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ENVIRONMENTAL IMPACT ASSESSMENT OF THE FOREST MANAGEMENT UNIT N°11004

NON TECHNICAL REPORT FOR THE GENERAL PUBLIC

April 2008



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INTRODUCTION

This document is the version of the environmental impact assessment of the Forestry Management Unit (FMU) No. 11 004 for the general public. More consistent than the non-technical summary required in the study, this version synthesizes in a non-technical vocabulary, the content of all the environmental impact study.

It aims at ensuring the better participation of forest adjacent populations in the process, since it requires the reading of documents. The full environmental impact study report is very voluminous and contains technical language not accessible to the general public.

The document carries the following issues:

- The presentation of the project promoter and other actors;
- The objectives, context and methodology of the study;
- The description of the project;
- The initial state of the environment;
- The brief presentation of the environmental management plan.

1. PRESENTATION OF THE PROJECT PROMOTER AND OTHER ACTORS

1.1. The promoter: SEFECCAM

The project promoter is the *Société d'Exploitation Forestière et Commerciale Camerounaise* (SEFECCAM), P.O.Box 3139 Douala, Tel.: 33 43 25 94; Fax: 33 43 25 95; which is a Limited Liability Company (SARL), an entirely legally constituted Cameroonian owned capital. It signed an industrial partnership agreement with the Transformation Reef Cameroon (TRC) for processing of part of the timber produced in its forest concession.

The FMU N° 11 004 and FMU 11003 are part of the forest concession N° 1089 attributed to SEFECCAM by provisional convention N° 0612/CPE/MINFOF/SG/DF/SDAFF of 5 December 2006.

1.2. The industrial partner: TRC

Transformation Reef Cameroun (TRC) is a company with a capital of 110 000 000 FCFA francs operating in Cameroon since 01/07/1999. It was approved for forestry profession since February 2002, by decree N° 005/CAB/PM of 05/02/02. TRC has its headquarters in Ndogbong, Douala. It has two wood processing plants with one in Douala and the other in Kumba. Its finished products are sold in the Netherlands market, were its main shareholders are established.

TRC is strongly committed to the forest certification which is an indicator of sustainable forest management. To that end, it obtained in February 2008 the certificate of Forestry Stewardship Council (FSC) for its FMU N° 00004 located in the Central and Littoral provinces of Cameroon.

1.3. The Consultant: CARFAD

For this environmental impact study, SEFECCAM commissioned the African Centre for Applied Forestry Research and Development (CARFAD) which is an organisation approved by the Ministry of the Environment and Nature Protection (MINEP) to the carry out environmental impact assessments and environmental audits. CARFAD is based in Yaounde and with address: P.O box: 885 Yaoundé; Tel.: (237) 22 31 08 92, E-mail: carfadcameroun@yahoo.fr.

For the study, CARFAD has constituted a team comprising experts in various profiles composed as follows:

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- **Benjamin TCHOFFO**, Forestry and Wildlife Engineer, Professional M.Sc. in Environmental management, head of mission;
- **MABOUL EBANGA Eustache Marie Aimé**, Psychosociologist, expert in charge of socio-economic aspects;
- **NANDA DJOMO Raymond**, Forestry and Wildlife Engineer , Professional M.Sc in wildlife management in tropical environments; expert in charge of the wildlife issues;
- **TSITCHOUACH Madeleine**, Forestry and Wildlife Engineer, expert in charge of issues concerning forest management.

2. OBJECTIVES, BACKGROUND AND METHODOLOGY OF THE STUDY

2.1. Objectives of the study

The objective of this study is to determine the advantages and disadvantages of the FMU N°11 004 operations on men and their economic activities and on the physical and biological environment (soil, air, water, plants, etc.). It also aims at identifying measures to maximize the advantages and measures to prevent, reduce or compensate for disadvantages.

2.2. Background of the study

In legal terms, the study of environmental impact is governed by a set of laws and regulations concerning environmental protection, forest management or natural resources management in general. The most specific in relation to this study are:

- Law N° 96/12 of 5 August 1996 (framework law) on environmental management;
- Law N° 94/01 of 20 January 1994 governing forests, wildlife and fisheries;
- Decree N° 2005/0577/PM of 23/02/2005 laying down modalities of carrying out environmental impact assessments;
- Order N° 0070/MINEP of 22 April 2005 fixing the various categories of projects whose implementation is subject to an environmental impact assessment.

As far as the institutional context is concerned, several institutions are affected by this environmental impact study, either during the study phase or the implementation phase. These institutions are:

- The Ministry of the Environment and Nature Protection (MINEP);
- The Ministry of Forestry and Wildlife (MINFOF);
- The Interministerial Committee on the Environment (ICE).

Geographically, the FMU N° 11 004 with an area of 15 434.4 ha is located entirely in Manyu Division in the South-West Province. It covers more specifically the Mamfe and Akwaya sub-divisions.

In ecological terms, the FMU N° 11 004 is part of the Guinea-Congolese Centre of endemism. Located to the South of the Takamanda Reserve after the agroforestry area, it shares a limit in the North-East with Mawne Reserve.

As regards the socio-economic context, the FMU N°11 004 is surrounded by 8 villages. People in the villages live mainly on agriculture, but derive a significant portion of products needed for their diet from the natural resources (game, fish and other NWFP).

2.3. Methodology used

To conduct the study, CARFAD had to consult documents on the subject at the level of the promoter and specialized agencies, including the Institute for Research and Development (IRD), the National Institute of

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Cartography (INC) and the documentation centre of WWF. Documents were also consulted over the Internet.

Working guides have been made to prepare the field mission which took place in three stages. The first stage was to plan in a participatory manner the public consultations with the various stakeholders; including people living close to the FMU, administrative and traditional authorities and the civil society (the field mission took place from 14th to 18th March 2007). A programme of public consultations was developed during this mission. This as well as the memoir for the description and explanation of the project has been submitted for approval to MINEP. The second stage was to notify the programme of public consultations to parties concerned in making sure that the interval between the date of notification and holding the first meeting is at least one month as required by Decree N° 2005 / 0577/PM of 23/02/2005 laying down the modalities of carrying out environmental impact assessment. The final stage consisted of carrying out proper public consultations which took place from 02 to 11 May 2007. The photos below show a few meetings during public consultations.



Photo 1: Meeting with Administrative and Council authorities and the Civil society of Manvu



Photo 2: Meeting with the Okpambe local population

The various data collected were then analysed which allows the production of the report which is exposed to public hearings .

3. PROJECT DESCRIPTION

3.1. Objective of the project

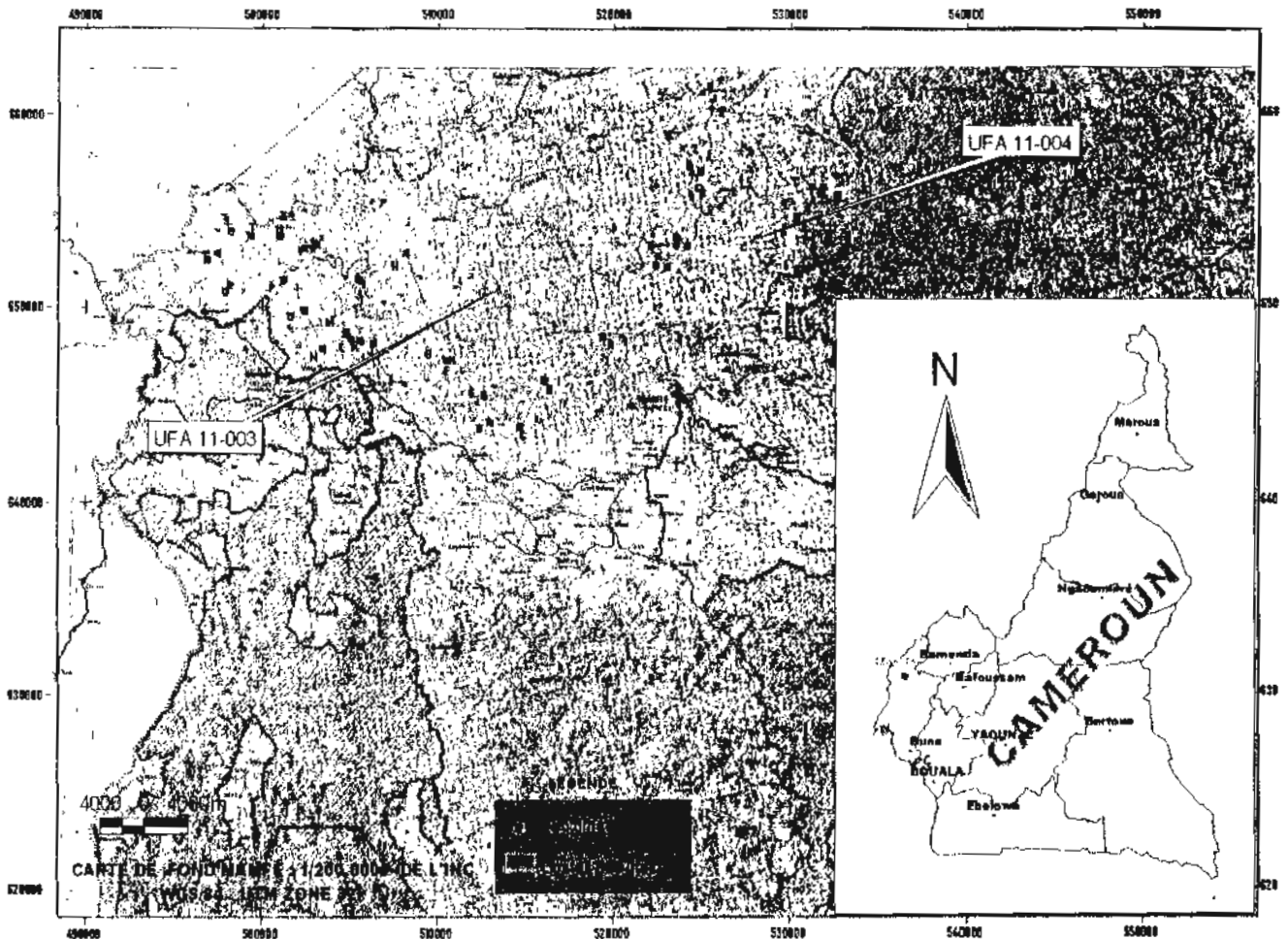
The main objective in the short and long term development of the FMU N° 11 004 is to produce in a sustained manner, timber for the supply of raw materials to wood processing units located in Kumba and Douala and to export logs of certain species abroad.

3.2. Locating the FMU N°11 004

The FMU N° 11 004 is located about 15 km northeast of Mamfe town, in the Manyu Division, South-West Province. It sits on the territory of two subdivisions: that of Mamfe Central and that of Akwaya. It covers an

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area of 15 434.4 ha and forms with the FMU° 11 003 (32 495.6 ha), the forest concession N° 1089, whose location is identified on the map next page¹.



Map 1: Locating the FMU N°11 004

3.3. Project duration

The FMU N° 11 004 forms with FMU N° 11 003, concession N° 1089, the first passage of exploitation is planned for a period of 30 years.

3.4. Description of project activities

Activities related to the exploitation of the FMU N° 11 004 include (i) the installation of the company in the project locality, (ii) maintenance of roads, the opening of the access road and other forest tracks and (iii) the logging proper.

- The installation of the company in the locality

¹ FMU N° 11 003 has been subject to a separate environmental impact assessment.

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SEFECCAM and its industrial partner TRC are at their first site in the area. Due to job provision, SEFECCAM and its industrial partner TRC are convinced that the arrival of a new project in an area will lead to the revitalization of economic activities; they have chosen to allow workers to stay in Mamfe Town or in villages to maximize the impact of the project.

- Road maintenance, opening of the access road and other forest tracks

Road maintenance is planned among other activities of the logging company. Thus, it has already begun on the road from Mamfe to the FMU. It will continue throughout the project. In addition, to access the FMU and more precisely the first based annual coupe (AAC), the opening of an access road three kilometres from the Kesham village is necessary. More, service tracks will be opened inside the forest to facilitate the extraction of harvested wood.

- Logging proper

Logging proper includes:

- delimitation and materialization of FMU limits, it is by opening 2 m - wide enumeration paths and the establishment of milestones marked with oil paint;
- conduct a forest management inventory;
- delimitation of harvesting blocks;
- socio-economic studies;
- environmental impact assessment;
- treatment of the data set and production of the management plan.

For the moment, the delimitation and materialization are the only activities that have actually already begun.

The other logging activities include: marking and felling, skidding, the loading and hauling of timber.

3.5. Labour used

To operate the concession, the industrial partner TRC uses on the site 40 people, all categories combined. The logging operations have been subcontracted to OYE and Company a logging company, which has a work force of 38 persons with 33 permanent and 5 temporary.

3.6. Production residues, waste and various nuisances

Logging is generally accompanied by very large residues, often abandoned in the forest which could be recovered. Apart from these, wastes are also found, namely:

- household waste with little importance, given the small number of workers;
- solid waste (metal rods, wires and worn mechanical parts, tires and worn out batteries, oil containers, paints and other products, etc.);
- liquid waste (oils, paint remains);
- the smoke and dust resulting from the operation and the movement of vehicles on the hand and from road maintenance on the other.
- noise caused by logging operations (hum of chain saws and felling trees, movement of equipment and vehicles).

There are no plans to treat wood on the site; therefore, the harvested timber will be transported to the processing units without the use of any chemical.

4. DESCRIPTION OF THE INITIAL STATE OF THE ENVIRONMENT

4.1. Delimitation of the study area

The study area has been divided into two zones. The first zone is the one which receives the direct impacts of the project. It includes the villages at the periphery or inside of the FMU. The second zone is the one with indirect impacts. It includes the Manyu division and all areas that are indirectly related, notably the Mamfe - Kumba - Douala road which will help transport the logs and processed wood.

The following table shows the different villages forming part of the direct influence zone of the project.

Tableau 1: Villages found in the direct influence zone of the Project

Council	Village	Localisation
Akwaya	Okpambe	Inside the Forestry Management Unit
	Bache	Periphery of the FMU
	Nyang	Inside the FMU
	Mukoyong	Periphery of the FMU
	Kesham	Periphery with farms inside the FMU
Mamfé	Egbekaw	Periphery of the FMU
	Eshobi	Periphery of the FMU
	Bombe	Periphery of the FMU

4.2. Physical environment

Climate: The Manyu Division is in a zone with north coastal equatorial climate type with two seasons: a rainy season which runs from mid-March to mid-November and a dry season which runs from mid-November to mid - March. The average rainfall is around 3 300 mm per year and the monthly average temperature oscillates around 26°C.

Relief: The study area can be divided into two sub zones: the region of lower altitudes encountered in Mamfe gorge drained by the Cross River and more particularly at Ekok in Eyumojock subdivision where the altitude is 100 m. The region of high altitude includes the Akwaya high plateau whose altitude is around 600 m and rises up to 1400 m.

Geology and soil: From a geological view point, the area is constituted of a series of Precambrian basement, volcanic series in the East and South and sedimented fields corresponding to deposits of the former Gulf of Mamfe.

The soils of the study area are essentially ferrallitic. Under the influence of climate, soils have suffered differences in physical conditions giving yellow and red soils, which occupy a large part of the study area.

Hydrography: The project area is part of the Cross River basin much of which lies in Nigeria. Regarding the FMU N° 11 004 in particular, it is drained by a river system with very dense rivers that flow irregularly. These small rivers belong to three sub catchments of the Cross River:

- the Munaya north of the FMU with main tributaries the Mawane and Mabeme Rivers;
- the Mam River with main tributaries the Mbuley and Mam Rivers;
- the Manyu Mabume with its tributary, which drains the eastern part of the FMU.

4.3. Biological environment

Vegetation and flora: the study area is part of the dense humid evergreen forest. Because human activities developed in the area, it encounters secondary forests characterized by the presence of residual timber species, more or less linked to humans (hardwood retained, non-forest product wood).

Fauna: The FMU N° 11 004, adjacent to the Mawne Reserve and very close to the Takamanda Reserve, harbours a very rich and diversified fauna, consisting of mammals, birds, fish, reptiles, and so on.

Among the large mammals encountered in the region are the gorilla, forest elephant, the chimpanzee, drill, forest buffalo, antelopes and rodents of different species. A species of gorilla, notably the Cross River Gorilla is endemic to the region.

The primates and rodents colonize degraded forests and the nearby farms where they cause great damages on crops.

The area harbours about 313 species of birds. Specific studies have not been carried out in the FMU N° 11 004, but those made in the Takamanda Forest Reserve adjacent to the FMU show that 2 species of birds are vulnerable, 9 are endangered, one in extinction and other species have a limited range.

With the presence of many rivers, the area has several species of fish. Thus, 54 species of freshwater fish have been identified.

It was identified nearly 81 species of reptiles in the area, representing 30% of species identified in Cameroon. Some species are endemic and other threatened. Among the endangered species, are the Africa dwarf crocodile and the Nile crocodile.

To safeguard the biological resources, the state has created several protected areas in the department of Manyu. They are:

- The Ejagham Forest Reserve founded in 1936, recently converted into a FMU;
- The Nta ali Forest Reserve created in 1935 (the management plan is in the process);
- The Takamanda Forest Reserve created in 1934, which awaits transformation into a national park;
- The Mawne Forest Reserve created in 1951;
- The Kywane Gorillas sanctuary.

This vast network of protected areas shows the great richness of biodiversity in the project area which needs protection. This is what explains the presence of organisations such as WWF and the WCS involved in conservation.

4.4. Human environment

Demography and ethnic groups: The total population of villages bordering the FMU is around 8400 inhabitants. The immediate environment is made up of eight villages of which five (Okpambe, Bache, Nyang, Mukonyong and Kesham) are located in the Akwaya Subdivision and three (Egbekaw, Eshobi and bomb) in Mamfe Central Subdivision.

The population of the project area consists of two main ethnic groups, notably the Ajang or Anyang and the Bayangi. The Anyang are found in Okpambe, Bache, Nyang, Eshobi, Mukonyong, Kesham and Bombe villages whose main clan is called "Eyungowaa", the language is Denya (Nyang, Eshobi, Mukonyong). The Egbekaw village is composed of Bayangi whose clan is called "Mforteh."

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Economics: The inhabitants of the project area are mostly farmers and fishermen. However, there are also some traditional farmers, traders and civil servants. With regard to agriculture, cocoa, coffee and palm oil are cash crops in the region. Food crops are groundnuts, plantains, bananas, cassava, maize and beans. The products of these crops are hardly sold outside these areas because of the advanced state of deterioration of roads.

Livestock is poorly developed and concerns mostly chickens, pigs, goats, ducks and bees. Villagers use almost no veterinary products.

Hunting is moderately developed in the study area. The main products are porcupines, hedgehogs, duikers, pangolins, monkeys, antelopes and chimpanzees. People use guns and also hunt with dogs trained to that effect. Generally, the products of hunting are consumed locally, but can also be sold directly by hunters.

Fishing is practised mainly in the rivers in the FMU and in Manyu River. People use hooks, baskets and nets. Small rivers are also blocked for fishing in the dry season. The fish species include catfish, tilapia, "Dog fish", "Cover pot" and "Corocoro nose."

Some villages have market places with strong commercial activity (Bache and Mukonyong). But the biggest market is in Mamfe. The proximity of the study area with Nigeria led to the trade in vehicles spare parts, pharmaceuticals and petroleum products (Gas oil, petrol, etc.).

Craft work is also a quite important economic activity. Different items are made and sold: baskets, hoods for the collection of forest and field products, canaries, potteries, dishes, cups and nets made by hand. Despite the diversity of products, this craft work is still poorly developed.

Infrastructures and sociocultural equipment: As far as communication infrastructure is concerned, only Egbekaw village has an extensive communication network: there are cable distributors who supply several foreign television and local channels (CRTV, CANAL 2 and STV). There is a local radio station in Mamfe (Voice of Manyu), which broadcasts in English and Pidjin-English. Other villages have access only to foreign radios.

The road network is insufficient. For example, Okpambe and Nyang are two neighbouring villages distant from one another at less than 3 km. But to reach these 02 villages by car, one must pass through Kesham by making a distance of more than 50 km. Moreover, this road network is in very poor condition.

In terms of school infrastructures, most schools are built with solid materials. All schools are full cycle. There are approximately 10 primary schools and 2 public kindergartens, 1 primary school and nursery schools confessional 2 (Apostolic and full gospel), 1 Normal School Teachers of the General Education (ENIEG).

The direct impact zone is characterized by the scarcity of health facilities near the villages. The Manyu pharmacy in Mamfe is the only one that feeds the area. With this situation, people purchase pharmaceutical products at roadsides. There is a district hospital in Mamfe with four doctors. There are also 30 contract staff (nurse aids, nurses and State graduated nurses) paid from revenues of the hospital.

The most frequent diseases within the project zone are: malaria, bacillary dysentery, typhoid and cholera. According to the Coordinator of the Provincial Technical Group for the fight against HIV/AIDS for the South-

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West Province, the prevalence rate of HIV/AIDS is about 8% with a prevalence rate of 11% for women and 5.1% for men.

People fetch water from natural springs, streams and wells. The only village served by the SNEC network is Egbekaw. People believe that the cost of water is still very high and a significant fringe of the population continues to fetch water from springs or rainwater.

The main source of energy in the area is firewood. People use kerosene lamps and traditional torches (old milk cans with wick passed through a made hole). As in the case of piped borne water, the Egbekaw village is the only village served by AÉS-SONEL. Here, the current is very unstable and is subject to unnotified light seizures.

5. IMPACTS OF THE PROJECT AND ENVIRONMENTAL MEASURES PROPOSED

The impacts were identified and analysed with a specific method taking into account the proposals of forest adjacent populations made during public consultations meetings, field observations and experience gained by the team of experts in environmental management of other projects.

5.1. Impacts on the physical environment

Air pollution (negative impact): The movement of vehicles and machines, the opening of the access road, wood parks and borrowing pits, and road maintenance activities during the dry season will lead to production of dust. Similarly, the usage of vehicles and machines will result in emissions of gases in the air. The dust and gas emissions are likely to contribute to air pollution. This can be harmful to people who are mostly located along the road and to workers on sites that might produce these emissions.

The mitigation of this impact is the limitation of dust and gas. It consists of:

- Wearing a workers masks at all sites of work likely to produce dust;
- Limiting the speed of vehicles and some machines when crossing populated areas;
- A regular and proper maintenance of vehicles and machines.

Disturbance of the physical properties of the soil (negative impact): The opening of the access road, forest track, borrowing pits and wood parks will lead to the compaction of the soil due to repeated passage of vehicles and machines. It will result in a disturbance of soil properties. At the level of borrowing pits in particular, the removal of laterite will leave to a stony surface that will hardly tolerate vegetation growth.

The mitigation measure of this impact consists of:

- Limiting the opening of surfaces to a strict minimum necessary;
- Removing of the topsoil throughout its thickness and on all temporary used sites (wood parks, borrowing pits) and usage afterwards;
- Rehabilitation of sites at the end of their use by spreading organic topsoil stored in order to promote natural regeneration.

Soil erosion (negative impact): During the opening of the access road, forest tracks, borrowing pits and wood parks, the soil is robbed of its vegetation cover and hence exposed. This soil devoid of any protection is subject to erosion during the rainy season.

The mitigation measures of this impact consist of:

- Removing of the topsoil throughout its thickness and on all temporary used sites (wood parks, borrowing pits) and usage afterwards;
- Rehabilitating the sites at the end of their use by spreading organic topsoil stored in order to promote natural regeneration.
- Establishing and maintaining an adequate system for permanently runoff evacuation.

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Soil pollution (negative impact): The soil is likely to be not only polluted by oil spills, used oils during maintenance operations of vehicles and equipment, but also by the release into nature of worn out cables and other waste from maintenance of vehicles and machines on site (filters, tires, old batteries).

To prevent soil pollution, environmental measures recommended are:

- To cover the hydrocarbons storage facilities with tarpaulin or plastic to prevent the runoff from accidental spills;
- To make provision in the contract for the oil purchase, of the withdrawal of used oil by the supplier;
- To systematically remove the cables used and other waste from vehicle maintenance and carry recycle them.

Noise pollution (negative impact): The noise level in the project area may rise because of logging activities, felling of trees, opening the access road and forest tracks and especially the maintenance of chainsaws. The personnel exposure to noise may affect their hearing.

The mitigation of this impact is to minimise the noise to protect workers exposed and preserve the tranquility of forest adjacent populations. To do so, the company needs to:

- Provide workers especially those working with chainsaws with ear gadgets;
- Outlaw night maintenance of chainsaws.

Surface water pollution (negative impact): The oil spills during maintenance operations of vehicles and machines as well as the supply of oil and lubricants can be trailed to waterways by runoffs. In addition, the opening of the access road, borrowing pits and wood parks will weaken the soil and cause the departure of soil particles to be deposited in rivers during the rainy season. The latter will lead to siltation. It follows, therefore, pollution of surface waters.

To mitigate this impact, the same measures proposed in the fight against soil erosion remain valid. But in addition, the company shall:

- Divert runoff to a vegetated area at a minimum distance of 30 metres of rivers, in accordance with Article 39 of manual of intervention in forests milieu;
- Cover with tarpaulin or plastic drainage areas and have a tank recovery of used oils;
- Spread a layer of sawdust to absorb oil spills.

Disturbance of water flow and hydrological regime (negative impact): The disturbance of the system of drainage is linked not only to the opening of the access road and other forest tracks, but also to the felling of trees. The first two cause siltation of rivers while branches abandoned on the river bed obstruct it and create lakes upstream. These lakes upstream will cause the death of the vegetation.

To mitigate this impact, the following measures must be implemented by the Company:

- Avoid depositing poor quality soil near rivers (not less than 30 m);
- Create several spoon drains upstream and divert the runoff in vegetation area;
- Remove from the rivers debris after cutting operations in accordance with Article 21 of the manual of intervention in the forest milieu;
- Avoid obstruction of the waterways during the road maintenance.

Ground water pollution (negative impact): With the rains, the products of soil pollution (oil and lubricants, used oils) can be leached into the depths to pollute groundwater.

Mitigation measures advocated for soil pollution are also valid at this level.

Decrease in level of the water table (negative impact): Tree felling activities will cause the decrease of forest cover. This reduction will promote runoff water which will result in the early dry up of water sources and streams and possibly lower the level of groundwater.

The mitigation measures of this impact will be:

- During the felling of trees, keep intact an edge of at least 30 metres from the flood plain line;
- Reduce to an absolute minimum opening sites for temporary use;
- Rehabilitate sites in order to encourage regeneration of vegetation.

5.2. Impacts on the biological environment

Loss of vegetation cover (negative impact): Several project activities will lead to the destruction of vegetation cover. These include the opening of the access road and other forest tracks, deforestation on borrowing pits and wood parks. In addition, the opening of the access road in the non-permanent forest estate may lead to the development of the slash and burn agriculture that is recognized as one of the main causes of deforestation.

To mitigate this impact will require:

- Plan the road network in the FMU, which will reduce the density of the network and the destruction of the forest ecosystem;
- Limit the influence of the road and the opening of temporary sites to use (borrowing pits and wood parks) to the bare minimum necessary;
- Sensitize local populations on good agricultural practices;
- Use environmentally friendly logging techniques;
- Regenerate open sites after logging.

Decrease in Non-Timber Forest Products (NTFPs) useful to the populations (negative impact): The felling of trees, opening up of access road, forest tracks, wood parks and borrowing pits will probably cause the destruction of medicinal plants and other NTFPs. All this will contribute to reducing the quantity of NTFPs useful to the local population.

To mitigate the impact of logging on NTFPs, the Company will:

- Identify carriers of NTFPs trees with the help of local people and preserve them as much as possible. This work must be done during inventories and the results must be taken into account in the management plan;
- Sensitize local communities on the establishment of NTFPs tree nurseries;
- Train local communities on the establishment of nurseries;
- Ensure the supply of seeds for nurseries.

Expulsion of wild animals (negative impact): The felling operations, skidding, opening the access road, skid trails and wood parks as well as maintenance of machines and other equipment will produce noise likely to disturb the animals and will distance them from the logging site.

To mitigate this impact, the company shall avoid night chainsaws maintenance operations. Moreover, existing limits of annual coupe established in the management plan, must be scrupulously respected. In addition, it is recommended the closure of skid trails after the logging operation of each zone.

Destruction of wildlife habitat (negative impact): The opening of the access road, forest tracks and wood parks will lead to the destruction of habitats of wild animals. Similarly, habitats and spawning areas for aquatic fauna can be destroyed by the products of erosion that might invade rivers, thereby undermining the reproduction of fish. In addition, trees felling, opening up of forest tracks and the creation of wood parks will diminish the sources of animal feed, fragment or destroy their habitat. Finally, the felling of some trees whose products are consumed by animals or serve as habitat will lead to their departure.

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The mitigation of this impact will be:

- Limit the areas opened to a bare minimum. To this end, the management plan must take account of enough spaces visited by animals;
- Follow measures advocated in the manual of intervention in the forest milieu with respect to the waterways;
- Identify hideouts of threatened animals during the forest exploitation inventories so as to preserve them while logging.

Decrease of certain plant species (negative impact): Logging often focuses on a few species causing skimming the forest. This will threaten the most valued species and may contribute to their disappearance. This is notably the case of rare species already in place such as Moabi and Ebony.

To mitigate this impact, the company shall preserve the reproductive plants during the operation. These will promote the regeneration of these species.

Diminution of wildlife biodiversity (negative impact): The opening of the access road and forest tracks inside the forest will inevitably facilitate the access of the forest to poachers who can use equipment such as vehicles, motorcycles and other means to penetrate the most remote areas of the forest, to hunt and transport large quantities of animals. Among the animals which may be hunted, there are endangered species. Increasing the pressure on these animals could lead to their disappearance. Fear is being expressed on the impact on the Cross River Gorilla variety, which is endemic to the region.

To mitigate this impact will require:

- Identifying protected species and endangered species existing in the area;
- Educating people about the importance of protecting these species;
- Supporting local services of MINFOF in the fight against poaching.

5.3. Impact on the human environment

Risk of accidents (negative impact): Several project activities are likely to cause accidents. The felling of trees threatens the lives of fellers, the opening of access roads and other forest tracks endangers the lives of machines' drivers, the transportation of logs and movement of vehicles and machines threatens the lives of local populations. The danger is particularly higher at the level of villages and schools. With the road maintenance, vehicles will tend to drive faster; the risk of accidents is even greater because the road has no signs boards.

To mitigate this impact will require:

- Limiting speeds to 40 km/h while crossing the villages and particularly schools;
- Building speed breaks at the entrance and exit of nearby villages, bridges and around social infrastructures (schools, health centres, etc.);
- Installing signs boards at dangerous zones (bends, schools, intersections and bridges);
- Educating residents and transporters (including motorcycle taximen) on the consequences of the increase in speed due to the improvement of road conditions;
- Training trees fellers on direction felling;
- Giving the staff adequate protective equipment (helmets, safety shoes, etc.);
- Reinforcing security in machines with suitable material.

Job creation and income increase (positive impact): The exploitation of the FMU will offer job opportunities to local populations. The recruitment of local labour will contribute to reducing the rate of youth unemployment in villages found in the project area. But, a particular qualification may be required for certain posts. These job opportunities are expected by local communities. Anyway, these jobs will lead to an increase

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in revenue at local level, particularly in promoting the development of small businesses, as well as improved housing, which can then be rented by foreign labour.

To maximize the impact, the company shall:

- favour recruitment of local labour if local people have required qualifications and this in all villages affected by the project;
- Make a transparent recruitment policy;
- Inform people about the job opportunities available to them;
- Paste job offers in public places with high attendance, in this case chiefdoms, markets and churches.

Risk of destruction of crops (negative impact): The opening of the access road and other forest tracks, borrowing pits for the maintenance of the road and felling operations and skidding may lead to the destruction of crops. The threat is particularly true for Nyang and Okpambe villages which are located inside the FMU and the Kesham village which has plantations within the FMU. The threat is also true for people who have plantations on the outskirts of the FMU. The fall of misguided trees may lead to the destruction of certain crops located on the periphery of the FMU.

To mitigate this impact, the company shall:

- Proceed to directional felling of trees;
- Avoid the maximum passages in areas with crops;
- Compensate owners of destructed crops in accordance with the regulations in force or by an amicable agreement if possible.

Development of agricultural activities and livestock (positive impact): The maintenance of roads and bridges will facilitate the development of agricultural activities. It will also increase income of people in the region because of the presence of the workforce which will increase demand for agricultural products. This demand will certainly induce the development of agricultural activities and livestock in the region. Similarly, the road maintenance will enable people to evacuate without difficulties the products of their farms. Ultimately, it will lead to a revitalization of agriculture in the project area.

The maximization of this impact entails:

- Educating people on new economic opportunities offered by the project;
- Supporting the agricultural micro-projects if possible;
- Encouraging people to work better in order to qualify for benefits due to the presence of foreign personnel and maintenance of roads and bridges.

Development of other economic and social activities (positive impact): The project will facilitate the development of economic activities, notably the small-scale trading. Similarly, income from the exploitation of the FMU (Annual Forest Fee: AFF) will help boost economic activities, particularly by conducting community projects. The development of economic and social activities represents a very positive impact expected in the adjacent villages.

The optimization measures for this impact will be:

- Educate local people on new development opportunities offered by the project;
- Support local communities in establishing management committees in charge of projects elaboration and management in order to well use the Annual Forest Fee.

Influence on cultural and archaeological heritage (negative impact): A study of the potential archaeological site is not available. However, it is always possible that archaeological remains may be destroyed by the excavation when opening roads, creating borrowing pits and wood parks. There shall be therefore an effect on the archaeological and cultural heritage.

To safeguard the archaeological and cultural heritage, the company shall:

- Identify all sacred sites, delineate and materialize, then avoid intruders;
- Stop work if an archaeological remains is discovered and call an expert and the Ministry of Culture.

Facilitation of the movement of persons and property (positive impact): The improvement of road conditions due to road maintenance will allow vehicles to move more quickly and easily.

Maximizing this impact will entail:

- Educating local people about the possibilities for agricultural development;
- Avoiding the closure of certain roads giving access to villages or agricultural plantations after forest exploitation;
- Ensuring routine maintenance of roads.

Risk of deterioration of the road (negative impact): The movement of heavy machines and trucks of the company can contribute to the degradation of the road. This deterioration may hamper the smooth circulation of small vehicles.

To mitigate this impact will require:

- Ensuring the regular maintenance of roads and bridges in particular on the frequently used road axis (forest - sawmill in Kumba);
- Establishing and enforcing rains gates.

Risk of conflicts (negative impact): Several project activities are likely to create conflicts. These are:

- The presence of foreign labour which may not respect the ways and customs of local populations;
- The opening of the access road, road maintenance and felling of trees likely to cause damage on populations' crops;
- The recruitment of manpower when the process is not transparent;
- The management of the Annual Forest Fee.

To mitigate the risk of conflicts will require:

- Educating staff on ways and customs of the local population;
- Following the debts of employees to local populations and effect payment from salary cuts in case of complaints.
- Giving priority to the recruitment of local labour;
- Holding information meetings at the start of new activities;
- Creating a platform for dialogue for resolving problems;
- Proceed to compensate people affected by the felling of trees, path opening or road maintenance;;
- Negotiate beforehand with the owners of borrowing pits before their exploitation.

Risk of embezzlement of funds (negative impact): The risk of embezzlement of the Annual Forest Fee is feared by local communities. Actually the management of the Annual Forest fee is decried by the local people.

To avoid the embezzlement of the AFF, it shall be preferable to ensure transparency in transactions. To this effect,

- The promoter must inform the traditional authorities and local people concerned of the payment of the percentage (10%) of the AFF allocated to them;
- The Forest – Farmers committees must be created and trained in the identification, design and implementation of projects eligible for funding Annual Forest Fee funding.

Increase in unwanted pregnancies (negative impact): The increase in unwanted pregnancies is linked to the presence of foreign personnel in the villages. Given that workers leave their wives to live alone in the villages and given the level of poverty in the region, girls may be lured by them. Sexual relations when they are not protected may be at the origin of unwanted pregnancies that are destabilizing the life of these girls.

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To mitigate this impact, the sensitization of young girls on the risks associated with cultural mix and the use of condoms for any risky sexual act is necessary. Also, the campaign against the spread of HIV for staff currently conducted at the site should be strengthened to incorporate the consequences of unwanted pregnancies.

Improvement of the quality of life (positive impact): Regular maintenance of the road will allow traffic flow and evacuation of agricultural products. Proper management of revenues from the exploitation of the FMU (10% of the AFF) will enable the improvement of health facilities, education and development of water sources and hence improving the quality of life. Similarly, the salary received by employees recruited from the villages of the project area will contribute to improving the living standard of the people concerned.

The maximization of this impact entails:

- Ensuring the regular maintenance of the road;
- Educating local people on their rights and duties and on the opportunities offered by the project;
- Supporting socio-economic micro-projects;
- Supporting the Forest – Farmers committees in project elaboration and monitoring.

Threats on the health of staff and local populations (negative impact): The felling of trees, the transportation of logs and road maintenance may constitute a threat to the health of staff or local populations. These threats are twofold: the risk of accidents and risks of respiratory diseases related to the absorption of dust. The staff assigned to road maintenance and trees felling and skidding will be particularly vulnerable to threats.

To mitigate this impact will require:

- Establishing an infirmary in the company;
- Giving workers appropriate personal protective equipment (boots, helmets, masks for protection against dust and other particles in the air, etc.);
- Following the road maintenance directives laid down by the Ministry of Public Works;
- Educating the staff on site precautions to avoid accidents.

Increased prevalence of STI, HIV/AIDS (negative impact): The spread of sexually transmitted infections and HIV/AIDS will be linked to the presence of personnel on site in villages bordering the FMU. This is quite obvious because workers leave their wives and other partners to live alone in the project area. Given the level of poverty in the region, girls and even married women may be lured by the staff of the site. Sexual relations when they are not protected can be a source of proliferation in the locality of STI / HIV / AIDS.

Measures to mitigate the increase in unwanted pregnancies apply here. The company has already started an awareness campaign and distribution of condoms on the ground.

Increase of poaching (negative impact): The presence of foreign labour could contribute to increased demand for bushmeat, as it will need to satisfy its needs for animal proteins. There will be increased pressure on wildlife. This risk will increase when employees will be accommodated outside the town of Mamfe, notably in villages where there are no butchers.

The mitigation measures of this impact are :

- Educate the staff and local communities on wildlife protection;
- Establish a system for the supply of meat and fish whenever employees will be accommodated outside the town of Mamfe to constitute an alternative to the consumption of game;
- Integrate environmental aspects in the internal regulations of the company which shall emphasize on the ban on hunting, transport and consumption of game. These rules will be backed by sanctions to be imposed on all those who do not comply with the measures imposed;
- Encourage livestock and fish farming micro-projects.

6. BRIEF PRESENTATION OF THE ENVIRONMENTAL MANAGEMENT PLAN

The environmental impact assessment study is accompanied by an Environmental Management Plan (EMP). This is the most important chapter in this study. It requires concrete, practical and operational ideas. It was developed to ensure a smooth project operation of the FMU 11004 and its environment.

It is recalled here the cost of environmental measures, the environmental control plan and the environmental monitoring plan. A summary table is also presented. It contains the various measures proposed with their different tasks, implementation actors, indicators and monitoring actors.

6.1. Overall cost of environmental measures

The overall cost of the implementation of environmental measures amounted to 25,015,625 CFA Francs but with repetitive annual cost of about 6,900,000 CFA francs divided between the salary of the official in charge of socio-economic and environmental matters (6,000,000 FCFA) and the running cost of the system to supply staff in animal protein (900,000 FCFA).

6.2. Environmental control plan

The environmental control will be assured by the site environmental officer to be recruited. It aims at ensuring proper implementation of environmental measures.

The elements requiring environmental control are as follows:

- Equipment and vehicles used (state, the emission level of exhaust gases);
- Staff (wearing of protection equipment, health status);
- Sites for temporary use;
- Rivers (pollution);
- Parking and maintenance areas of machines (pollution);
- Security and emergency arrangements (existence, status, operation, accessibility);
- Waste;
- Transport (pollution and safety).

The promoter is required to submit an annual report on environmental control of operations to the administration. This report will be deposited in four (04) copies to the Divisional Delegation of MINEP for exploitation.

6.3. Environmental monitoring plan

Environmental monitoring is used to measure the real impacts of the project and evaluate the performance of environmental measures proposed. It is therefore a continuous or periodic examination and observation of the project. It aims at checking the envisaged impacts; the effectiveness of measures implemented and finally ensures the optimization of benefits.

The elements requiring an environmental monitoring are:

- The policy of the recruitment of workers;
- The prevalence of STI, HIV/AIDS;
- The traffic accidents caused by the activities of the project;
- The level of degradation of the road used by the project vehicles and machines;
- The health status of workers and resident populations;
- The rehabilitation temporary use sites of the company.

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The monitoring actors are: the site environmental officer, the authorities concerned, the non-governmental organizations and the local communities.

The promoter is required to produce an annual report on environmental monitoring of its activities (in five copies) to distribute the same way as the environmental control report.

6.4. Overview of the Environmental Management Plan

The table on the following page provides a summary of the plan for environmental management. It presents for each environmental measure, the objectives, activities to be carried out, implementation actors, monitoring indicators, the cost and the monitoring actors.

Environmental measures	N° Impacts	Place	Objectives	Activities	Implementation Actors	Implementation Period	Monitoring Indicator	Cost of the measure (FCFA)	Monitoring actors
Creating a post of the site environmental officer	All the impacts	Within the company	Ensure the effective implementation of the EMP	- Define the content of the post ; - Designate and train a staff to occupy the post.	The promoter	Before the beginning of the second base annual cut	- Act designating the site environmental officer	6 000 000/year	MINEP/ MINTSS.
Revision of the internal rules of the company	1, 3, 6, 8, 14, 16, 27, 23, 29	At the office of the site environmental officer and on work sites.	Ensuring the incorporation of environmental considerations in the various activities of the company	-Revise the rules of procedure; - Multiply and distribute the revised rules of procedure;	The Promoter through the site environmental officer	Before the start of work on the second base annual cut	- Presence and display of revised rules of procedure; - Presence of clauses for respect for the environment in the employment contracts and subcontracts	Incorporated in the cost of the project	MINEP
Limiting emissions of dust and toxic gases	1 et 16	In villages and along the roads used	Significantly reduce air pollution.	-- Replace filter elements of machines. -- Establish speed breaks.	The promoter	Beginning of work and during the lifetime of the project.	- Number of road accidents recorded; - survey at the level of the populations; - rate of proliferation of lung diseases in the villages.	Incorporated in the cost of the project	MINEP MINTSS
Limiting the disturbance of soil properties and its erosion	2, 3, 10, 14	sites for temporary use	Avoid erosion and loss of topsoil.	-- Ploughing of parks after logging; -- Reshape the field; -- Create drainage ditches.	The Project Sponsor	By the end of the operation of each site	- Environmental report of project activities; - Visual observation made on these sites.	Incorporated in the cost of the project	MINEP
Limiting pollution by oil	3, 6, 8.	Garage	Avoiding pollution of soil, surface water and groundwater.	- Develop the storage and handling of hydrocarbons. - Build a washing area. - Retrieve and send used oil and filters to an actor with the ability to recycling and incineration - Outlaw washing or discharged in water and within 60 metres around them	The promoter of the project through the site environmental officer	Before starting work on the second base annual cut	- Environmental activity Report; - The physical presence on the different areas of drums used for recovery.	2 400 000	MINEP
Limitation of noise and protection against it	5, 12 et 27	Zone of project	-Avoid harming the health of workers, -avoid to disturb the tranquility of people, -avoid the deterioration the forest calmness.	- Acquire and distribute protective equipment; - Avoid maintenance of equipment especially chainsaws overnight.	The promoter	Since the start of work and throughout the lifetime of the project	- The order form and detailed discharge materials; - Finding and investigations on the ground; - Certificates of visits	Incorporated in the cost of the project	MINEP, MINSANTE; MINTSS.

Table 2: Summary of Environmental Management Plan

Summary of Management Plan for the Environment (continued)

Environmental measures	N° Impacts	Place	Objectives	Activities	Implementation Actors	Implementation Period	Monitoring Indicator	Cost of the measure (FCFA)	Monitoring actors
Limiting the destruction of vegetation and wildlife habitat	9, 10, 11, 13, 14	In the forest environment.	<ul style="list-style-type: none"> - Reducing the impact of the destruction of trees by the various project activities; - protect the rivers banks and wildlife habitat; - conserving wetlands 	<ul style="list-style-type: none"> - Avoid use of wetlands; - avoid building the access road and other forest track and sites for temporary use in the band of 60 m of water; - train trees fellers in environmentally friendly techniques; - restrict the opening of temporary sites to use to bare minimum necessary 	The promoter	Since the start of work and throughout the lifetime of the project	<ul style="list-style-type: none"> - Certificate of training of trees fellers; - report of environmental activities of the company; - distances between the tracks and wetlands sites 	incorporated in the cost of the project	MINEP MINFOF
Attenuations of silt of rivers and destruction of wetlands	6, 7.	In the forest environment.	<ul style="list-style-type: none"> - Avoid disruption of the flow regime of water; - reduce siltation of rivers and preserve habitat degradation of aquatic fauna 	<ul style="list-style-type: none"> - Prohibit building the access road and other tracks in the band 60m of a water; - diverting drainage ditches water to a vegetated area and a minimum distance of 30metres watercourse; - prohibit the operation within 30 metres of rivers and on slopes greater than 10%; - open sites temporary use at least 30metre watercourse. 	The promoter	Throughout Project life	<ul style="list-style-type: none"> - Plan locating sites temporary use; - Report of field observations and monitoring; - Presence of outlets oriented areas of vegetation; - Existence of margins of 30 m minimum kept intact at the edge of water bodies; - Existence of a band at least 60 m line between the natural and high water gap 	incorporated in the cost of the project	MINEP MINFOF
Protection of NTFP and plant diversity.	11, 13, 14.	In the forest environment.	Protect the Non Timber Forest Products and avoid the disappearance of plant species around the project area.	<ul style="list-style-type: none"> - Preserving seed bearing plants to ensure the natural regeneration and / or artificial NTFP and rare species - Identify and preserve the NTFP and young sapling at various operations - Avoid as much as possible the destruction of these species during the opening of the access road and exploitation 	The promoter in collaboration with local communities	Since the start of work and throughout the lifetime of the project	<ul style="list-style-type: none"> - Report of environmental activities of the company; - Finding report on the ground. 	incorporated in the cost of the project	MINEP MINFOF
Fight against poaching and loss of wildlife diversity	12, 15, 30	In the forest environment.	<ul style="list-style-type: none"> - Reduce the disappearance of animals' species; - fight against poaching and the pressure of staff on wildlife resources. 	<ul style="list-style-type: none"> - Educate staff on site and local communities; - All the rules of procedure of the revised site; - Establish a reliable system of supply staff in animal protein 	The promoter through the site environmental officer	Since the start of work and throughout the lifetime of the project	<ul style="list-style-type: none"> - Report awareness; - Rules posted; - Survey of workers; - Report of environmental activities of the company. 	1 400 000	MINEP MINFOF

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Environmental measures	N° Impacts	Place	Objectives	Activities	Implementation Actors	Implementation Period	Monitoring Indicator	Cost of the measure (FCFA)	Monitoring actors
Accident prevention.	1, 16.	Throughout the used roads and in the operation site	Limiting to minimum risks of accidents and other nuisances.	<ul style="list-style-type: none"> - Raise awareness among drivers and villagers in traffic; - Set up signboards; - Train fellers with directional felling technique; - Build speed breaks at the entrance and exit of villages and social infrastructures; - Purchase and equip workers with safety equipment. - Monitor the protection equipment; 	Promoter	As work began and during the lifetime of the project	<ul style="list-style-type: none"> - Number of accidents recorded; - Number of sign boards put in place; - Training certificate of trees fellers 	3 750.000	MINEP ; MINSANTE ; MINT
Protection of workers.	1, 16, 27.	Work sites	Protecting workers against threats to their health.	<ul style="list-style-type: none"> - Purchase and equip workers with safety equipment. - Monitor the protection equipment; 	Promoter	As work began and during the project period.	<ul style="list-style-type: none"> - Sheet-discharge equipment; - Visual observations; - Number of patients received and treated. 	Incorporated in the cost of the project	MINEP ; MINSANTE ; MINTSS.
Elaboration of a transparent recruitment policy.	17, 23, 26	Within the company	- To promote transparency and equal opportunity in the recruitment of manpower.	<ul style="list-style-type: none"> - Develop and implement a transparent recruitment policy; - Recruit local workers as a priority; - Inform people of the recruitment process (for the qualified the positions at equal competence, give priority to applicants from the villages) 	Promoter of the project	As work began and during the lifetime of the project	<ul style="list-style-type: none"> - Number of employees from the outskirts of the project; - Surveys of local populations; - Notice of appeal to apply for the recruitment of staff 	Incorporated in the cost of the project	MINEP MINTSS
Compensation of crops destroyed.	18	In the villages	To compensate the potential owners of crops destroyed.	<ul style="list-style-type: none"> - Identify crops destroyed and their owners; - Define the procedures and modalities of compensation; - Compensate for the destroyed crops. 	The Promoter and MINADER.	During the project.	<ul style="list-style-type: none"> - Number of complaints received; - Minutes of compensation; - Report of the site 	Incorporated in the cost of the project	MINEP, MINADER, MINFOF
Sensitisation	9, 16, 17, 19, 23, 28, 25, 30	Within the company and in the villages	Raising environmental awareness.	<ul style="list-style-type: none"> - Develop a program and design the content of sensitisation targets; - Acquire and distribute education materials and condoms - Organizing meetings 	The Promoter through a research department or local NGO	As work began and during the lifetime of the project	<ul style="list-style-type: none"> - Presence of posters in villages; - Minutes of the sensitisation meetings; - Number of condoms distributed; - Surveys of populations. 	4.700.000	MINEP MINFOF MINSANTE

Summary of Management Plan for the Environment (end)

Environmental measures	N° Impacts	Place	Objectives	Activities	Implementation on Actors	Implementation Period	Monitoring Indicator	Cost of the measure (FCFA)	Monitoring actors
Contributing to the fight against the misuse of RFA	23, 24,	In the villages	Ensure that 10% of the Annual Forest Fee for the local population is really used to carry out the projects in the villages - Enable people to improve their living conditions -- Allowing also ensure the fight against poaching	- Inform the traditional authorities and populations payment of the AFF. - Establish a management committee of the AFF; - assist the committee in the techniques of assembling projects eligible for funding from the AFF. - Develop and implement a training program for communities bordering on mounting small projects of common interest. - Subsidize pilot projects	The Promoter through its site environmental officer	Before the end of the Exploitation of the second base annual cut	- Newsletter populations; - Report of the site environmental officer	Incorporated in the cost of the project	MINEP; MINFOF.
Supporting Communities in developing small projects of common interest	11, 17, 20, 24, 26, 30,	In the villages	Avoiding destruction of archaeological remains .	- Identify with precision the sacred sites; carry-marking of these sites; - do surveillance during archaeological excavations; -- Stop work if it is discovered archaeological remains and to call an expert.	The owner of title operating through site environmental officer	Before the end of the Exploitation of the second base	- Activity Report of the site environmental officer - Number of projects funded by the Promoter.	Incorporated in the cost of the project	MINEP MINFOF
Protection of cultural heritage and archeological	21	Inside the FMU			The Promoter through site environmental officer	Before the start of exploitation	Activity Report of the site environmental officer	Incorporated in the cost of the project	MINEP, MINERES and the Ministry of Culture

CONCLUSION

This study has helped describe the various activities of FMU N° 11 004 exploitation project, and the relevant components of the environment of the insertion site of this project. This study indicates that the implementation of the project will generate short-and long-term positive and negative impacts on the biophysical and socio-economic environment.

To reduce the various risks and allow the project to contribute among others to the fight against poverty, the study recommended a set of measures to implement, either to mitigate the negative impacts, or to maximize the positive impacts, or to offset the residual important negative impacts. The creation of a post of site Environmental Officer will ensure the effective implementation of these measures. Also, the study called for the integration of environmental aspects into the rules of procedure to coerce employees to comply with the various measures proposed. It also strongly recommends that developing the management plan of the FMU takes into account the results of this study.

With effective implementation of measures recommended in the EMP, the importance of most negative impacts will be minor and the positive impacts will prevail over the negative impacts. As a result, monitoring and controlling the implementation of the EMP by the actors concerned constitute a guarantee of the sustainability of this balance between development and environmental protection.

It is understood that the reader who will need details or scientific techniques used in the report should refer to the complete document. Copies will be placed in the reading rooms at Eyumodjock and Mamfe for public consultation.