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Strengthening the capacity of ITTO producer countries in Africa in generating and disseminating scientific information on Reducing Deforestation and Forest Degradation and Enhancing Environmental Services from Forests

Assessments on socio-economic, ecological and institutional issues in the pilot site in Cameroon



By



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1. Introduction

1.1. Justification for the selection of the pilot site.

The inhabitants of the Dimako district are very closely linked to the forest and its resources. Forest ecosystems provide many products and services to the (local) population e.g. wood, berries and mushrooms, bush meat, NTFPs and other recreational activities. More recently recognized benefits of forests include various environmental services, such as carbon sequestration watershed protection, erosion control and maintaining biodiversity.

Dimako has an annual population growth of 3.2% in the forestry zone (Commune de Dimako., 2010).

Human activities with the quest for better livelihood is the principal driving force which has unfortunately led to deforestation and perturbation of forest land in the district.

The forest of Dimako has been subjected to industrial logging for more than half a century which has led to the creation of roads for the installation of agricultural exploitations at the expense of the existing forests. Deforestation for agricultural purposes has been further stimulated by the presences of the principal road linking Abong-Mbang to Bertoua through Dimako. The creation of catholic Bishop's residence of the East region at Doume (just about 38Km from Dimako) with all administrative infrastructures and services accompanying this institution has been a contributing factor to land occupation (J.J FAURE, 1993).

Pressure on the forest land greatly increased between 1972 and 1980 due to the delocalization of the saw mill out of the district. This brought about poverty and unemployment in an area where forest exploitation has for long dominated agriculture. The misery of the inhabitants was later aggravated with the advent of the devaluation of the Franc CFA in 1993.

The fall of prices of tobacco, coffee and cocoa in the world market greatly discouraged the farmers and also led to the close down of structures and projects that promoted their production which were later replaced by poorly managed vulgarization and micro financial projects. (Durrieu de Madron et al, 1998).

The forest of Dimako is home to many plant and animal species as well as NTFPs (traditional medicines, consumption of fruits, roots and fruits) of diverse uses which are resources vital for the livelihood of the people in and around Dimako and their collection represents a threat to these resources.

The Dimako district is only about 28km away from Bertoua an urban center with high demand of wood for building, furniture and other household uses. The commercialization of wood is a lucrative business encouraging not only overexploitation but also illegal exploitation of trees in the district.

The forest in this district has been subjected to clandestine and uncontrolled exploitation of flora and fauna coupled with poor tillage practices (the use of bushfires, with the practice of slash and burn

agriculture) have led to the modification of the vegetation profile which is gradually being transformed into a savanna.

It is evident that the activity of the inhabitants has altered forest function, degraded its structure and resources exposing the population and the environment to negative consequences.

Therefore it is necessary to sensitize the population, bring up alternative strategies which will enable them adapted to changes in their environment, as well as restore the degraded vegetation and forest in particular.

1.2. Objectives of the study

The objective of the present study is to collect the available ecological and socio-economic information, draws up a basic profile of the pilot area and conduct assessments on socio-economic, ecological and institutional issues in the pilot site.

1.3. Methodology

The methodology is based on a participative approach integrating all actors involved in development and environmental protection within the Dimako district council.

Step 0: Literature Reviews .

Find out and analyze all existing data, reports and documents with valuable information on the environment and development in the Dimako district in order to compile, examine and judiciously exploit all useful information relative to the pilot site Dimako.

Step 1: Selection a pilot area in Cameroon

The Dimako district has a vegetation is characteristic of a tropical green rain forest, dotted with fallows which covers 90% of the municipal territory. The rest (10%) is occupied by a shrubby savannah in the north of Dimako.

Forest in Dimako has been subjected to industrial logging for nearly 55 years by a French logging company (SFID).

Step 2: Expert Groups

In order to assemble the vital information experts from certain domains were engaged and those who participated are,

Mr. Louis Bernard Cheteu (Silviculturist & Forest Management Specialist/Team Leader)

Mr. Essang Timothée (Socio-Economist/Agro-Economist)

Mrs. Fidelia Ucheck Fomum (Forest Ecologist/Forest Botanist)

Mrs. Mercy Bessem Ashu Egbe (Forest policy specialist)

Step 3: assessments on socio-economic, ecological and institutional issues in the pilot area

The assessments comprise the compilation of the whole range of socio-economic, ecological, and institutional aspects relevant to the pilot area. The information is collected through study of available literature; web pages of past and ongoing development projects; technical reports and results of previous assessments related to natural resource use in the Dimako district.

Step 4: consultations with stakeholders

The method used has been adopted from that used by Foli and Makungwa, (2011) in the description of pilot sites in Ghana and Malawi respectively. That is Field trips were carried out to consult the different stake holders involved in the socio-economic , developmental and environmental issues in the district including communities, including field forest officers and local NGOs, Common initiaative Groups discuss the problems encountered in the Dimako district as a consequence of changing climate, the locally-devised strategies they have adopted in combating and/or adjusting to these climate-induced impacts on the environment and their own livelihoods and well being, and to come up with appropriate science-based adaptation strategies to modify the severity of the impacts

Step 5: Compiling of information

As above, the methodology used by Foli and Makungwa, (2011) was adopted.

This aspect of the work entailed the following activities:

- Identifying and analysing all existing work and/or published information on climate change variability and its impacts in the area.
- Identifying the gaps that exist in the existing/on-going climate change adaptation strategies.
- Identifying existing local knowledge about resource degradation related to climate change and other human-related factors, as well as the traditional/local strategies used to adapt to the observed impacts, through focus group discussions and stakeholder consultations.

The experts compiled useful information about the pilot areas in the following aspects:

- Brief description of the forest ecosystem, botany and the ecological region;
- forest legislation
- Local trends in climate change (historical records);
- Socio economic activities
- Current knowledge on adaptation strategies;

2. Description of the Pilot site

2.1. Location

The district of Dimako is located in the Eastern Region of Cameroon (Latitude: 4.3666667°, Longitude: 14.1666667), in the Upper Nyong division. It covers an area of 750 square kilometers and is bounded to the East by the Mbang and Ndemnam respectively (in the Kadey division), to the North by the districts of Bertoua 1 and Bertoua 2, to the west by the district of Diang (in the Lom and

Djerem division) and the south by the district of Doumé (in the Upper Nyong division).

Dimako is crossed from Nord to the South by the N° 10 national road linking Yaounde Cameroon's Capital to Bertoua on a distance of 26Km and by the secondary road linking Abong-Mbang – Loumbou – Batouri in its Eastern part on a distance of 18 Km. The District is situated at about 30Km from Bertoua, 75Km d'Abong Mbang (Headquarters of the Upper Nyong division) and 310Km from Yaoundé the capital of Cameroon.

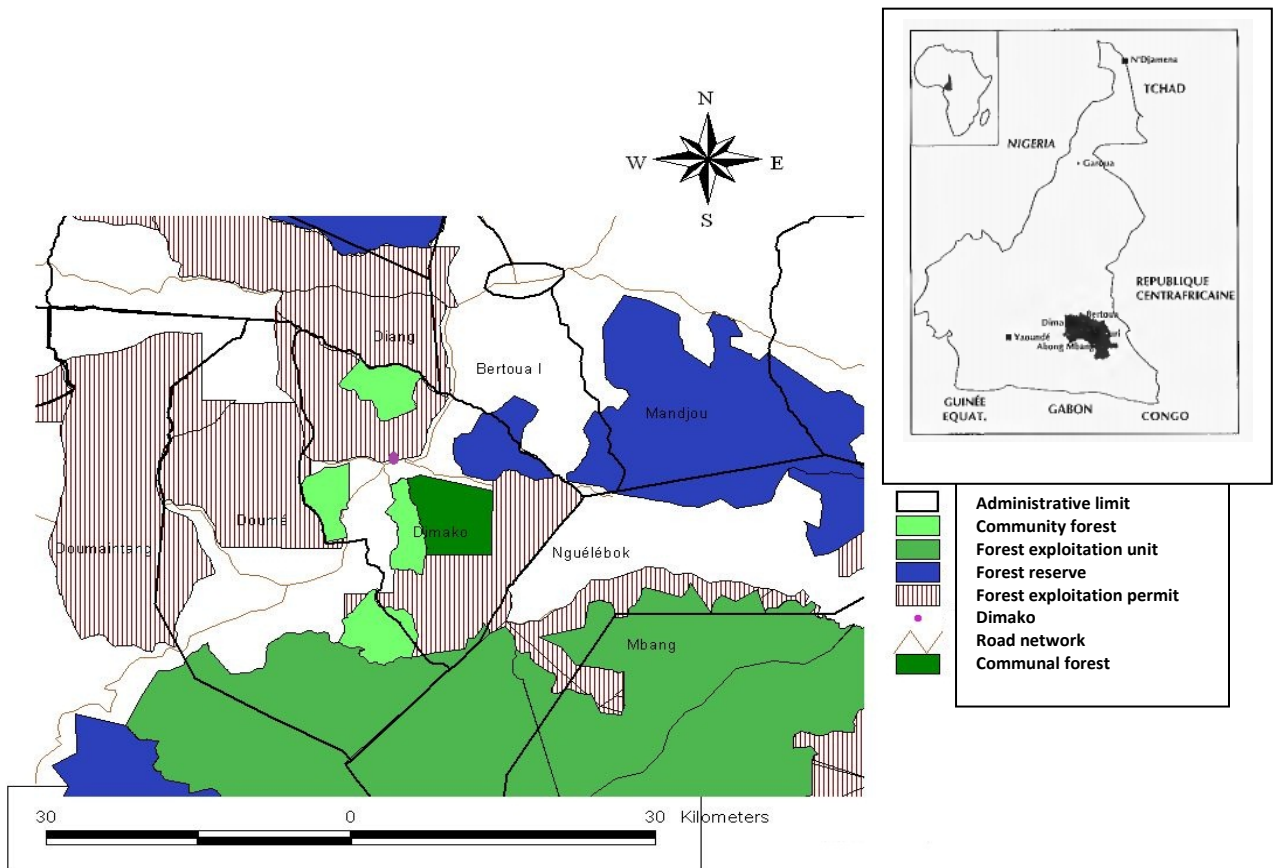


Figure 1: Location of Dimako in the Cameroon Map

2.2. Ecological situation

In terms of relief, Dimako is dotted with small hills and streams and the vallies, accumulating an average height of about 600 m.

According to LOTOUZEY (1968, 1985) cité par (Durrieu de Madron et al., 1998) a greater part of the forest is described as semi- caducus forest made of sterculiaceaes and ulmaceaes with the most characteristic species being: *Cola altissima*, *Cola cordifolia*, *Cola gigantea*, *Mansonia altissima*, *Nesogordonia papaverifera*, *Pterygota macrocarpa*, *Sterculia rhinopeta* la, *Triplochiton scleroxylon* the most common species (sterculiaceaes)and the genus *Celtis spp* et *Holoptea grandis* (ulmaceaes).

Apart from the two plant families mentioned above, there are many other tree species representing other families also characteristic of this forest type such as : *Aningeria altissima*, *Austranella congolensis*, *Albizia ferruginea*, *Albizia iwa*, *Amphimas pterocarpoides*, *Gossweilerodendron balsamiferum*, *Khaya anthotheca*, *Gambeya lacourtiana*, *Pterocarpus mildbraedii*, *Entan*, **ophragma cylindricum*, *erythroxyllum mannil*, *Parinari excelsa*...

The district has community forest under community management and a communal forest of 18 052 hectares (classified under the permanent Forestry Domain in Cameroon) solely managed by the council following an operating plan and situated between latitudes 4°10' et 4°20' North and longitudes 13°30' et 13°50' Est of the Equator. Results got thanks to the geographic information system in November 1999 have permitted the observation of 3 types of vegetation cover in the Dimako forest; the dense semi caducious forest Covering , -the degraded forest area as a result of agricultural practices and – the swampy forest area (CANADEL 2010).

The climate of Dimako is of the Equatorial Guinean type with four seasons:

A long rainy season which runs from mid August to mid November;

A long dry season which runs from mid November to late February;

A small rainy season from March to May;

A short dry season between July and mid August.

The rainfall in the district of Dimako is estimated at 1600 mm per year. But we observe in recent years some disturbance rainfall cycle and the amount of precipitation per year.

The district of Dimako is crossed by two major rivers: the **Doumé** and its major tributary the **Djo**. Both rivers receive waters of a large network of small rivers which are seasonal.

The soils are predominantly red colored of ferralitic type with thin layer of topsoil. They are nutrient poor, acidic and brittle. The soil is hydro morph in the vallies and swampy areas with a characteristic forest mostly made of the various species of raffia such as *Raphia hookeri* , *Raphia monbuttorum* with other species like *Allanblackia floribunda*, *Uapaca guineensis* and *Xylopia staudtii* , *Cleistopholis patens* , *Cola lepidota* , *Garcinia manni* , *Macaranga sp*, *Hallea ciliata* , *Nauclea pobeguinii* .

2.3. Socio-economic situation and pressure on resources

Social situation

City Dimako was founded in 1800 by a fraction of the Bakoum people in the Ngolambélé chiefdom. Initially the village was called KPWENGUE. Due to the creation of a wood mill by the French SAUBATE and GEBERON, the site changed its name to Dimako. In fact the settlement of the Kaka population at KPWENGUE was facilitated by French loggers who chose to call this land home Dimako in memory of their village of origin. The name was finally adopted because it is easier to pronounce. An anecdote tells that after the death of the chief of Bakoum Bangda Andrew his successor and nephew, anxious to soothe relations between peoples of Bakoum, Pol, the Kaka and other tribes particularly worked to ensure the settlement of the French founders of the sawmill .

The district of Dimako is made of 11 225 Inhabitants with more than half of the population living in

the district center. The average density is 4,5 inhabitant per km² and growth rate of 3,2% (RGPH, 1987) quoted by (MINFOF, 2006).The district Dimako includes 30 villages and neighborhoods subdivided into five sectors:

Pol Sector: Tahate, Bongossi, Ngombol, Akano, Nkolmeyanga, *Grand Pol*, Simeyong, Tonkoumbé, Little Pol, Nkolbikon, Mayos

Forest sector: Djandja, Kouen, Toungrelo, Lossou Mbang

Road sector: Kandala, Nguinda, Nkoumadjap

Savannah Area: Small Ngolambebe, Ngolambebe, Baktala, Longtimbi

Dimako center: Kpwengué, Source, God knows, Tombo, Ayene, North Camp, Mokolo Beul. Each village is governed by a traditional leader chosen by his elders and generally approved by the administrative authority.

All these leaders are under the authority of the Sub-Prefect of the district, representing the *State*. Several ethnic groups make up its population the majority group being the Bakoum, the Pols, the Baka pygmies. Moreover the once flourishing economy of Dimako has drained in populations from other areas of Cameroon. (Kako, Mezimé, Maka, Baya, Beti, Bamileke, Bassa, Bafia, Fulbe, Bororo) and even the populations of neighboring Central Africa Republic, Nigeria and Niger.

Governance structures in Dimako

- **The Council**

The municipal executive is composed of the mayor and his two deputies. Elected for a mandate of five years, the current mayor is in his 5th term. In the absence of the mayor, he is replaced by the 1st, or the 2nd deputy mayor.

- **Decentralized services of the State present in Dimako District**

The state institutions include:

- The Ministry of territorial Administration and Decentralization- MINATD (the mayor is accountable to the prefecture)
- The Delegation for youth affairs (Office found at the City Hall);
- The inspection of Basic Education (Its offices are also located within the walls of City Hall);
- The Delegation of the Women and Family Affairs [(MINPROFF), its offices are located in the municipality];
- The Ministry of Health represented by the District Medical Centre (DMC):

-The Delegation of agriculture,-The delegation for Professional training, the Sub delegation of Forestry,

-The Delegation of Social Affairs;

- **Traditional leaders**

Traditional leaders participate in the socio economic and cultural aspects of the area.

- **NGOs and other development partners**

The NGO, PLAN Cameroon

The NGO, Plan Cameroon work with the municipality in various fields such as education, health, housing. Moreover, thanks to the development of his communal development Plan (CDP), new opportunities for creating new partnerships with NGOs have envisaged.

- **FEICOM**

This structure financially assists councils in the realization of its development projects.

The council works in collaboration with FEICOM which supports a number of its investments projects.

- **The CTFC (Technical Center for Council Forests)**

The CTFC which is the Technical Center for Council Forests

The Municipality maintains partnership relations with the CTFC. She signed the charter of Council forest s CTFC for monitoring the environmental impact assessment and implementation, monitoring and implementation of the communal development plan, inventory also monitors exploitation activities in the Dimako communal forest, and support the marketing of NTFPs.

Economic activities

Dimako is essentially inhabited by a rural community whose main activities are based on the primary sector namely agriculture, fishing, hunting and exploitation of timber and non-timber forestry products and most inhabitants highly depend on these activities for subsistence. These activities are practiced in or around forest land exerting negative impacts both on it's structure, function and resources.

. Hunting is practiced for bush meat which is a major source of animal protein for the entire population. It is also a direct source of revenue and as such it is not often selective. However, the most hunted are monkeys, rodents and other herbivores. Fishing is a common activity usually carried out by the Bantus using traditional methods. Species commonly caught are catfish, tilapia, car, fish vipers, prawns and crabs. Fishing is carried out using traditional methods and the products are generally used for home consumption and are occasionally sold .The occasionally they use illicit substances (poison) to catch fish the consequence being mass killing of fish which greatly reduces the population as well as pollution.

The inhabitants practice subsistence farming and cash crop farming.

Subsistence agriculture is practiced for consumption and generally practiced in fallows. The farmlands are mostly located along road sides and around the urban center. However, some crops such as plantain and cocoyam may require the opening of new forest areas. The practice of shifting cultivation is common throughout the region. The main crops cultivated are plantain, banana, cocoyam, cassava, corn, groundnuts, yams, cocoa yams, sweet potatoes maize, vegetable crops. Generally, people practice a combination of cultures, and average areas of the fields are about 1 to 2 ha of land.

The production of cash crops is mostly for commercial purpose and done on large portions of land. The cultivation of cocoa and Robusta coffee is being revived despite the price instability in the world market. The town also has a large palm oil plantation of nearly 15 hectares which is not yet in and production. It is difficult to estimate the agricultural production in the municipality because producers do not keep accounts and there is no statistical data at the delegation of agriculture.

Forest exploitation activities are intense in the district and it's carried out in two ways; legal and illegal exploitation. Legal exploitation is done in the council forest by the council and in the two community forests by the population organized in common Initiative groups (CIGS).

Occupation	Surface area (ha) in 1999	Surface area (ha) in 2001
Plantations perennial crops	25	12.5
Annual crops and Fallows	475	487.5
Banana plantations	87	87
Total	587	587

Table1: the distribution of agricultural activity within the forest and their evolution between 1999 and 2001.

Source : management plan of communal forest Dimako (2006)

The population collects diverse NTFPs from the communal forest such as: jansang (fruits of *Récinedendron heudolotii*), bush mangoes (fruits of *Irvingia gabonensis*), fruits of Moabi (*Baillonella toxisperma*) are used as food, tree barks, roots and leaves are used as traditional medicine, wine is got from palm and raphia tree. The small cane (*Eremospatha macrocarpa*) and large cane (*Laccosperma secundiflorum*), bambos, raffia, lianas, eben, leaves of *Megaphrynium macrostachyum* a *Marantaceae*) stems from the forest are used for craft and building of habitats.



Picture 1a: Women collecting NTFPS in council forest of Dimako

Picture 1b: camps established in the council forest for the collection of NTFPs

Firewood indispensable for cooking and drying of fish and bush meat is either collected from the forest or fallows and the most appreciated species are, *Myrianthus arboreus*, *Hylo dendron gabunensis*, *Pentaclethra macrophylla* et *Terminalia superba*. In some cases the wood is sold to supply the neighboring town Bertoua which are in high need. Tree barks and other medicinal plants are collected from the forest for auto medication.

Other activities are practiced on small scales which also participate in ameliorating the well being of the people. They include rearing of fowls, pigs, sheep and goats around homes and tourism through the promotion of the arts and culture of the BAKA people at the Mayos Multimedia centre.

3. Local Trends in Climate Change in the Dimako distirct

Climate and rainfall

The climate of Dimako is of the Equatorial Guinean type with four seasons:

- A long rainy season which runs from mid August to mid November;
- A long dry season which runs from mid November to late February;
- A small rainy season from March to May;
- A short dry season between July and mid August.

The rainfall in the district of Dimako is estimated at 1600 mm per year. But we observe in recent years some disturbance rainfall cycle and the amount of precipitation per year.

The average rainfall calculated from 1975 to 1994 at the meteorological station of Bertoua is only 28km away from Dimako the same data is valuable for the Dimako District as presented in the table and figure below;

Tab.2: Average monthly precipitations in the Bertoua station in mm.

	Jan.	Feb.	march	April	May	Jun	Jul.	August	Sept	Oct.	Nov.	Dec.
Bertoua	19,3	25,9	96	126,1	165,2	145,4	92	148,3	251,7	247,9	106,6	21,3

Source: East provincial meteorological Service

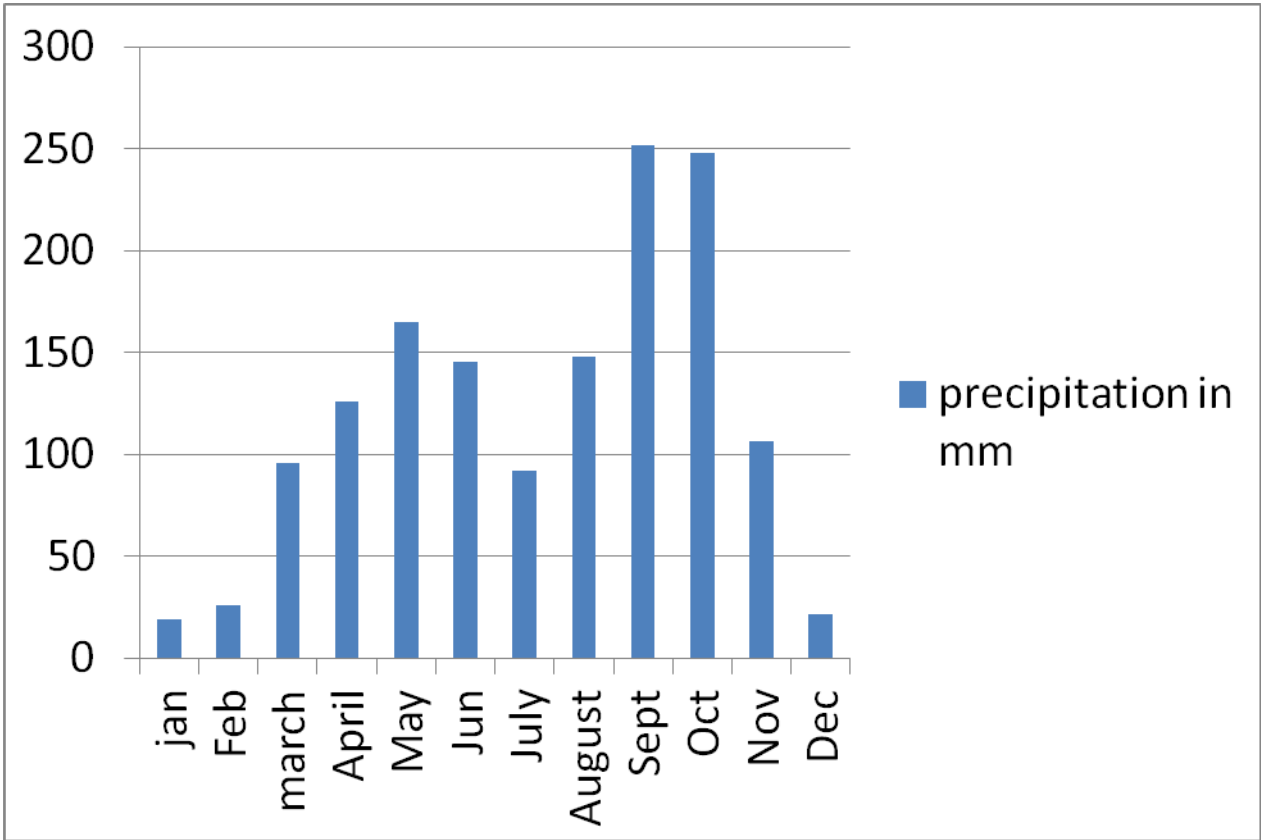


Fig: A histogram of the monthly precipitation in the Bertoua meteorological

The average precipitation is 1500mm/year (1446mm in Bertoua).

Maximum rainfall registered in 24hrs during this period in Bertoua is 178,2m

- Mean annual rainfall over Cameroon has decreased by around 2.9mm per month (2.2%) per decade since 1960. Cameroon experienced particularly low rainfalls in 2003 and 2005.
- There is not sufficient daily precipitation data available to determine trends in daily rainfall Extremes (Izcano et al).

The average temperatures stand at 24°C with an average amplitude of 2,4°C

Temperatures have increased confirmed by very hot and long periods of sunshine accompanied by hot nights.

Table 3: Temperature, humidity and evaporation statistics in the Bertoua station

Month	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Average T° in C°	23.4	25.3	25.9	25.5	25.0	24.1	23.2	23.5	23.9	24.0	24.0	23.1
Humidity (%)	68	65	68	74	77	79	80	80	79	78	76	72
Evaporation (mm)	85.0	98.9	88.7	63.3	50.1	42.0	39.5	41.9	40.8	44.2	49.9	62.8

Source: East provincial meteorological Service

There are few daily observations available from which to infer changes in daily temperature extremes. Available data indicate significantly increasing trends in the frequency of days, annually, that are classed as 'hot' in annual data. The average number of 'hot' nights per year in Cameroon has increased by 79 (an additional 21.7% of nights²) between 1960 and 2003. The projected rate of warming is faster in the continental interior regions of Cameroon (the north and east), and slower in the western coastal areas. Model projections all indicate increases in the frequency of days and nights that are considered 'hot' in current climate. The rate, at which the frequency of hot days increases, however, varies considerably between models (Izcano et al) .

Even though existing data on recent temperature and rainfall patterns for Dimako are not yet available, information gathered from the inhabitants testify recent irregularities in rainfall regimes coupled with relatively very hot nights and days especially at the approach of the rainy season period. It is therefore evident that the unpredictable and irregular patterns of these climatic factors have influenced and continue to influence farming activities, productivity of the soils, crops yields, the health of the population and the environment as a whole.

4. Resources Degradation and Vulnerability of Local Communities

4.1.1. Resource degradation due to human activities

Forest exploitation has greatly favoured the expansion of farm lands through the creation of roads into the forest. The commercialization of wood is a very lucrative business which motivates illegal logging carried out in many forest patches in the district.

The felling and evacuation of trees is always accompanied by the destruction of other plants especially the young plants and the undergrowth. There is also soil compacting which is the reduction of the volume of the soil by repeated passage of heavy engines, causing low aeration, insufficient drainage and root deforestation (OBI, 2011).



Picture 2: Legal forestry exploitation in the council forest Dimako

In the Dimako District, only the council and community forests are legally exploited following a management plan; the future of the other existing patches of forest is compromised cautioned by certain personalities in the administration. Even though under the surveillance of forest guards, the resources in this area are still being tampered with by illegal forest exploiters favoured by corrupt practices who exchange these resources for money. The illegal exploiters not ready to leave the forest patches of Dimako for as long as they benefit from the solidarity of the local administrators. According to Alain BOUSSOUGOU (2010), the complicity between the forest guards and illegal exploiters is a motivating factor to the exponential exploitation of forest resources



Picture 3: Illegal forestry exploitation in Dimako

Besides logging and illegal forest exploitation, the practice of agriculture is the main activity responsible for the destruction of large areas of forest land consequently biodiversity loss.

Agricultural practices and particularly shifting cultivation is at the center of deforestation and agriculture is said to contribute to more than 90% of Cameroon's green gases as shown in the following table⁸. This is far above the world ratio of all green gases from anthropogenic sources in the forest sector. The Intergovernmental Panel on Climate Change's fourth assessment report estimates it at 17.4% (Tchoffo, 2009).

Table 4: Green House Gases emissions of Cameroon in Gg CO₂ equivalent

Sector (year of reference 1990)	CO₂	CH₄	N₂O	TOTAL	Percentage
Energy	3 058	596.2	108	3762.2	6.7
Industry	310	-	-	310	0.6
Agriculture	-	2932.6	189	3121.6	5.6
Land use change	46774	1215.5	216	48205.5	86.4
Wastes	-	402.6	-	402.6	0.7
TOTAL	50142	5146.9	513	55 801.9	100
Percentage	89.9	9.2	0.9	100	

Source: Adapted from MINEF and TRANS ADE, 1994

The cultivation of crops like banana (*Musa cercopoides*) and plantain (*Musa paradissima*), oil palm, cocoa, coffee are cultivated essentially on hectares forest land at the expense of the forest. An area of 587ha of the Dimako Council Forest has been degraded as a result of agricultural practices. The process of farm creation involves clearing and cutting down of trees and mass burning. The use of Bush is a frequent technic used by farmers to prepare farmlands for planting. Such methods when practiced are very devastating as they clear up the entire flora, kill or send away the fauna.

The activities practiced by the population in the council forest such as hunting, fishing, harvesting and agriculture have led to the following consequences;

- A decrease in the abundance of resources in the south-eastern part of the forest which can be considered the bread basket of the inhabitants.

- inhabitants have move from the west to the Eastern part of the council forest

- fishing has been concentrated along the Abonja river where the majority of the population has established.

- The presence of strangers coming to hunt in the forest for the collection of resources

- the presence of an agricultural zone in the North West of the Dimako Council Forest (DCF).

The invasion and expansion of farm lands by industrialists favoured the creation of roads into the forest especially from 1965 by a logging company SFID which operated in the district for nearly 55years. Data got in 1986 by *Durrieu de Madron et al*;1998) shows that the forest domain has been reduced by 3% in 13years while fallow and cultivated land has increased by 2.01% representing a total surface area of 22.4% while a good portion of the savanna domain has been subjected to burn. Deforestation has scared away animals like gorillas, chimpanzees, elephants, giant pangolins, bush pigs and they have become very rear. Cases of illegal forest exploitation are very common and some tree species have been banned either because of overexploitation or for their low density per hectar. The tree species *Nauclea diderrichii* (bubinga) stands the risk of disappearing because of excessive exploitation both by tradi practioners and wood exploiters.

Table 5: other species threatened with extinction and banned from exploitation.

Tree species	Scientific names	Density (trees/ha)
Doussie (red)	<i>Afzelia bipindensis</i>	0.04
Moabi	<i>Baillonella toxisperma</i>	0.02
Kossipo	<i>Entandrophragma condollei</i>	0.05
Pao rosa	<i>Swartzia fistuloides</i>	0.01
Tiama	<i>Entandrophragma congolensis</i>	0.05
Acajou (Bassam)	<i>Khaya ivorensis</i>	0.05
Azobé	<i>Lophira alata</i>	0.02
Sipo	<i>Entandrophragma utile</i>	0.02
Mukulungu	<i>Austranella congolensis</i>	0.01
Acajou blanc	<i>Khaya anthoteca</i>	0.006
Fromager	<i>Ceiba pentandra</i>	0.76
Total 11 Species		

Source: MINFOF, 2006

4.1.2. Decline in the availability of non-timber forest products

According to JUSTICE et al (2001) in ecological terms, NTFP harvesting impacts primarily the distribution, abundance and age class distribution, of individual species, thus it contributes to forest degradation not deforestation.

NTFPs collected, play an important role in the lives of the people of Dimako for they serve as food, medicine, gift and source of income. A wide range of NTFPs are collected in the district and as of now no inventory has been carried out on the quantity of each product collected. The collection of NTFPs is uncontrolled and with pressure from demographic growth and urban demand, the people have abandoned the customary methods of collection which were relatively sustainable and have adopted mass collection methods some of which have led to the destruction of trees without regeneration. Such plant species are threatened or have completely disappeared from some parts of the forest. (Durrieu de Madron et al ;1998)

An example is the *Entandrophragma cylindricum* (sapelli) tree on which the highly appreciated caterpillar species always live on. Since these caterpillars are a source of revenue to many families, the tree that harbors them are exposed to destruction. The fact that the women have to trek long distances into the forest in groups nowadays to collect these products is a clear indication of the decline in quantity of NTFPs in the Dimako district.

Illegal and uncontrolled management of NTFPs may provoke the disappearance the trees species from which they are collected. A clear example of such a specie is *Baillonella toxisperma* commonly called Moabi apart from its wood and being used as above, its grains are used for producing oil used both for cooking and aesthetics highly appreciated both at the urban and local markets the specie stands the risk of being overexploited (J..J FAURE, 1993)



Picture 5 : NTFPs in the Dimako market

Table 6: Principal forestry products collected, their origin and parts used

Products underlined are those of high economic potentials

Vernacular Name	Scientific name	Exploited for wood	Part used
Moabi	<i>Baillonella toxisperma</i>	yes	pulp, grain, bark, latex
Ayous	<i>Triplochiton scleroxylon</i>	yes	Specific caterpillars
Sapelli	<i>Entandrophragma cylindricum</i>	yes	Specific caterpillars
Padouk.	<i>Pterocarpus spp</i>	yes	Bark
<u>Essessang</u>	<i>Ricinodendron heudelotii</i>	yes	Grain
Emien	<i>Alstonia congolensis</i>	yes	Bark
Tali	<i>Erytrophleum ivorensis</i>	yes	Bark
Yellow MoambÈ	<i>Enanthia chloranta</i>	yes	Bark
Bush Mangoes	<i>Irvingia gabonensis</i>	No	Fruit, seed
colanuts	<i>Cola accuminata</i>	No	Seed
<u>Voacanga</u>	<i>Voacanga africana</i> Non fruit, latex	No	Fruit, latex
<u>Akpa</u>	<i>Tetrapleura tetraptera</i>	No	The pod
<u>Ndimba</u>	<i>Afrostyrax lepidophyllus</i>	No	Graine, Bark
Raffia	<i>Raphia spp</i>	No	Shoots, rachis (bambo)
Palm trees	<i>Elaeis guineensis</i>	No	Nuts
Cane	<i>Ancystrophyllum spp.</i> Non tige	No	Stem
YAM	<i>Dioscorea spp.</i>	No	Tuber

<u>Koko or eru</u>	<i>Gnetum africanum</i>	No	Leaves
Bitter cola	<i>Garcinia cola</i>	No	Seed

4.1. 3. Reduction in agricultural crop yields

The Even though there are no written documentations yet ,recently farmers have been victims to the changes in the rainfall regimes, the rains either come earlier or late and do not last long as such farmers find it very difficult to program their farming activities.

The results are loss of seed, poor harvest, and eventually increase in the prices of foodstuff at the local markets. The low agricultural productivity is also as a result of inefficient use of seed and poor farming practices.

Seasonal drying up of streams and wells used for irrigation has a negative impact on the productivity

Accessibility of roads is a problem for the once abandoned by the exploiters they are poorly managed and accessibility is not easy especially in the rainy season and so most farmers find it difficult evacuating the harvest which often is the main source of revenue to their families.



Picture 6: Plantation of perennial (oil palm trees) and annual crops (maize and plantain)at the Dimako district.

4.1.4. Declining potable water supply and associated risk of water-borne diseases and other illnesses

Water supply is generally from natural sources. A fraction of villagers get water from boreholes and pumps. About twenty modern water points were created by the council but today, most of them do not function. Some of the accessible stream either reduces in volume or dry off in the dry season.



Photo7: water points in the district of Dimako

The population in Dimako suffers from water related diseases such as river blindness, guinea worm, diarrhoea in children, typhoid (CANADEL, 2010) Mosquitoes find fertile breeding ground in wet areas, bushes causing malaria. Other diseases include amoebiasis, chronic schistosomiasis, sexually transmissible infections (STIs) and HIV / AIDS. The types of epidemics constant are cough and pneumonia etc...

The birth rate stands at 4%, mortality rate at 2% and the rate of infant mortality at 8%. Infant mortality is mainly due to malnutrition, and malaria. Many people die by neglect and the practice of self-medication.

Several cases of patients with STI and HIV/AIDS have been reported in the town. The main factors favoring the spread of these diseases include: Insufficient health facilities, illiteracy, prostitution, and unemployment, ignorance of the population, sexual risk behavior, the practice of self medication and unhygienic practices by witch doctors.

The hygienic situation of the district is poor with inhabitants depositing wastes in the nearby streams thus polluting both their own source of water and the environment. Many people die by neglect and the practice of self-medication motivated by the fact that health centers are just three insufficient, poorly equipped and distant. This situation exposes the population to inadequate health services and consequently leads to poor productivity of the district.

The level of scolarisation in the district is low thus illiteracy is a major problem which highly influences the management of the environment and its resources. For example, children prefer to go collecting NTFPs and fishing which will give them an immediate income rather than attending school.

Table 7: Major impacts of climate change on forests and people in the Dimako District in Cameroon with the associated vulnerabilities and adaptation measures and activities adopted

Resource degradation	Vulnerabilities	Adaption measures and activities adopted
<p>Loss of forest resources due to human activities</p>	<ul style="list-style-type: none"> -Overexploitation and loss of biodiversity of flora and fauna. -Reduction of forest vegetation - Irregularities in rainfall patterns and temperature changes. 	<ul style="list-style-type: none"> - Forest exploitation following a management plan - Biodiversity conservation by creation of biodiversity conservatories within the council forest. And sustainable wood production. - the application of FLEGT (forest law governance and trade) at Dimako - Fight against corruption. - Installation of a barrier at the entrance to the forest to check poaching/illegal tree felling - population participation in the Management of forest resources associating/stimulating villagers through local consultative forest management committees to audit and follow forest logging, -partnership with the CTFC Technical Center for Council Forests - Exclusion of rare species like moabi (<i>Baillonella toxisperma</i>) from exploitation - Fire management strategies such as, Opening of external limits of DCF to prevent passage of fire from the exterior to the interior of the forest -the practice of agro forestry methods
<p>Decline in the availability of non-timber forest products</p>	<ul style="list-style-type: none"> -Destructive collection methods -NTFPs decline and threatened -NTFP collectors travel longer distances; 	<ul style="list-style-type: none"> Educate the population on sustainable collection and management methods of NTFPs - improve knowledge on NTFPs such as inventory of NTFPs -Attribution of permits to CIGs exploitation NTFPs -Reinforcement of managerial and organizational technics of CIGS and provision of machines for appropriate transformation of NTFPs - management plan of NTFPs - put in place an information system on the marketing of NTFPs. -Domestication of medicinal Plants -Regulate collection of NTFPs

		-Train population in sustainable collection methods
Declining potable water supply and associated risk of water-borne diseases and other illnesses	-Low productivity -exposure to diseases	- provision of portable water sources -Partners involved in development such as PLAN CAMEROON -Extension and accessibility of the hospital, and training of qualified staff -Education on hygienic health practices

5. Adaptation Strategies and Specific Activities in the Dimako District (ON GOING)

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