condoms per worker per month	C	U	448,000	50	22,400,000	The company	Coordination unit	During the construction works operations	Monthly minutes of the coordination unit
	2.13	Information and awareness raising campaigns for the workers, the residents and the road users (against STDs and AIDS for security) every 3 months	A	U	75	5,000,000	373,333,333	Project owner through the control office (already scheduled in the operation monitoring)	Coordination unit	Every 3 months	Minutes of the coordination unit
	2.14	Convention with the Ministry of Health or a private doctor in order to perform monthly visits of the camp, control the workers' health, check the respect of the hygienic conditions and perform screening tests of the workers on a voluntary base	B	U	224	400,000	89,600,000	The company through a health care institution	Coordination unit	Every month	Monthly reports to be established by the health care institution concerning the state of hygiene and health in the camp
	2.15	Systematic watering of the roads used to transport materials, the construction works operation areas and the crushing sites in order to reduce the amount of dust generated	C	Included in the services covered by the company			The company	Coordination unit	Every day during the dry season	Monthly minutes of the coordination unit/Possible claims from the residents and the users (dusts) recorded in the claim logbook	
2.16	Selection of the adequate period for the implementation of specific operations of the construction works	—	Measure that doesn't generate additional costs			The company	Coordination unit	During the construction works operations	Constrains found and cleared mentioned in the monthly minutes of the ESMP		

Environmental and social management plan and related costs

Phases or cycles of the project	Recommended measures and actions							Monitoring/Supervising implementation of the measures			
	N°	Contents of recommended measures and actions	Category of the measure*	Cost of the measures			Responsible for implementation of the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measures implementation indicators	
				Unit	Quantity	Unit price (XAF)					Total price (XAF)
2 - Implementation phase of the road construction works (continue)	2.17	Selection of the most adequate construction site techniques : prefabricated elements, labor-intensive works (HIMO), etc.	-	Measure that doesn't generate additional costs			The company	Coordination unit	During the construction works operations	Respect of the delays + Number of workers HIMO	
	2.18	Regular services and maintenance of the construction site facilities in order to protect the environment : adding lime to the septic tank for disinfection, burying and covering the wastes, transportation of the old motor oil, maintenance of the decantation basin for the equipment cleaning waters, etc.	C	F/Month/camp	224	500,000	112,000,000	The company	Coordination unit	During the construction works operations	Monthly minutes of the coordination unit/Claims from the population (pollution) recorded in the claim logbook
	2.19	Strict control of the game meat consumption in the camp, including the supply made by people from outside the construction site	B	Measure that doesn't generate additional costs			The company/Workers	Coordination unit/rangers	During the construction works operations	Monthly minutes of the coordination unit/Number of offenses + reports	
	2.20	Regular control of the heavy equipment of the construction site	B	Measure that doesn't generate additional costs			The company	Coordination unit/DIPER	Every day during the whole duration of the construction works operations	Monthly minutes of the coordination unit/Possible claims from the residents and the users (noise, fumes) recorded in the claim logbook	
	2.21	Hiring as much as possible workers from the local population, women and young people contribution to the project while conforming to the legislation: respect of the minimum age, usage as much as possible of labor-intensive works (HIMO)	—	Measure that doesn't generate additional costs			The company/Project owner	Coordination unit/Ministries in charge of work, child protection and women promotion	During the construction works operations	Number and percentage of locally hired workers/ Number and percentage of women/Age of the youngest workers	

Environmental and social management plan and related costs

Phases or cycles of the project	Recommended measures and actions							Monitoring/Supervising implementation of the measures			
	N°	Contents of recommended measures and actions	Category of the measure*	Cost of the measures			Responsible for implementation of the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measures implementation indicators	
				Unit	Quantity	Unit price (XAF)					Total price (XAF)
3- Post construction phase – Delivery of the construction works – Restoration of the sites	3.1	Restoration of the borrow areas (correction of the slope, transportation and spreading of plant soil, revegetation, maintenance and watering until strong growth)	C	ha	302	2,000,000	604,000,000	The company	Coordination unit	Since the end of the construction works operations/Before the final delivery	Minutes of the final inventory/ Payment (separated) of the related works/Conditional restitution of the completion bonds
	3.2	Restoration of solid rocks quarries, including the possible reforestation of the affected sites	C	F	8	4,000,000	32,000,000	The company	Coordination unit		
	3.3	Restoration of the storage and deposit areas	C	ha	60	10,000,000	604,000,000				
	3.4	Clearing of the rivers	C	F	40	2,000,000	80,000,000				
	3.5	Deliverance of the wells, drilling sites and ponds created for the needs of the construction works operations to the population customarily holding these in usufruct	C	Measure that doesn't generate additional costs				The company	Coordination unit	End of the construction works operations	Final contradictory inventory
	3.6	Establishment of the final contradictory inventory (after the end of the construction works operations) by an independent consultant, including the inventory of the plant species of particular interest for the local population or the wildlife	B	F/camp	8	15,000,000	120,000,000	The company through independent consultant with the support of the local population	Project owner/ Coordination unit	End of the construction works operations	Inventory report established by an independent consultant/ minutes of the final reception of the works
	3.7	Conversion of the camp site into a rest stop by maintaining the water source, the toilets, the trash cans, drainage infrastructures, etc. and the creation of several further creations (wooden benches and tables, tree plantation for shading, etc.)	C	F/camp	8	10,000,000	80,000,000	The company within the framework of the construction works operations	Project owner	End of the construction works operations	Minutes of the final inventory/ Payment (separated) of the related works
	3.8	Closing seminar of the construction works operations and of participative planning to switch to the "exploitation phase" of the ESMP	A	F	1	5,000,000	5,000,000	The company	Project owner	End of the construction works operations	Minutes of the closing seminar
	3.9	Extension of the guaranty concerning the environmental aspects	—	Included in the services covered by the company				The company	Project owner	Liability period	Minutes of the final reception/ Conditional restitution of the completion bonds

Environmental and social management plan and related costs

Recommended measures and actions

Monitoring/Supervising implementation of the measures

Phases or cycles of the project	N°	Contents of recommended measures and actions	Category of the measure*	Cost of the measures			Responsible for implementation of the measures (costs borne by)	Responsible for monitoring or supervising	Measures implemented when/how often	Measures implementation indicators	
				Unit	Quantity	Unit price (XAF)					Total price (XAF)
4- Exploitation phase of the improved road	4.1	Panels for awareness raising against road dangers and AIDS and the sexually transmitted diseases (one metallic panel of 3 m x 4 m, alternatively set every 5 km)	C	U	119	2,500,000	297,500,000	Project owner through the company (within the framework of the construction works operations)	Project owner	End of the construction works operations	Minutes of the final reception/ Evolution of the number of accidents recorded in the Environmental and Social Parameters Database (ESPD) that shall be maintained by the Environment Service of the MINEP
	4.2	Panels for awareness raising against danger in the areas of animal passage (wild and domesticated) and nature protection	C	U	60	1,250,000	148,750,000				
	4.3	Creation of warnings (speed bumps) at the entrance of the towns and villages located directly on the road	C	U	186	500,000	93,000,000				
	4.4	Protuberant marking with reflecting 3D plots in order to reinforce the nocturnal perception for crossing the villages, about 200 ml per village	C	Counted in the technical study							
	4.5	Creation of parking lanes by enlarge the embankments within the towns and the reduce visibility areas and the creation of parking lanes for logging trucks	C	Counted in the technical study							
	4.6	Building of wooden fences in order to delimit the sites near the road which are highly crowded (school playgrounds, water points, markets, playgrounds, etc.) and stop the animals to cross the road in dangerous areas	C	Measure that doesn't generate additional costs			Local population within the framework of community works	Project owner/Waters and Forests Agency of the department of Mbam and Kim and Adamaoua	As soon as possible (preferably during the construction works operations)	Number, evolution and human and material damages of the accidents with pedestrians and animals (recorded in the ESPD)	
	4.7	Creation of stairs or access ramps (on both sides) for the main rivers crossed by the road and the villages or houses located in areas with difference in height compared to the road	C	Counted in the technical study			Project owner through the company (within the framework of the construction works operations)	Project owner	As soon as possible (preferably from the beginning of the construction works operations)	Minutes of the final reception	

Environmental and social management plan and related costs

Phases or cycles of the project	Recommended measures and actions							Monitoring/Supervising implementation of the measures			
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				Unit	Quantity	Unit price (XAF)					Total price (XAF)
4- Exploitation phase of the improved road	4.8	Cover with concrete paving of the gutters located in the towns and near houses in order to facilitate the access of people in the houses and the vehicles in the village	C	Counted in the technical study			Project owner through the company (within the framework of the construction works operations)	Project owner	End of the construction works operations		
	4.9	Planting row trees in every village crossed	C	60	90	15,000					81,000,000
	4.10	Creation of parking areas, rest areas (benches, garbage cans and various equipment)	C	Counted in the technical study							
	4.11	Revegetation operations in order to protect and stabilize the embankments and stabilize the embankments and the river banks and regular maintenance of the road embankments	C	Included in the maintenance fees covering the road			Subdivision of public works/Road maintenance funds	Project owner	At the same frequency than the road maintenance	State of the embankments and consequences for the state of the road	
	4.12	Regular maintenance of the road and the engineering works in order to ensure the viability, the sustainability and the continuity of the project	C								
	4.13	Study of an operational exploitation and maintenance program of the road	B	F	1	20,000,000	20,000,000	Project owner/Road maintenance funds	Project owner/Ministry in charge of transportation	As soon as possible	Maintenance operations/ Evolution of the state of the road
	4.14	Enclosure of all the schools + hospitals	C	ml	37,600	65,500	2,462,800,000	Project owner	Coordination unit	As soon as possible	Construction equipment and minutes of the local authority
	4.15	Construction of two classrooms, one accommodation for teachers and toilettes for every school on the road	C	U	50	10,000,000	500,000,000	Project owner	Coordination unit		Equipment and minutes of the local authority
	4.16	School equipment for the classrooms	C	U	50	1,000,000	50,000,000	Project owner	Coordination unit	End of the construction works operations	Acquisition of the equipment and minutes of the local authority
	4.17	Equipment of all the CSI located in the direct influence zone of the road (patients beds, medical equipment for child delivery, a solar panel, vaccine holders and frost accumulators)	C	U	15	20,000,000	300,000,000	Project owner	Coordination unit		Equipment and minutes of the local authority
	4.18	Measures for the transhumance: construction of a watering place and rest areas every 50 km	C	U	11	20,000,000	220,000,000	Project owner	Coordination unit		Equipment and minutes of the local authority
4.19	Support for women and the Income Generating Activities: construction of a manioc drying shed	C	U	90	200,000	18,000,000	Project owner /Ministry of Women and Family Promotion	Ministry of Women and Family Promotion	End of the construction works operations	Acquisition of the equipment/ Control of the presence of the material in the villages, inventory every three month per village	

Summary tables of the costs**Summary table per phase of the project**

Phases of the project		Costs (XAF)
1-	Preparation phase of the improvement construction works	1,160,450,000
2-	Implementation phase of the road construction works	2,104,800,000
3-	Post construction phase – Delivery of the construction works – Restoration of the sites	1,525,000,000
4-	Exploitation phase of the improved road	4,191,050,000
Grand total		8,981,300,000

(*) Summary table per category of measures

Category of the measures		Costs (XAF)
A	Measures for capacities reinforcement – Training sessions – Awareness raising campaigns - Information and consultation of the population	1,374,066,667
B	Performing complementary studies and investigations – Control operations – Funding of researches – Follow-up of the environmental and social parameters	1,134,933,333
C	Setting of facilities, equipment or implementation or services or complementary works	6,472,300,000
Grand total		8,981,300,000

Summary table per responsible of management

Category of the measures		Costs (XAF)
i-	Measures covered by the project owner	6,442,116,667
ii-	Measures covered by the company	2,539,183,333
Grand total		8,981,300,000

Data of the project:	
594	Length of the road (km)
1600	Number of workers
28	Duration of the construction work operations (months)
240	Number of trucks
93	Number of towns located directly on the road
12	Sites where landscaping shall be implemented
302	Borrow sites (ha)
8	Rock quarry sites (ha)
60	Storage and deposit areas (ha)

Arrêté n° 0648/MINFOF du 18 décembre 2006 fixant la liste des animaux des classes de protection A, B, C.

Article 1er : En application des dispositions de l'article 78 de la loi n° 94/01 du 20 janvier 1994 portant régime des forêts, de la faune et de la pêche ainsi que les articles 14 et 15 du décret 95/466 du 20 juillet 1995 fixant les modalités d'application du régime de la faune, les espèces animales vivant sur le territoire national sont réparties en trois classes de protection A, B et C.

Article 2 : (1) La classe A comprend les espèces rares ou en voie de disparition. Ces espèces dont de ce fait intégralement protégées et ne doivent en aucun être abattues ou capturées.

(2) Toutefois leur capture ou détention est subordonnée à l'obtention d'une autorisation spéciale délivrée par l'Administration chargée de la faune, à des fins d'aménagements ou dans le cadre de la recherche scientifique, de la protection des personnes ou de leurs biens.

(3) Les espèces appartenant à cette classe sont les suivantes :

I- Mammifères

Noms communs		Noms Scientifiques
Français	Anglais	
Lion	Lion	<i>Panthera leos</i>
Panthère	Leopard	<i>Panthera pardus</i>
Guépard	Cheetah, Hunting Leopard	<i>Acinonyx jubatus</i>
Caracal	African Caracal, Asian Caracal, Caracal, Desert Lynx	<i>Felis caracal</i>
Zorille commun	Striped pole cat	<i>Ictonyx striatus</i>
Lycaon	Wild dog	<i>Lycaon pictus</i>
Gorille	Gorilla	<i>Gorilla gorilla</i>
Chimpanzé	Chimpanzee	<i>Pan troglodytes</i>
Drill	Drill	<i>Papio leucophaeus</i> (<i>Mandrillus leucophaeus</i>)
Mandrill	Mandrill (<i>Mandrillus sphinx</i>)	<i>Papio sphinx</i>
Colobe à manteau blanc	Eastern Black-and-White Colobus, Magistrate Colobus, Guereza	<i>Colobus guereza</i>
Cercopithèque de Brazza	De brazza's monkey	<i>Cercopithecus neglectus</i>
Cercopithèque de l'Hoest	Preuss's Guenon, Preuss's Monkey L'Hoest's Monkey, Mountain	<i>Cercopithecus hoesti</i>

	Monkey	
Guenon de preuss	Preuss' monkey	<i>Cercopithecus preussi</i>
Cercocèbe agile	Agile mangabey	<i>Cercocebus agilis</i>
Potto de Calabar	Angwantibo, Golden Potto	<i>Aretocebus calabarensis</i>
Potto de Bosman	Bosman's Potto, Potto, Potto Gibbon	<i>Perodicticus potto</i>
Galago d'Allen	Allen's Bushbaby, Allen's Galago, Allen's Squirrel Galago	<i>Galago alleni</i>
Oryctérope	Aardvark, Antbear	<i>Orycteropus afer</i>
Pangolin géant	Giant Ground Pangolin, Giant Pangolin	<i>Manis gigantea</i>
Lamentin	African Manatee, West African Manatee	<i>Tichechus senegalensis</i>
Anomalure de Beecroft	Beecroft's Flying Squirrel,	<i>Anomalurops beecrofti</i>
Eléphant (pointe de moins de 5 kg)	African Elephant, African Savannah Elephant (with tusk of less than 5 kilogrammes)	<i>Loxodonta spp.</i>
Rhinocéros noir	Black Rhinoceros, Browse Rhinoceros, Hook-lipped Rhinoceros	<i>Diceros bicornis</i>
Girafe	Giraffe (Seahorse)	<i>Giraffa camelopardalis</i>
Gazelle à front roue	Red-fronted Gazelle	<i>Gazelle rufufrons</i>
Cephalophobe à dos jaune	Yellow backed duiker	<i>Cephalophus sylvicultor</i>
Redunca de montagne	Mountain Reedbuck	<i>Redunca fulvornfula</i>
Hippopotame	Hippopotamus	<i>Hyppopotamus amphibus</i>
Damalisque	Topi tsessebe	<i>Damaliscus spp</i>
Chevrotin aquatique	Water Chevrotain	<i>Hyemoschus aquaticus</i>

II- Oiseaux

Noms communs		Noms scientifiques
Français	Anglais	
Flaman nain	Lesser Flamingo	<i>Phoeniconais minor</i>
Vautour oricou	Lappet-faced Vulture	<i>Torgos tracheliotus</i>
Bussard pâle	Pilid Harrier	<i>Circus macrourus</i>
Francolin du Cameroun	Cameroon Mountain Francolin	<i>Francolinus camerunensis</i>

Bécassine double	Great snipe	<i>Gallinago media</i>
Sterne des baleiniers	Damara Tern	<i>Sterna baelearum</i>
Pigeon à nuque blanche	White-naped Pigeon	<i>Columba albinucha</i>
Touraco doré	Bannerman's Turaco	<i>Touraco bannermani</i>
Calao à casque jaune	Yellow-casqued Wattled Hornbill	<i>Ceratogymna elata</i>
Indicateur d'Eisentraut	Yellow-footed Honeyguide	<i>Melignomon eisentrauti</i>
Bulbul concolore	Cameroon montane Greenbul	<i>Andropadus montanus</i>
Bubul à ventre jaune	Grey-headed Greenbul	<i>Phyllastrephus poliocephalus</i>
Grive de Crossley	Crossley's Ground Thrush	<i>Zoothera crossleyi</i>
Bouscarle géante	Dja river Warbler	<i>Bradypterus grandis</i>
Bouscarle de Bangwa	Bangwa Forest Warbler	<i>Bradypterus bangwaensis</i>
Pririt à bande noire	Banded Wattle-eye	<i>Platysteira laticincta</i>
Pririt de Verreaux	Verreaux's Batis	<i>Batis minima</i>
Phyllanthe à gorge blanche	White-throated Mountain Babbler	<i>Kupeornis gilberti</i>
Picatharte du Cameroun	Grey-necked Picathartes	<i>Picathartes orea</i>
Souimanga d'Ursula	Ursula's Mouse-coloured sunbird	<i>Nectarinia ursulae</i>
Zostérops du Cameroun	Mount Cameroon Speirops	<i>Speirops melanocephalus</i>
Gladiateur du mont Kupé	Mount Kupe Buh Shrike	<i>Malaconotus kupeensis</i>
Gladiateur à poitrine verte	Green-breasted Bush Shrike	<i>Malaconotus gladiator</i>
Gladiateur de Monteiro	Monteiro's Bush Shrike	<i>Malaconotus monterii</i>
Tisserin de Bannerman	Bannerman's Weaver	<i>Ploceus bannermani</i>
Tisserin de Bates	Bates's Weaver	<i>Ploceus batesi</i>
Poliolaïs à queue blanche	White-tailed Warbler	<i>Poliolais lopezi</i>
Outarde de Denham	Denham's Bustard	<i>Neotis denhami</i>
Canard de Hartlaub	Hardlaub's Duck	<i>Pteronetta hartlaubli</i>
Onoré à huppe blanche	White-crested Tiger Heron	<i>Tigriornis leucolophus</i>
Bec en ciseau d'Afrique	African Skimmer	<i>Rynchops flavirostris</i>
Echinilleur loriot	Eastern Wattled Cuckoo-	<i>Lobotos oriolinus</i>

	Shrike	
Cisticole de Dorst	Dorst's Cisticola	<i>Cisticola dorsti</i>
Gobemouche de Tessman	Tessmann's Flycatcher	<i>Muscicapa tessmani</i>
Fou du cap	Cape Gannet	<i>Sula capensis</i>
Marmaronette marbrée	Marbled Duck	<i>Marmaronetta angustirostris</i>
Fuligule nyroca	Ferruginous Duck	<i>Aythya nyroca</i>
Aigle impérial	Imperial eagle	<i>Aquila heliaca</i>
Râle des genêts	Corn Crake	<i>Crex crex</i>
Outarde nubienne	Nubian Bustard	<i>Neotis nuba</i>
Glaréole à ailes noires	Black-winged Pratincole	<i>Glareola nordmani</i>
Hirondelle brune	Mountain Saw-wing	<i>Psalidoprocne fuliginosa</i>
Prinia aquatique	River prinia	<i>Prinia fluviatilis</i>
Apalis de Bamenda	Bamenda apalis	<i>Apalis bamendae</i>
Autriche d'Afrique	Ostrich	<i>Struthio camelus</i>
Faucon de barbarie	Barbary falcon	<i>Falco pelegrinoides</i>
Cigogne blanche	White Stork	<i>Ciconia ciconia</i>
Cigogne noire	Black Stork	<i>Ciconia nigra</i>
Flamant rose	Greater Flamingo	<i>Phoebastria ruber</i>
Bateleur d'Afrique	Bateleur	<i>Terachopius ecaudatus</i>
Messenger serpenteaire	Secretary bird	<i>Sagittarius serpentarius</i>
Perroquet jaco	Gry parrot	<i>Psittacus erithacus</i>
Perroquet robuste	Brown-necked Parrot	<i>Poicephalus robustus</i>
Perroquet à calotte rouge	Red-fronted Parrot	<i>Poicephalus gulielmi</i>
Perroquet youyou	Senegal Parrot	<i>Poicephalus senegalus</i>
Inséparable à tête rouge	Red-headed Lovebird	<i>Agapornis pullarius</i>
Inséparable à collier noir	Black-collared Lovebird	<i>Agapornis swindernianus</i>
Touraco vert	Green turaco	<i>Touraco persa</i>
Grue couronnée	Northern Crowned Crane	<i>Balearica pavonina</i>
Jabirus d'Afrique	Saddle-billed Stork	<i>Ephippiorhynchus senegalensis</i>
Perruche à collier	Rose-ringed Parakeet	<i>Psittacula krameri</i>

III- Reptiles

Noms communs		Noms Scientifiques
Français	Anglais	
Crocodiles à museau allongé	African Sharp-nosed Crocodile	<i>Crocodilus cataphractus</i>
Crocodile du Nil	Nile Crocodile	<i>Crocodilus niloticus</i>
Crocodile nain	African Dwarf Crocodile	<i>Osteoleamus tetracus</i>

Grande tortue marine (Tortue verte)	Green turtles	<i>Cheloniidae spp.</i>
Tortue caouanne	loggerhead	<i>Caretta caretta</i>
Tortue imbriquée	Hawksbill turtle	<i>Eretmochelys imbricata</i>
Tortue olivâtre	Olive ridley	<i>Lepidochelys olivacea</i>
Tortue luth Tortue marine	Leatherback turtle	<i>Dermochelys coriacea</i>
Tortue à soc (tortue de forêt)	African spurred tortoise	<i>Geochelone sulcata</i>
Caméléon d'Eisentraut	Eisentrau chameleon	<i>Chamaeleo eisentrauti</i>
Caméleon de Pfeffer	Pfeffer's chameleon	<i>Chamaeleo pfefferi</i>
Caméléon à 4 cornes du Sud	Four horned chameleon	<i>Chamaeleo quadricornus</i>
Caméléon de Weidersheim du Sud	Mount Lefo chameleon	<i>Chamaeleo weidersheimi perreti</i>
Euprepis des Nganha		<i>Euprepis nganhae</i>
Scinque de Lepesme	Lepesme skink	<i>Lacertaspis lepesmei</i>

IV- Batraciens

Noms communs		Noms Scientifiques
Français	Anglais	
Grenouille Goliath	Giant frog	<i>Conrua goliath</i>

Article 3 : (1) La classe B comprend les espèces bénéficiant d'une protection partielle, elles ne peuvent être chassées, capturées ou abattues qu'après obtention d'un titre d'exploitation de la faune. Ces espèces font l'objet de mesure de gestion particulière sans lesquelles elles deviendraient rares ou menacées d'extinction.

(2) Cette classe comprend :

I- Les Mammifères

Noms Communs		Noms Scientifiques
Français	Anglais	
Eland de Derby	<i>Eland</i>	<i>Taurotragus derbianus</i>
Bongo	<i>Bongo</i>	<i>Bocerus eurycerus</i>
Buffle	<i>African buffalo</i>	<i>Syncerus caffer</i>
Hippotrague	<i>Roan antelope</i>	<i>Hypotragus equitus</i>
Bubale	<i>Hartebeeste</i>	<i>Acephalus buselaphus</i>
Elephant (pointes de plus de 5 kgs)	<i>Elephant</i>	<i>Loxodonta spp</i>
Sitatunga	<i>Sitatunga</i>	<i>Tragelaphus spekei</i>
Cob de buffon	<i>Kob</i>	<i>Kobus kob</i>
Cob de Defassa	<i>Defassa waterbuck</i>	<i>Kobus ellipsiprymmus</i>
Guip harnaché	<i>Bush buck</i>	<i>Tragelaphus scriptus</i>
Hylochère	<i>Giant forest hog</i>	<i>Hylocherus meinertzhageni</i>
Potamochère	<i>Bush pig</i>	<i>Potamochoerus porcus</i>
Phacochère	<i>Wart hog</i>	<i>Phacochoerus aethiopicus</i>

Civette	<i>African civet</i>	<i>Viverra civetta</i>
Genette	<i>Genet</i>	<i>Genetta spp</i>
Serval	<i>Serval</i>	<i>Felis serval</i>
Loutre à joues blanches	<i>Chawless otter ; african cameron</i>	<i>Aonyx congicus</i>
Céphalophe à bande dorsale	<i>Bay duiker</i>	<i>Cephalophus dorsalis</i>
Céphalophe Peters	<i>Peter's and harvey's Duiker</i>	<i>Cephalophus callipigus</i>
Hyène tachetée	<i>Spotted heyna</i>	<i>Crocuta crocula</i>

II- Oiseaux

Noms Communs		Noms Scientifiques
Français	Anglais	
Pigeon du Cameroun	Cameroon Olive Pigeon	<i>Columba sjostedi</i>
Hirondelle de forêt	Forest Swallow	<i>Hirundo fuliginosa</i>
Bulbul à gorge grise	Grey-throated Greenbul	<i>Andropadus tephrolaemus</i>
Bulbul olivâtre	Cameroon Olive Greenbul	<i>Phyllastrephus poensis</i>
Cossyphé d'Isabelle	Mountain Robin-Chat	<i>Cossypha isabellae</i>
Cisticole à dos brun	Brown-backed Cisticola	<i>Cisticola discolor</i>
Prinia verte	Green Longtail	<i>Urolais epichlora</i>
Souimanga à tête bleue	Cameroon Blue-headed Sunbird	<i>Nectarinia oritis</i>
Gonolek à ventre jaune	Yellow-breasted Boubou	<i>Laniarius atroflavus</i>
Malimbe de Rachel	Rachel's Malimbe	<i>Malimbus racheliae</i>
Dos-vert à tête noire	Little Oliveback	<i>Nesocharis shelleyi</i>
Spatule d'Afrique	African Spoonbill	<i>Platalea alba</i>
Canard à bosse	Knob-billed Duck	<i>Sarkidiornis melanotos</i>
Balbusard pêcheur	Osprey	<i>Pandion haliaetus</i>
Baza coucou	African Cuckoo Hawk	<i>Aviceda cuculoides</i>
Bondrée apivore	Honey Buzzard	<i>Pernis apivorus</i>
Milan des chauves-souris	Bat Hawk	<i>Macheiramphus alcinus</i>
Elanion blanc	Black-shouldered Kite	<i>Elanus caeruleus</i>
Elanion naucleur	African Swallow-tailed Kite	<i>Chelictinia riocourii</i>
Pygargue vocifer	African Fish Eagle	<i>Haliaeetus vocifer</i>
Palmiste africain	Palm-nut Vulture	<i>Gypohierax angolensis</i>
Vautour percnoptère	Egyptian Vulture	<i>Neophron percnopterus</i>
Vautour charognard	Hooded Vulture	<i>Necrosyrtes monachus</i>
Vautour africain	African White-backed Vulture	<i>Gyps africanus</i>
Vautour de Rüppell	Rüppell's Vulture	<i>Gyps rueppellii</i>
Vautour à tête blanche	White-headed Vulture	<i>Trigonoceps occipitalis</i>
Circaète cendré	Western Banded Snake Eagle	<i>Circaetus cinerascens</i>
Gymnogène d'Afrique	African Harrier Hawk	<i>Polyboroides typus</i>
Busard cendré	Montagu's Harrier	<i>Circus pygargus</i>
Busard des roseaux	European Marsh Harrier	<i>Circus aeruginosus</i>
Autour gabar	Gabar Goshawk	<i>Micronisus gabar</i>
Autour sombre	Dark Chanting Goshawk	<i>Melierax metabates</i>
Autour à flancs roux	Chestnut-flanked Sparrowhawk	<i>Accipiter castanilius</i>

Epervier shikra	Shikra	<i>Accipiter badius</i>
Epervier de Hartlaub	Western Little Sparrowhawk	<i>Accipiter erythropus</i>
Epervier de l'Ovampo	Ovampo Sparrowhawk	<i>Accipiter ovampensis</i>
Autour noir	Black Sparrowhawk	<i>Accipiter melanoleucus</i>
Autour à longue	Long-tailed Hawk	<i>Urotriorchis macrourus</i>
Busautour des sauterelles	Grasshopper Buzzard	<i>Butastur rufipennis</i>
Autour unibande	Lizard Buzzard	<i>Kaupifalco mongrammicus</i>
Buse variable	Common Buzzard	<i>Buteo buteo</i>
Buse féroce	Long-legged Buzzard	<i>Buteo buteo rufinus</i>
Buse d'Afrique	Red-necked Buzzard	<i>Buteo auguralis</i>
Aigle pomarin	Lesser spotted Eagle	<i>Aquila pomarina</i>
Aigle criard	Greater Spotter Eagle	<i>Aquila clanga</i>
Aigle ravisseur	Tawny Eagle	<i>Aquila rapax</i>
Aigle des steppes	Steppe Eagle	<i>Aquila nipalensis</i>
Aigle de Wahlberg	Wahlberg's Eagle	<i>Aquila wahlbergi</i>
Aigle fascié	African Hawk Eagle	<i>Hieraaetus spilogaster</i>
Aigle d'Ayres	Ayres's Hawk Eagle	<i>Hieraaetus ayresii</i>
Aigle huppard	Long-crested Eagle	<i>Lophaetus occipitalis</i>
Aigle de Cassin	Cassin's Hawk Eagle	<i>Spizaetus africanus</i>
Aigle couronné	Crowned Eagle	<i>Stephanoaetus coronatus</i>
Aigle martial	Martial Eagle	<i>Polemaetus bellicosus</i>
Faucon crécerelle	Common Kestrel	<i>Falco tinnunculus</i>
Crécerelle renard	Fox Kestrel	<i>Falco alopex</i>
Faucon ardoisé	Grey Kestrel	<i>Falco ardosiacus</i>
Faucon chicquera	Red-necked Falcon	<i>Falco chicquera</i>
Faucon kobez	Red-footed Falcon	<i>Falco vespertinus</i>
Faucon hobereau	European Hobby	<i>Falco subbuteo</i>
Faucon de Cuvier	African Hobby	<i>Falco cuvierii</i>
Faucon lannier	Lanner Falcon	<i>Falco biarmicus</i>
Faucon sacre	Saker Falcon	<i>Falco cherrug</i>
Faucon pèlerin	Peregrine Falcon	<i>Falco peregrinus</i>
Outarde arabe	Arabian Bustard	<i>Ardeotis arabs</i>
Outarde du Sénégal	White-bellied Bustard	<i>Eupodotis senegalensis</i>
Outarde à ventre noir	Black-bellied Bustard	<i>Eupodotis melanogaster</i>
Touraco à gros bec	Yellow-billed Turaco	<i>Tauraco macrorhynchus</i>
Touraco à huppe blanche	White-crested Turaco	<i>Tauraco leucolophus</i>
Effraie des clochers	African Grass Owl	<i>Tyto capensis</i>
Effraie du Cap	Barn Owl	<i>Tyto alba</i>
Petit-duc à bec jaune	Sandy Scops Owl	<i>Otus icterorhynchus</i>
Petit-duc scops	European Scops Owl	<i>Otus scops</i>
Petit-duc à face blanche	White-faced Scops Owl	<i>Otus leucotis</i>
Duc à crinière	Maned Owl	<i>Jubula lettii</i>
Grand-duc africain	Spotted Eagle Owl	<i>Bubo africanus</i>
Grand-duc à aigrettes	Fraser's Eagle Owl	<i>Bubo poensis</i>
Grand-duc de Shelley	Shelley's Eagle Owl	<i>Bubo shelleyi</i>
Grand-duc de Verreaux	Verreaux's Eagle Owl	<i>Bubo lacteus</i>
Grand-duc tacheté	Akun Eagle Owl	<i>Bubo leucostictus</i>
Chouette-pêcheuse de Pel	Pel's Fishing Owl	<i>Scotopelia peli</i>

Chouette-pêcheuse de Bouvier	Vermiculated Fishing Owl	<i>Scotopelia bouvieri</i>
Chevêchette perlée	Pearl-spotted Owlet	<i>Glaudicum perlatum</i>
Chevêchette à pieds jaunes	Red-chested Owlet	<i>Glaudicum tephronotum</i>
Chevêchette du Cap	African Barred Owlet	<i>Glaudicum capense</i>
Chevêchette à queue barrée	Sjöstedt's Barred Owlet	<i>Glaudicum sjostedti</i>
Chouette africaine	African Wood Owl	<i>Strix woodfordii</i>
Hibou du Cap	Marsh Owl	<i>Asio capensis</i>
Culba de Gambie	Northern Puffback	<i>Dryoscopus gambensis</i>

III- Reptiles

Noms Communs		Noms Scientifiques
Français	Anglais	
Python de Sébae	<i>African python</i>	<i>Python sebae sebae</i>
Python royal	<i>Royal python</i>	<i>Python regius</i>
Boa des sables de Müller	<i>Müller's sand boa</i>	<i>Gongylophis muelleri</i>
Python D88	<i>African burrowing python</i>	<i>Calabaria reinhardti</i>
Cobra égyptien	<i>Egyptian cobra</i>	<i>Naja haje haje</i>
Cobra cracheur de kati	<i>Spitting cobra</i>	<i>Naja katiensis</i>
Cobra de forêt, cobra noir et blanc	<i>Black mamba</i>	<i>Naja melanoleuca</i>
Cobra cracheur à cou noir	<i>Black cobra</i>	<i>Naja nigricollis nigricollis</i>
Faux cobra de goldi	<i>Green cobra</i>	<i>Pseudohaje goldi</i>
Cobra fouisseur	<i>Burrowing cobra</i>	<i>Paranaja multifasciata anomala</i>
Varan du nil	<i>African small-grain lizard</i>	<i>Varanus nicotilus</i>
Varan des savanes	<i>African savanna monitor</i>	<i>Varanus exanthematicus (= griseus)</i>
Varan orné	<i>Ornate monitor</i>	<i>Varanus ornatus</i>
Tortue de forêt	<i>Bell's hinged tortoise</i>	<i>Pelusios gabonensis</i>
Cinixys rongée	<i>Common tortoise</i>	<i>Kinixys erosa</i>
Cinixys de Home		<i>Kinixys homeana</i>
Tortue molle élégante	<i>Elegant turtle</i>	<i>Cyclanorbis elegans</i>
Tortue molle du Sénégal	<i>Senegal turtle</i>	<i>Cyclanorbis senegalensis</i>
Tortue plate africaine	<i>African turtle</i>	<i>Trionyx triunguis</i>
Cnemaspis de Perret (Gekos)		<i>Cnemaspis dilepis</i>
Gecko africain à queue grasse	<i>African fatty tail Gecko</i>	<i>Hemitheconyx caudicinctus</i>
Lygodactyle de Perret	<i>Stone lygodactyle</i>	<i>Lygodactylus dysmicus</i>
Gecko arboricole palmé	<i>Palm dwelling Gecko</i>	<i>Urocotyledon palmatus</i>
Gecko arboricole de Weiler	<i>Aboreal Gecko</i>	<i>Urocotyledon weileri</i>
Agame de Mehely (Lézard Agama)	<i>Agama lizard</i>	<i>Agama mehelyi</i>
Caméléon africain (Caméléons)	<i>African chameleon</i>	<i>Chamaeleo africanus</i>
Caméléon du Cameroun	<i>Cameroon chameleon</i>	<i>Chamaeleo camerunensis</i>
Caméléon à crête	<i>Crested chamaleon</i>	<i>Chamaeleo cristatus</i>
Caméléon à cape	<i>Flap necked chamaleon</i>	<i>Chamaeleo dilepis dilepis</i>

Caméléon gracile	<i>Graceful chamaleon</i>	<i>Chamaeleo gracilis gracilis</i>
Caméléon de montagne	<i>Cameroon saiffin chamaleon</i>	<i>Chamaeleo montium</i>
Caméléon à 3 cornes	<i>Owen's three horned chamaleon</i>	<i>Chamaeleo oweni</i>
Caméléon du Sénégal	<i>Senegal chamaleon</i>	<i>Chamaeleo senegalensis</i>
Caméléon de Weindersheim du Nord	<i>Mount Lefo chamaleon</i>	<i>Chamaeleo weindersheimi weindersheimi</i>
Caméléon nain	<i>Dwarf chamaleon</i>	<i>Rhampholeon spectrum spectrum</i>
Grand gerrhosaur		<i>Gerrhosaurus major zechi</i>
Scinque à œil de serpent d'Afrique	<i>African snake eyed skink</i>	<i>Afroablepharus duruarum</i>
Scinque de Chris Wild	<i>Chris wild skink</i>	<i>Lacertaspis chriswildi</i>
Scinque d'Amiet	<i>Amiet skink</i>	<i>Leptosaiphos amieti</i>
Scinque de Fuhn	<i>Fuhn skink</i>	<i>Leptosaiphos fuhni</i>
Scinque jaune et violet	<i>Yellow and purple skink</i>	<i>Leptosaiphos iantinoxantha</i>
Scinque de Koutou	<i>Koutou skink</i>	<i>Leptosaiphos koutoui</i>
Scinque de Paulian	<i>Paulian skink</i>	<i>Leptosaiphos pauliani</i>
Scinque à vingt raies	<i>Striped skink</i>	<i>Leptosaiphos vigintiserierum</i>

Article 4 : (1) La classe C comprend les mammifères, reptiles et batraciens autres que celles des classes A et B et les oiseaux de l'annexe III de la CITES.

(2) Ces espèces sont partiellement protégées, leur capture et leur abattage sont réglementés afin de maintenir la dynamique de leurs populations.

Article 5 : Les petits des animaux de ces trois classes ainsi que les œufs des oiseaux des classes A et B bénéficient du régime de protection de la classe A.

Article 6 : Sous réserve des dispositions contraires prescrites par des textes spécifiques nationaux, sont automatiquement prises en compte dans la classification nationale :

- En classe A, les espèces de l'Annexe I de la classification CITES et les espèces appartenant aux groupes dits éteints à l'état sauvage, en danger d'extinction, en danger, vulnérable au regard de la classification de l'UICN ;

- En classe B, les espèces de l'Annexe II à l'exception de celles déjà admises en classe A au niveau national de la classification CITES et de celles des groupes dits quasi menacés aux préoccupations mineures des catégories de l'UICN ;

- En classe C, les espèces de l'Annexe III à l'exception de celles déjà admises en classe B ou A au niveau national de la classification CITES ou appartenant au groupe de préoccupations mineures selon l'UICN.

Article 7 : La présente répartition par classe de protection sera actualisée au moins une fois tous les cinq ans après avis motivé d'une commission technique et scientifique ad hoc mise en place par le Ministre en charge de la faune.